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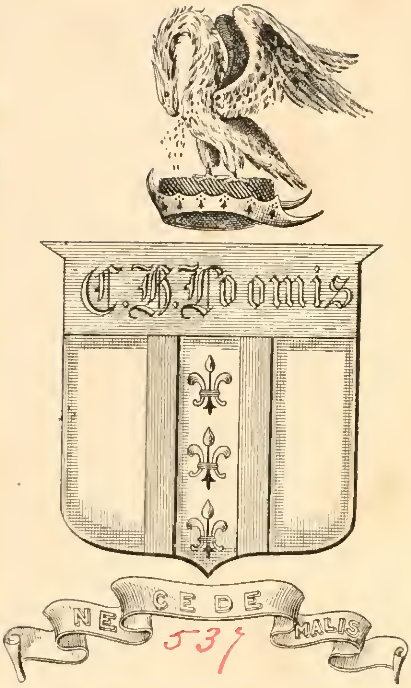
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HARDWICKE'S

SCIENCE-GOSSIP:

1889.

HARDWICKE'S

Science-Gossip:

AN ILLUSTRATED MEDIUM OF INTERCHANGE AND GOSSIP

FOR STUDENTS AND

LOVERS OF NATURE.

EDITED BY

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PREFACE.

THE present is the Twenty-fifth Annual Volume of our Magazine. There is no other magazine of popular science which equals the record. A quarter of a century is a long period in the history of magazine literature. It beholds the rise and fall and keen competition of many rivals. The law of the "Survival of the Fittest" is as true among literary and scientific competitors as in the world of living things.

What an enormous advance Science has made within the period comprehended by the lifetime of SCIENCE-GOSSIP! There is, perhaps, no previous quarter of a century equal to it in the whole history of scientific research. Our past volumes record this progress—all the more faithfully because it was recorded almost unconscious of the fact that an act of evolution was going on.

Perhaps one of the most striking features in the scientific history of the last twenty-five years is its increased democratic character. It belongs to the people, without any reference to rank, wealth, or influence. For years, in our columns, peers and peasants have discussed natural history subjects on common and equal ground. Science has sprung from the people, and belongs to the people. Apart from its increasing national economic importance, it is one of their chief intellectual delights. For one person who cared enough about the multitudinous objects of nature to enquire into them a quarter of a century ago, there are at least ten now.

It has always been our aim to meet this growing and spreading love of Science among those who follow it for the love of it. On this account, from time to time, we have included new subjects of research and study.

Next year we propose devoting a special department to PHOTOGRAPHY. That charming branch of amateur and holiday science is capable of much good service in the cause of natural history. Photo-micrography is already an adjunct of microscopical research; and its splendid adaptation to the lantern for lecturing purposes is admitted by all who have taken advantage of it. Photography has many a little side path unentered. If it only gave artists real studies of plants for use in their foregrounds, rocks and trees for their landscapes, and clouds for their skies, and thus abolished the conventional kinds hitherto in use—it would be a great gain to Art. We therefore cordially invite our readers to assist us in forming and carrying on each month a Department devoted to Photography, especially so far as the latter affects Natural Science.

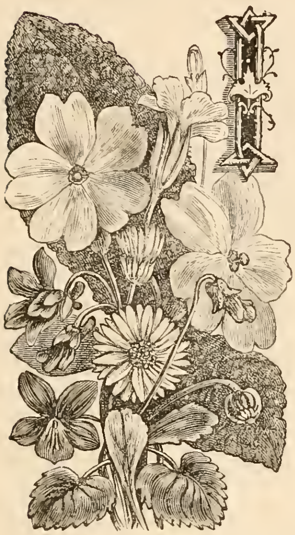
It is cheering to the Editor to receive from time to time the kindly encouragement and congratulations of contributors and subscribers. He asks all his allies to assist in making SCIENCE-GOSSIP known among their friends. An increased circulation means increased efficiency. He is grateful for the kindly sympathy and help of the past year. The conduction of the journal brings him into contact with troops of friends, to each of whom he appeals for increased assistance.

Perhaps the best evidence of the bibliographical value of SCIENCE-GOSSIP is the fact that many of the back numbers of years ago are asked for at double the price they were published.

LIST OF ILLUSTRATIONS.

RUDIMENTS AND THE IDEAL FORM.

By NINA F. LAYARD.



IN reply to two papers in the October issue of SCIENCE-GOSSIP, referring to my articles on "Rudimentary Organs," I will first notice Dr. William Smith's explanation of the word "rudimentary," as quoted by Mr. A. H. Swinton, though it does not materially differ from the meanings given by other good lexicographers. He says: "It is derived from the Latin adjective *rudis*, in a natural state, not improved by art," &c.

As a natural state is, according to Dr. Webster, a "normal" state, and a normal state is one in which the organ "performs its proper functions," this appears to disallow Mr. Darwin's expressed explanation of his own use of the word in a letter to C. Lyell, 1859. "An organ," he says, "should not be called rudimentary, unless it be useless." This characteristic he proceeds to contrast with that of a nascent organ, "which though little developed, as it has to be developed, must be useful," &c.

Notwithstanding, however, the assertion, that that which is properly called "rudimentary" is incapable of development, we find an instance in the "Descent of Man," in which the author has himself accidentally fallen into the generally accepted use of the word. Explaining the first attempts of birds to sing, he says, "Their first essays show hardly a rudiment of the future song." * He also, without comment, quotes Professor Wyman, and speaks of "rudimentary legs" in the human embryo.*

In the letter quoted by Mr. Swinton, the following expression occurs: "Natural selection cannot possibly make a useless or rudimentary organ." How is this to be reconciled with another statement in the "Descent of Man"? p. 25. Treating of the existence of rudimentary organs, Mr. Darwin says: "They became greatly reduced, either from simple disuse, or through the natural selection of individuals," &c.

With reference to Mr. Tansley's paper, I am sorry that he should suppose that I purposely ignored the instance of the "os coccyx" brought forward by him in his article of August last.

He there asks: "What 'quality' does Miss Layard find in the 'os coccyx' to compensate for the 'quantity' in the tail? And how can a structure, *i.e.* which is so degenerated as to have no function at all, be 'more perfect' than one which in many cases has distinct functions"?

To this I would reply: In the first place, it is not a fact that the os coccyx has "no function at all." It is perfectly adapted to its function, which is to "give attachment to certain muscles." Of this Darwin was aware, though he still chose to call it a "rudimentary tail." †

When we consider the difference of man's posture from that of the beasts, the former being erect, the latter quadrupedal, we may, perhaps, regard the tail as a necessary protection, which the improved structure no longer required.

I am not aware that this solution has been put forward, but it appears a very simple and natural one; in which case the tail, far from being the "typical standard" of a now debased organ, would rather suggest a mark of servitude, and stamp its wearer as of lower origin.

Mr. Tansley is perfectly justified in pinning me to the second consideration, which I am most certainly responsible for starting, namely, as to the claim of the human creature, from one point of view, to be regarded

* "Descent of Man," p. 86.

* "Descent of Man," p. 11.
† 'Letter to C. Lyell,' October 11, 1859.

as an "ideal form," but while I am ready to defend my position on the ground first taken up by me, it is fair that my original meaning should be clearly understood.

In my first article, I said: "According to the theory of development, it has taken untold ages of evolution advancing by gradations infinitely minute, to produce at length the ideal human form." This sentence Mr. Tansley omitted to quote, though he proceeded to challenge the following sentence which succeeded it: "allowing, as we must, man's to be the ideal form."

I think it is sufficiently clear that my object was to meet the evolutionist on his own ground. This I explained more fully in my second article, in the following sentence: "arguing upon evolution grounds, we are bound to look upon anything lower than the ideal form as an arrested development; and for the sake of the argument I adopted that position." In my third article, March, 1888, I again repeated that "arguing on evolution ground only," should I use such terms as "excrescences and deficiencies, with regard to organs in the lower animals," and concluded my paper by saying: "To the non-evolutionist every group is perfect in its kind, and for its environment." This I repeated again in my last article.

But while I wish it to be understood that I am not pressing for a linear classification, there are higher and lower morphological types which make a philosophical classification necessary, and I have the authority of Agassiz for placing man at the head of this classification. He says, "It is evident that there is a manifest progress in the succession of beings on the surface of the earth. This progress consists, &c., &c., among the vertebrata especially, in their increasing resemblance to man."*

With regard to Mr. Tansley's objection to my use of the term "ideal form," I will again quote the same authority. Speaking of groups of animals, Agassiz says, "For each of these groups, whether larger or smaller, we involuntarily picture in our minds an image made up of the traits which characterise the group. This ideal image is called a type, &c., &c. This image may correspond to some one member of the group, but it is rare that any one species embodies all our ideas of the class, family, or genus to which it belongs, &c., &c. It is common, however, to speak of the animal which embodies most fully the characters of a group, as the type of that group."†

If then it is true that groups of organic beings in an ever-ascending scale have given place to "other and more perfect groups," which is the expression used by Darwin, and if in the most perfect group, man is found to embody most fully the characters of the group, we may surely in this sense regard him as the type, and describe him as the ideal image.

* Agassiz and Gould's "Comparative Physiology," p. 417.
† Agassiz and Gould's "Comparative Physiology." Introduction, p. xx.

Mr. Tansley further says: "organs, &c., can only be considered more or less perfect in proportion as they are more or less able to perform the functions for which they were developed, and that, therefore, no organism can be said to be 'ideal' unless every one of its organs performs its function more completely than any corresponding ones throughout organic nature."

If this be the only legitimate way of comparing organs and organisms, the rule should certainly hold good with regard to groups of organic beings; but is this Mr. Darwin's meaning of the expression "more perfect" when alluding to them?

Does he mean "groups of organic beings better able to perform the functions for which they were developed"?

If so, this is a contradiction of Mr. Fenn's statement in the November number of SCIENCE-GOSSIP, 1887, that "all animals are as perfect as man, and as admirably adapted to their surroundings."

Again, Mr. Darwin speaks of man as "the wonder and glory of the universe."* If he judged of him simply "in relation to his environment," as Mr. Tansley would insist, why should he use such an expression regarding man rather than any of the lower animals?

It is very evident, I think, that he recognised in him, the type, or ideal image, of the most perfect group, "standing," as Dr. Nicholson expresses it in his "Manual of Zoology," "at the top of the whole animal kingdom."† This is hardly stronger language than that used by me in my first article, when I spoke of man as the "last triumph of creative power."

Mr. Tansley's view of the operation of Natural Selection is that it "ultimately consists in the action of certain purely mechanical environing agencies on the organism," and is not the result of "the operation of an intelligent agency."

This is hardly in accordance with the following statement of Mr. Darwin's. He says: "We can only say that it has so pleased the Creator to command that the past and present inhabitants of the world should appear in a certain order, &c., &c., that He has impressed on them the most extraordinary resemblance, and has classed them in groups subordinate to groups."‡

Mr. Tansley further adds "that the operation of an intelligent agency, would be entirely inconsistent with the operation of a factor like Natural Selection." I cannot reply to this better than by quoting the words of Mr. Alfred Russell Wallace, one of Mr. Darwin's ablest fellow-workers and followers, who, after combating in the earlier part of his argument, what he calls the "continual interference hypothesis," is forced by his observations of a certain class of phenomena relating to the development of man, to

* "Descent of Man," p. 212. † "Manual of Zool.," p. 16.
‡ "Animals and Plants under Domestication," vol. i. p. 9.

the following confession. "The inference I would draw from this class of phenomena is, that a superior intelligence has guided the development of man in a definite direction and for a special purpose, &c., &c. We must therefore admit the possibility that, if we are not the highest intelligences in the universe, some higher intelligence may have directed the process by which the human race was developed; by means of more subtle agencies than we are acquainted with."

"At the same time I must confess, that this theory has the disadvantage of requiring the intervention of some distinct individual intelligence, to aid in the production of what we can hardly avoid considering as the ultimate aim and outcome of all organised existence — intellectual, ever-advancing, spiritual man."*

Whether this "controlling intelligence" was angel, archangel, spirit or demon, does not affect the question. It is enough for the purpose to know that this champion of Natural Selection discovered the necessity of recognising the operation of an "intelligent agency," directing the process of man's development, and was honest enough to admit it.

Perhaps Mr. Tansley would agree with Mr. Wallace that "it is simply a question of how the Creator has worked," and not whether there exists an "intelligent Creator"?

If so, he is still in the company of Darwin, Wallace, and Dawson, names that may surely figure among "the prominent men of science of the day."

If on the other hand, such words as the following are the sum and substance of Mr. Tansley's belief, "Natural Selection, &c., &c., ultimately consists in the action of certain purely mechanical environing agencies on the organism," then the question becomes one of supreme importance.

Does Mr. Tansley see no difficulty in such a statement as that which I subjoin? Speaking of the rhizopoda, Huxley says: "In the substance of many of these creatures, nothing is to be discerned but a mass of jelly, &c., &c.; it is structureless and organless, and without definitely formed parts. Nevertheless, &c., it can produce a shell: a structure in many cases, of extraordinary complexity and most singular beauty. That this particle of jelly is capable of guiding physical forces in such a manner as to give rise to those exquisite and almost mathematically-arranged structures—being itself structureless and without permanent distinction or operation of parts is, to my mind, a fact of the profoundest significance."†

What this "profound significance" implies, the writer does not tell us, but to some minds it would not unnaturally necessitate the conception of an intelligent agent.

With regard to my statement, that "an evolution of retrogression has been cheerfully accepted," and to which Mr. Tansley takes exception, I will refer him to a paper by T. in June 1888.

In defence of the illustration used by me of "Mozart playing on a worn-out piano," though Mr. Tansley conceives it to be "singularly unhappy," and objects that the piano "cannot possibly be compared with an organism, which has infinite powers of adapting itself to changed conditions," he must remember that instead of speaking of the "os coccyx" as perfectly adapted to its present undoubted function, he described it as "so degenerated as to have no function at all."

In conclusion, I would thank Mr. Tansley for his last article, which has given a more clear and definite shape to the argument.

* Wallace, "On Natural Selection," p. 360.

† "Introduction to the Classification of Animals," Huxley pp. 10, 11.

HOW TO WORK WITH THE MICROGRAPHIC DICTIONARY.

By W. J. Simmons.

THE great value of the Micrographic Dictionary can only be realised by always having it at hand on the work-table, and by constantly referring to it. If used in this way it will soon prove itself to be something more than a mere work of reference. To enable students, and those whose leisure may be scanty, to work at the "Micrographic" from this standpoint, I venture to trespass on your space with a list of articles, the careful perusal of which, in the order I have given them, will repay the trouble of following my advice. It took me some little time to draw up the list; and, as I found it useful, I proceed to set it out for the benefit of your readers, as a clue to what may be designated "treatises," concealed in the pages of Griffiths and Henfrey's useful work.

List: Protoplasm, p. 641; Primordial utricle, p. 637; Sarcode, p. 674; Cells, animal, p. 137; Cells, vegetable, p. 142; Secondary deposits, p. 686; Pitted structures, p. 600; Spiral structures, p. 711 (herein refer to the following articles: Lycopodiaceæ, Ferus, Masses); Tissues, vegetable, p. 768 (herein also Fibro-plastic and Animal); Inter-cellular substance, p. 438; Medulla and Medullary rays, p. 495; Pollen, p. 613; Anther, p. 56; Spores, p. 724; Ovule, p. 565. Also the following: Epidermis, p. 294; Hairs, p. 370. The value of the notes to Bibliography which follow each article can only be appreciated by any one who is determined to follow up a subject, or to find what has already been written about some object which has awakened interest in the real student of nature.

Another way in which such a student can utilise the "Micrographic" is to draw up conspectuses in the form given below. Similar schedules will be found under some of the articles, e.g. under *Trachelina*, p. 775. But under *Actinophryina*, p. 14, a table only is given, on which my conspectus is entirely based, though I venture to consider my "Key" of more help in tracking down species than the table. Here is my method of arranging the information given in the table under the heading "Actinophryina."

ACTINOPHRYINA, p. 14.

I. Shell absent	1. Pseudopodia arising from all parts of the surface. *Ex. Actinophrys*, p. 14.	
	2. Pseudopodia arising from a zone near the circumference. *Ex. Trichodiscus*, p. 780.	
	3. Pseudopodia arising from one side. *Ex. Plagiophrys*, p. 604.	
II. Shell present, *free*. . .	1. Incrusted with foreign mattter. *Ex. Pleurophrys*, p. 606.	
	2. Not incrusted, oblong.	*a.* Orifice lateral. *Ex. Trinema*, p. 783.
		b. Orifice terminal. *Ex. Euglypha*, p. 306.
III. Shell present, *attached* to foreign bodies, *Ex. Urnula*, p. 795.		

(*The references are to the pages of the last edition of the Micrographic.*)

I have drawn up several of these "Keys," notably one for the *Rotataria*, which has proved serviceable; it extends over five full sheets of foolscap written brief-wise. Portions of these tables are merely re-arrangements, similar to the key to the *Actinophryina* given above. They suggest that complete sets of "Keys," with references to the pages of the text, printed as an appendix to the future editions of the dictionary would be as useful as the analyses prefixed to Lewis's Law of Trusts, and Smith's Real and Personal Property, the former of which also has references to the pages of the text.

Readers who have followed me thus far will understand that I advocate the exercise of drawing up these conspectuses for two reasons:—(1) the practice impresses characteristic features in the mind; and (2) the conspectus when framed is a handy and practical guide to the worker. Finally I believe the "Micrographic" can be most advantageously employed if the student will take it up, pen in hand, in the way indicated above.

GOSSIP ON CURRENT TOPICS.

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

LIQUID PRISMS.—The spectroscope has now become so important as an instrument for research, that everything concerning it is interesting. Its efficacy depends upon the varying refrangibility of light from different sources, or light of different colours. We pass compound light such as that of a white sunbeam through a prism of glass or other transparent substance, and thereby bend it out of its original course. If it were all bent in the same degree, we should still obtain a white image on a screen or in the eye; but as the violet, indigo, blue, green, yellow, orange and red rays, are refracted or bent in different degrees—in the order named—they diverge from each other in the newly-acquired or bent course, and thus are projected upon different places, and are accordingly seen separated from each other.

But the bending or refracting power of transparent substances varies considerably, and the degree of dispersion they thus effect varies accordingly. The more delicate researches in spectroscopy demand high degrees of dispersion, far more than a single prism of glass can supply. Therefore, trains of such prisms are used, the second receiving from the first, the third from the second, and so on, in such wise that each spreads further out the outspreading of the preceding one. But each of these prisms stops some of the light, and a long battery of prisms is complicated and costly. Therefore it is desirable to use the transparent substance which has the greatest dispersive power. When some fortunate chemist shall succeed in crystallizing carbon, or, better still, in obtaining it in the form of a plastic transparent jelly, like many of its compounds, we shall have prisms vastly superior to those of glass, and microscope lenses of corresponding superiority. In the meantime, a liquid compound of carbon with sulphur, the bisulphide of carbon, has been used by enclosing it in a hollow glass prism. This, however, stands a long way behind the diamond in dispersive power, though somewhat before glass, and it has a pernicious habit of becoming yellow as it grows old, and has done much work by exposure to light. Mr. H. G. Madan has tried, as a substitute, a liquid with rather higher refractive power than the bisulphide, which is also a carbon compound containing nitrogen and hydrogen in addition to the carbon and sulphur, and bearing one of those hideous hypothetically descriptive names that are now in fashion among a certain class of chemists, "*phenylthiocarbamide*" and "*iso-solfocianato-fenilico*." It is interesting, however, in spite of such ill-usage. It retains its colour; is far less volatile than the bisulphide; is not so combustible, and does not dissolve the cement that may be most conveniently used for uniting the three pieces of glass that constitute its prismatic prison walls. Therefore it will come into frequent use.

SCAVENGERS ON THE SEA-COAST.—"In the Revue Biologique du Nord de la France," is a paper on the natural scavengers of the coast, in which is stated the curious fact, that at Boulogne the species Nassa is very abundant, and works very hard in destroying dead and decaying animal matter. At Le Portel, a fishermen's village, so near that it is but a suburb to Boulogne, Nassa is scarce, but *Eurydice pulchra* is very abundant, and transacts the necessary business. At Cape Alprech, there are neither Eurydice nor Nassa, but *Ligia oceanica* performs; and at Equihen, the work is done by Orchestiæ. No explanation of the difference is supplied, but I venture to suggest that, in the case of Boulogne, all but very hardy filth-eating animals must be killed by surfeit if they approach the harbour. At Le Portel there is one main sewer which is uncovered as it flows into the sea. I have seen the picturesque fisher-wives busily engaged washing their clothes at its outlet. I suppose they find that the ammonia softens the water. If Nassa objects to soap it would avoid this locality. The other places named are farther away and, therefore, may be the habitat of animals that are not sufficiently hardy to endure the aroma of the "eau de Boulogne" which is washed into the sea when the harbour is flooded by the Liane.

Rock-formation under Pressure.—The researches of W. Spring are throwing more and more light on the physics and chemistry of geology. He showed some time ago that a mixture of copper and zinc filings may, by simple compression, become completely interfused and form brass; that lead and tin may thus form pewter, and fusible alloy may be similarly formed by subjecting a mixture of its constituents to pressure. Also that sulphides of alkalis and alkaline earths may be similarly formed. It was previously assumed that fusion by heat was necessary for effecting such combination.

He has recently continued such experiments by operating with moistened substances, submitting them to a pressure amounting to 6000 atmospheres, *i.e.* to about the pressure to which the crust of the earth is subjected at a depth of 60,000 to 70,000 feet. With all the metals the moisture exerts a retarding action, but with soluble substances that give a solution having less bulk than the undissolved materials the conglomeration is assisted by the moisture, while with substances that give a solution of greater volume than the sum of the solid and its solvent it is retarded.

Substances of the first of these two classes have their solubility in water increased by pressure, while those of the second, suffer a diminution of solubility by pressure. Insoluble substances do not show such marked differences under pressure in the wet and dry state, but in some cases among these the water assists the conglomeration.

A little reflection will show the bearing of these researches upon the formation of rocks and minerals of all kinds, seeing that in the subterranean laboratory of nature pressure is always operating, and therefore, our superficial laboratory results are modified accordingly. Mr. Spring's researches are, in fact, opening up a new chemistry, modifying and even contradicting some of the laws induced from our ordinary laboratory phenomena. One of these is the supposed law, that chemical combination cannot occur between dry solids, as familiarly illustrated by the fact, that dry carbonates of soda or potash may be mixed in a state of powder with dry tartaric or citric acid without combining, while they combine with effervescence immediately they are dissolved or even wetted.

It appears that the agency of water in such cases does no more than to bring the substances into contact; that the contact, if effected by pressure, has the same effect. If dry sulphate of baryta and carbonate of soda are compressed, a reaction sets in, which is greatly accelerated by heat, and other new and curious chemical reactions may be produced under pressure. Mr. Spring is proceeding with further investigations.

Dyes from Sea-weed.—Mr. F. Nettlefold has recently communicated to "The Chemical News" (vol. lviii. page 15), some interesting results obtained by nitrating alginic acid, a sea-weed product. He thus obtains a light yellow substance, which is insoluble in water, but which by treatment with alkalis yields a brown solution. This alkaline solution, especially when the alkali used is ammonia, dyes cotton directly, without any mordant, and produces a fine "Bismarck brown," which resists soap, and is said to excel many of the aniline colours, the depth of shade being considerable and of great intensity. This dye differs from the aniline dyes in having little affinity for wool, either mordanted or unmordanted.

This may be the beginning of much useful work, as the dye is so especially applicable to cotton. It seems to be generally the case where any one very decided colour may be brought out, others are obtainable by modified processes. It will be a great boon if we can turn the vast accumulations of sea-weed on our shores to good account as raw material for chemical manufacture.

Pig Feeding.—German chemists and farmers are doing a great deal of useful work in the feeding of animals scientifically, *i.e.* by weighing different kinds of food and carefully recording results. N. J. Fjord, by thus using corn, skim milk, whey, &c., as pig-food, comes to the following conclusions. 1st, that the common opinion that pigs make more profitable use of their food when it is largely diluted with water—as in ordinary pig-wash—is fallacious; 2nd, that although confining pigs produces more increase of weight than allowing them to run in the sty-yard, he thinks they are thus rendered more liable to disease. This is not new. I have heard the same opinion expressed by English farmers; it is in fact almost self-evident, but unfortunately many pig-feeders care for nothing beyond obtaining weight, whether the fattening be a healthy growth or a result of disease. Judging from the panting specimens commonly exhibited at our cattle-shows, I suspect the judges who award the medals are equally indifferent. I may safely venture to affirm that they rarely or ever apply the stethescope to their victims.

The 3rd conclusion of this experimenter is that 12 parts by weight of whey, 6 of skim milk, 1 of bruised barley, and 1 of bruised rice, are of approximately equal feeding value.

Mixed Diet *v.* Vegetable-food for Pigs.—Another German experimenter selected six pigs from the same litter 100 days old; and three were fed on 1 part by weight of dried blood, 6 of bran, and 14 of skim milk; the other three received an unlimited amount of maize-meal. The difference of composition of these two kinds of food was considerable; in the first, one half of the dry weight was albuminoid or nitrogenous; in the second, only $\frac{1}{7}$ or $\frac{1}{8}$, the excess in the latter being carbo-hydrates or farinaceous food. At the end of 130 days, the pigs were killed and compared, with the following results.

The total live weight of the first set was 19 per cent. greater than that of the second. In set 1, 38 per cent. of the whole body, excluding bone, was fat; in set 2 it amounted to 46 per cent. The dead carcasses of set 1 were 21 per cent. heavier than set 2; the kidneys of set 1 were 42 per cent.; the spleens 33, the livers 32, the blood 59, the hair and skins 36, the large muscles of the back 64, the two muscles of the body cavity 38, and the bones 23 per cent. greater than in the second set. The strength of the thigh-bones, determined by a specially-contrived machine, was found to be 62 per cent. greater in the first than in the second set.

From this it is inferred by the author that by varying the feeding, fat or lean can be cultivated at pleasure, the carbo-hydrates being the most effective fat producers, but that excessive fat is produced at the expense of the muscles and to the detriment of the animals if used for breeding.

Referring again to our Christmas shows of fat beasts, it would be well if some such analyses as the above were made occasionally.

As pigs in their natural state obtain neither the dietary of set 1 nor set 2, a third set of experiments might be made in which green vegetables and roots should be added to the excessively farinaceous diet of the third set, the absence of vegetable juices in which is a serious defect.

LAELAPS ARVOLICA.

Parasite of Water Rat (*Arvicola amphibius*).

THIS Gamasid, so far as I know, has never been described, or figured. The Gamasi are so numerous that we may be thankful wherever there is any well-marked structural difference enabling us to form a subdivision. We have to thank Koch for the division Laelaps. He describes and figures four species. These were all found on mice; two of them (*L. hilaris* and *L. pachypus*) on *Lemmus arvalis*, and two (*L. agilis* and *L. festinus*) on *Mus sylvaticus*. The division is founded chiefly on the fact, that the front legs, though longer, are almost as thick as the second pair, whilst in gamasus the front legs are not only longer, but much thinner than the second

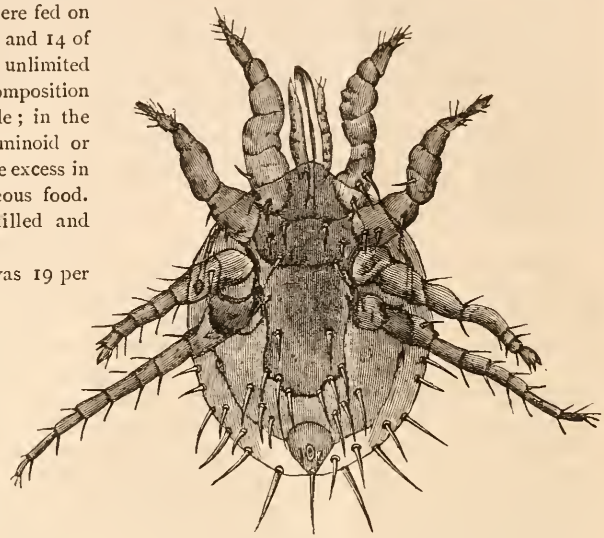


Fig. 1.—Ventral surface of Parasite of Water-Rat (magnified).

pair. Murray ("Economic Entomology," Aptera), objects to this genus on the ground that the figure in Koch's Uebersicht does not bear out his diagnosis.

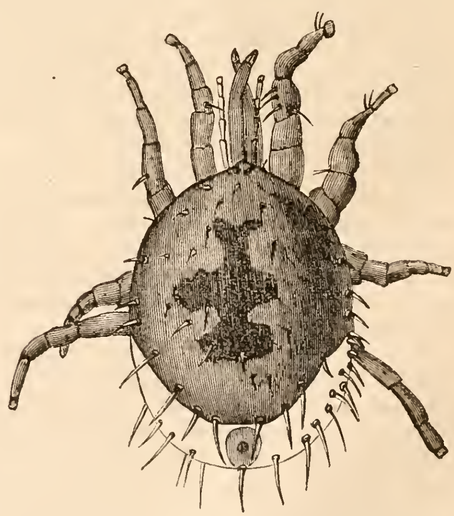


Fig. 2.—Dorsal surface of Parasite of Water-Rat (magnified).

This shows that Murray had not seen any of the creatures, and probably had not seen the figures in Koch's larger work. The specimens from which my figures are drawn were sent to me for identification by my friend Mr. J. E. Mason, of Alford, in this county. He found them on a vole (now in the Museum at Edinburgh) which was brought into his house by his cat.

Figure 2 is a view of the upper-surface of the mite. It will be observed that the larger portion of the body is covered with a chitinous plate of a dark brown colour; in its middle is a darker portion in the form of a cross. The creature is covered with a number of strong spiky hairs, especially noticeable near the edge of the dorsal plate, and on the hinder margin of the soft part of the body.

Figure 1 shows the under-surface. There are two somewhat quadrangular chitinous plates, one thoracic, the other abdominal, having spiky hairs, especially near the angles. And besides these two plates, there is a third lighter-coloured anal plate, of a triangular shield-shape, having the anal aperture in the centre, a small hair on each side of this aperture and a long spiky hair at the apex.

The two spiracles are easily seen, also the air-tubes leading from them.

C. F. GEORGE.

ASTRONOMY AND METEOROLOGY.

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

AT the meeting of the Royal Astronomical Society Mr. J. Roberts described the instrument by means of which he measured and engraved copies of stellar photographs, to which I referred in my last article. The diameters of the star discs are measured by the aid of a micrometer connected with a graving tool moving over a copper plate, so that a circle is drawn on the plate corresponding to the size of the photographed star disc, and the position of the star is accurately registered on the copper plate.

Mr. Inwards described a novel compensating pendulum of very simple construction. The pendulum has a steel rod and a steel sphere. The rod is suspended by a spring, which is clasped between jaws held in a sliding block of metal, which moves vertically in a groove below the point of suspension. With each variation of temperature the sliding block moves up or down, so that the spring is clasped by the jaws at a different height, as the sliding block is attached to a zinc rod, the height of which can be adjusted by a fine screw.

In January Mercury will be an evening star, setting at the beginning of the month about 4 aft., and on the 31st at 6.33 aft.

Venus will be an evening star, setting on the 1st at 7 hrs. 41 min., and on the 31st at 9 hrs. 7 min.

Mars will be an evening star, setting on the 1st at 7 hrs. 47 min., and on the 31st at 8 hrs. 3 min.

Jupiter will be a morning star, rising on the 1st at 6.46 A.M., and on the 31st at 5.15 A.M.

Saturn will be an evening star, rising on the 1st at 7.13 P.M., and on the 31st at 5.3 P.M.

Meteorology.—At the Royal Observatory, Greenwich, the lowest reading of the barometer for the week ending 24th November, was 29·61 in. on Tuesday morning, and the highest 30·06 in. on Friday evening. The mean temperature of the air was 49 deg., and 7·8 deg. above the average. The general direction of the wind was W.S.W. Rain fell on two days of the week, to the aggregate amount of 0·11 in. The duration of registered bright sunshine in the week was 6·2 hours, against 5·1 hours at Glynde Place, Lewes.

For the week ending 8th December, the lowest reading of the barometer was 29·75 in. at the beginning of the week, and the highest was 30·6 in. on Thursday morning. The mean temperature of the air was 49·1 deg., and 6·7 deg. above the average. The general direction of the wind was S.S.W. Rain fell on three days of the week, to the aggregate amount of 0·17 in. The duration of registered bright sunshine in the week was 11·5 hours, against 9·3 hours at Glynde Place, Lewes.

The temperature in January is several degrees higher on the west coast than it is on the east coast.

The isotherm, or line of equal temperature, 38°, runs along the east coast from Berwick to Lincoln, and then trending to the west returns inland through York to Dumfries. 39° runs from Kirkcudbright through Bolton, Chester, Hereford, Oxford and London to Ramsgate. 40° from Wigtown, through Radnor, Bournemouth, Bristol, Salisbury, Southampton, and four miles inland along the coast to Folkestone. 41° from the Isle of Man, through Taunton to the Isle of Wight. 42° from Anglesea, through Swansea, across Dartmoor to the sea. 43° from Pembroke through Plymouth. 44° runs through Truro, and 45° just through the Land's End.

In January the average rainfall on the east coast is 1 inch; inland throughout the midlands it is 2 inches; along the south coast it is 3 inches, and along the west coast it is mostly 6 inches, this last figure representing the enormous amount of 620 tons to each acre.

MILD DECEMBER DAYS—SOME CURIOUS CONTRASTS.—During the first week in December a strong and broad current of air came across our islands from the equatorial regions of the Atlantic, and unusually mild weather was reported over the entire kingdom. On the Continent, however, where light breezes descend from a large anticyclonic system lying over Central Europe, conditions were more seasonable, and as a result some curious contrasts have recently been observed between the weather over England and the state of things prevailing in localities which bear a reputation for sunny geniality. On the morning of the 4th of December, for example, London was 5° warmer than Naples, 7° warmer than Monaco, 9° warmer than Laghouat, in Central Algeria, 11°

warmer than Constantinople, 12° warmer than Bordeaux, 14° warmer than Marseilles, 16° warmer than Rome, 17° warmer than Madrid, and 19° warmer than Paris. On the 6th very similar contrasts were observed, the weather in the metropolis being 3° warmer than Lisbon, 11° warmer than Nice, 19° warmer than Paris, and 30° warmer than Belfast. In the course of the day the thermometer in London reached a maximum of 58°, and the day was therefore the mildest December day experienced since 1873, when a similar reading was recorded on the 17th of the month. An examination of the meteorological statistics shows that the thermometer in December seldom rises above 55°, and in the years 1885, 1886, and 1887, it did not succeed even in reaching that level.

On the 10th came a great change, for on the morning of that day it was colder in London than any other part of western Europe south of the Arctic circle, being 22° colder than the Scilly Isles, 10° colder than Berlin, 3° colder than Paris, and 1° colder than Stockholm.

A WINTER IN MASSAUA.

Part II.

BIRDS were more numerous. There were two species of vultures, the more numerous species being quite black, a stork, a heron, spoonbill (*Platalea leucorodia*), pelican, three species of gull: a bird of one of these species was wounded in the wing and is now alive and doing well in the Zoological Gardens; two species of terns—a specimen of one of these species (*Sterna velox*) was also wounded and kept alive for some months, and was a most interesting pet; it was astonishing to see what large fish it would swallow. A gannet, tropic bird, large numbers of sandpipers, turnstones and curlews, a sand grouse, three species of wagtails, several of flycatchers, an owl, a goatsucker, and a bunting, the last very common, and as its breast was jet black and its upper plumage and head sand-coloured, seemed to appear and disappear in a marvellous manner.

Reptiles were scarce: one small brown snake, a small striped sand lizard, and a gecko were all I saw. The sand lizard is a species also very common at Suakim.

Land Arthropoda.—Malacostraca by one species of armadillo. Arachnidi were poorly represented in species, but these species were plentiful. There were two scorpions, *Prionus liosoma*, and *Bultius Europæus*; three spiders of the genera Ixodes, Epeira (very common) and Thomisus respectively. The Myriopoda were represented by one species of the genus Scolopendra. Of Insecta were collected ten species of Hemiptera, among which were *Cletus notatus*, *Pentatoma verbasci*, *Lygnus crudelis*, Pentatiomi, Reduvius, Reduvii, *Dysderius superstitionis*; seventeen species of Orthoptera, *Cyrtacanthacris rufiurnius*, *Truxalis nasuta*, Œdipoda, *Caloptemus Italicus* (?), *Chrotogonus lugubris*, Gryllus (two species), Porthetis, Opernala (?), Opomala (?); seven species of Neuroptera, *Anax ephippigerus*, *Myrmeleon* (*acanthaclisis*), Myrmeleon, *Distoisteisa Brullei*, *Sphingonctus nebulonis* (?), *Cyrtacanthairis mœstus*, Chrysopa; ten of Diptera, *Hippobossa camelina*, Bombylius, several species of Muscidæ (the common house-fly was very numerous and troublesome), and Culicidæ, and one species of Tipulidæ; thirty-seven of Lepidoptera, *Attacus bankinæ*, *Sphingomorpha chlorea* (common), *Achæa melicerta*, *Deiopia pulchetta* (common), *Callopistria exotica*, Agrotis, *Arcidalea interpulsata*, *Callichryas pyrene*, *C. florella*, *Allylothris agathina*, Teraclus, *Belenois ellescutina*, *Colias hyale*, *Danais dorippus*, *Hypolimas alcippoides*, *Pyrameis cardui*, Yphthmia, *Azarus jesous*, *Plebeius trochilus*, *Taracus pulchra*, *Pyrgus asteroidea*. There were three other species of butterfly observed, and, among the moths, some Tineidæ, which I did not catch; seventeen of Hymenoptera, *Stilbum amethystinum*, *Eumenes dimidiatipennis*, Ammophila, Xylocopa, Multillo, *Xylocopa modesta*, Discolia (two species), Bracon, Rhynchium; fifty-seven of Coleoptera, two species of Trimera, Dermestes, and Coccinella; two species of Tetramera of the genus Cleonus; of Heteromera, *Zophosis sulcapus*, *Arthroideus cicatrix*, Oxycara, Crypticus, Aphitobius, Monomma, Opatrum, Adesmia (two species), Pimelia, Ocuera (?), Lentyria, Euryon (?) Nacerdes, and others unidentified; of Pentamera were Philonthus, Oxypoda, Aphodius (two species), Saprinus (four species), *Corynetes rufipes*, *Dermestes vulpinus*, Anomala, Dromius, Chlænius, Brachinus, Harpalus, Irox, Onthophagus, *Atenchus sacer*, Copris (two species), Hister, *Silpha micans*, Acanthophorus near Capensis, *Ermectes griseus*, Bradybænus, *Glycia ornata*, *Tetragonoderus flavo-vittatus*. In most cases the generic names only are given, but where possible the specific names have been added. There were great numbers of Orthoptera, particularly grasshoppers, but the variety of species was small. Of the beetles, the Carabidæ were well represented, while only two species of Staphylinidæ could be found and those very small.

Fishes, Crustacea, Corals, etc.—The scarcity of life on land is amply made up by its profusion in the sea; at times the harbour literally teems with fish, a "Half-beak" (Hemirhamphus) is particularly plentiful. These fish swim about in shoals and are often attended by one or two Belones, who occasionally snap up one of the "half-beaks." It is curious to see a belone swimming with, and in a shoal of "half-beaks," for a circle quite free of fish surrounds the belone, then suddenly with a dart like lightning the belone seizes an unfortunate "half-beak" and swallows it. I caught a belone in a strange manner one day, it had got some fatty substance entangled in its jaws, and was unable to dive or swim. Nineteen species of fish were captured as follows: *Apogon enneastigma*,* *Apogonichthys auritus*,* *Scolepsis ghanam*,* *Coesio striatus*,* *Chrysophrys bifasciata** (tolerably common and very good eating), *Serranus hexagonatus* and *S. lanceolatus*, both species plentiful and fairly good eating, commonly known amongst sailors as "rock-cod," *Lethrinus mahsena*, common and good eating, *Holocanthus maculosus*, *Caranx affinis*,* *Antennarius marmoratus*, var. *raninus*, *Acanthurus nigrofuscus*, *Gobius echinocephalus*,* very common amongst the coral and attaching itself to it by the sucker formed by the ventral fins, *Petroscirtes mitratus*,* *Tetrodon stellatus*,* a pretty yellow and black-striped "globe-fish," and when it was first hauled up in the trawl it was with difficulty that the mouth and fins could be distinguished, so perfectly inflated into a ball was the body; a species of Pseudoscarus, generally known as a "parrot fish," very common and good eating; *Glyphidodon cœlestinus*, *Julis lunaris*,* a species of "half-beak" (Hemiramphus), so called from having the mandible elongated into a long beak, large numbers of this fish would on dark nights jump into the boat as we pulled about the harbour, a species of belone,† several species of Plagiostomi, including the hammer-headed shark (Zygæna), saw-fish (Pristis), rays (Rajidæ); a species of coffer-fish (Ostracion), so-called from the body being enclosed in a sort of hard casing, the only soft skin being about the tail bases of the fins and snout to allow the free working of the muscles in these parts; numerous species of coral-fishes (Squamipinnes) glowing like butterflies in all sorts of colours and as varied in shape, and several species of Thynni. We had splendid opportunities of watching the fish, so clear was the water, and the ship lay just outside the edge of the reef, where most of the fish seemed to congregate. It is interesting to watch a large shoal of fish swimming about, and how they move round an obstacle following their leaders in exactly the same track as if they were all in one piece.

Of Crustacea, crabs were the most numerous, a long-legged fast-running species (Gecarcinus) was in great numbers on the beach, and could only be caught after a hard run; then came the hermit-crabs (Paguridæ) of all sizes, nearly every shell (and great numbers of empty shells of all kinds lay along the shore) contained a hermit-crab, and the effect of seeing numbers of shells moving rapidly about is very strange and rather startling; there was also a very pretty "calling-crab" (Gelasimus), a swimming-crab (Portunus), and a species of the curious sponge-crab (Dromia), which always carries about with it such a curious collection of living things on its back. Several species of prawns (Palæmon) and "Locust shrimps" (Squillæ) were common; also a curious little Crustacean like a minute lobster, which, after having been kept for some time in a glass, would throw off its limbs with a loud click, perfectly audible at a distance of two yards; and a cuttle-fish (Sepia). It was somewhat strange that, although quantities of empty shells could be picked up on the beach, very few were fresh, the principal live shells found were cowries, and even these were scarce. One land-shell (*Bulimus Abyssinicus**) only was found.

Asteroidea, as the common starfish, sunstar and brittle stars were common, two species of "sea-urchin" (Echinoidea), one with long thin spines, very common on the edge of the reefs in holes it makes for itself, and a short thick-spined species; there were also three species of "sea-cucumbers" (Holothuroidea). Tunicates were common, but sea-anemones (Hexactiniæ) were, comparatively speaking, rare. Of corals were obtained *Astrea denticulata* (specimens of this genus were found at a depth of 15 feet at Monkullo), a variety of *Tubipora musica*; *Madrepora gracilis*, a Fungina, *Heteropera hempridii*, and several species of Antipathidæ. At times the water was brilliantly phosphorescent, particularly on the night of January 10th, when the sea was one mass of green phosphorescent fire, the glow from which was distinctly visible all over the harbour; it appeared suddenly and disappeared as suddenly, and was caused by myriads of the *Noctiluca miliaris*, tons of which were thrown up on the beach the next day in great masses of reddish jelly (see letter in SCIENCE-GOSSIP of February 1886).

The varieties of minute marine life are almost beyond description, though some, as species of Lepralia and Cellepora, make themselves conspicuous by their numbers. To those interested in marine life no place offers such attractions as one of these coral-formed harbours. Varieties of seaweeds were not abundant, two or three species of Melanosperms growing in large patches were the most noticeable.

5. *Weather.*—As in most tropical places the constant regularity of the weather is wonderful, and strikes forcibly an observer who has been accustomed to the continual changes of the British Isles. Observations were taken with standard instruments (lent by the Meteorological Office) regularly day and night during the three months (December, January and February) every two hours for the barometer, wind's direction and force, and every four hours for all other observations, except those on the rainfall observed at 8 A.M., daily, solar radiation thermometer read at 8 A.M., noon, and 4 P.M., and spectroscopic observations (using one of Browning's miniature spectroscopes) at 7 A.M. daily. (1) Wind.—The phenomenon of the land and sea breeze was very marked. Towards 9.30 P.M., the land-wind set in; at first very light and gradually increasing, to about 4 A.M., then decreasing, veering to the N. and freshening about 9.30 A.M., and setting in from the sea about noon, increasing in force

* Deposited in the Natural History Museum, S. Kensington.
† "Gar-fish" of fishermen and sailors.

* Deposited in the Natural History Museum, S. Kensington.

until about 2.45 P.M., then decreasing, and towards 9.30 P.M. backing again into the land-wind. In all cases the velocity of the sea-breeze was much greater than that of the land-breeze. The mean direction of the wind for the three months was N. 28° W. with a mean velocity of 6·1 miles per hour. (2) Barometer.—Rise and fall slight and very regular, 1st minimum about 3.28 A.M., 2nd minimum, 3.33 P.M., 1st maximum 9.50 A.M., 2nd maximum 9.40 P.M. The general mean height was 29·952. The mean height of the barometer was higher in January than in December or February. (3) Temperatures.—Maximum temperature of air at 1.30 P.M., minimum at 4.11 A.M. The general mean for the three months was 77·8. The lowest temperature, 68.1, was registered at 4 A.M. February 2nd, and the highest 95° at 2.30 P.M. February 28th. The coolest time was the last fortnight of January and the first fortnight of February. The maximum temperature of the sea-water (in the harbour) was at 5h. 34m. P.M., and the minimum at 7h. 45m. A.M. Mean temperature for the three months was 81·6, and mean density 1·0265. (4) Vapour tension.—Mean for the three months 0·750. It is interesting to note that in December and February there were double daily maxima and minima. In January one daily max. and one min. (5) Relative Humidity.—Mean for the three months 79·2; maximum about 4.13 A.M., and minimum about 2.22 P.M.; in summer this is very low. (6) Clouds.—Mean amount for the three months 4·7; 1st maximum at 7.35 A.M., 2nd maximum at 7h. 51m. P.M. 1st minimum at 1h. 20m. A.M., 2nd minimum at 1h. 49m. P.M. The most common form of cloud was a middle layer stratus generally moving from a S.S.E. point, the low clouds, chiefly of the cumulus type, came with the wind, and the cirrus forms from a S.W. point. (7) Rainfall.—For December, was 1·0 inch, rain falling on 6 days; for January, was 1·8 inches, rain falling on 14 days, and for February, the record was unreliable, rain falling on 7 days. Observations with the spectroscope gave in the majority of cases valuable indications of approaching wet, though from the almost constant appearance of the rainband on seacoasts or at sea, it is more difficult to estimate the relative value of the band there than it is at inland places. (8) Black-bulb thermometer.—Mean height for the three months was 109·1. (9) Weather.—Generally fine, though this is likely to be interrupted in the winter season by heavy rainfalls of short duration, and hard squalls accompanied by lightning and thunder, and great variations in the direction and velocity of the wind.

From a commercial point, Massaua is only useful as being the best port for this part of Africa, for although it would be possible to cultivate the land (an event which would take place naturally in time) yet it would require an immense and continual outlay for irrigation.

In conclusion, my thanks are due to the gentlemen who so kindly assisted me in naming my specimens, particularly to Mr. Bauerman, of the Geological Museum, and to Mr. Boulanger and Mr. Waterhouse of the British Museum, South Kensington.

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SHORE HUNTING.

COMMON BRITISH SPONGES.

SURELY nothing can be more enjoyable than what I have termed above "Shore Hunting," on a sunny summer's day. With its aid the sea-side visitor may rid himself of that sea-side *ennui* which comes to all those who go away for a month or so from the labour and interests of business or profession, and neglect to provide themselves with the wherewithal to occupy their liberated energies.

"Pardon, my lord," says the monk in Hypatia, "of sitting, as of all carnal pleasure, cometh at length satiety," and the same might be said of that endless routine of sea-gazing, watching for the steamer, inspecting the hotel register, and the like, with which the sea-side summer visitant interests, or tries to interest, himself. The fallacy of the gospel of idleness is so patent, and is so continually being demonstrated, that it is wonderful how the superstition of it clings so firmly amongst us. The man who complains of being overworked and says he will go down to some quiet little watering-place and have a good spell of doing nothing, finds himself stranded, after a couple of days, with only himself for company, and very poor company at that, and is compelled to fall back upon the latest novel which he endeavours to read in the sun on the beach, getting a headache in consequence. Your other, and more sensible individual, willing to make his peace with the mammon of unrighteousness, goes to one of the more crowded resorts, where, by the aid of stuffy billiard rooms, many calls for refreshment, with much strong tobacco and a minimum of genuine open air sea-side life, he, at any rate, succeeds in keeping himself occupied and interested, and so is the healthier and better for his outing. The logical outcome of which is that a mild dissipation, though a low form of pleasure, is better than complete lack of interest.

The physiology of the matter is simple enough. For the greater part of the year, perhaps eleven months out of the twelve, every hour is occupied, and the whole nervous organisation is kept on the stretch. On the other hand, we have a condition where life is devoid of interest or excitement, living, or better vegetating, at the lowest possible pressure. It requires a special training to become habituated to either condition, and once so habituated, the change from the one to the other is impossible, and the attempt to make it harmful.

The characters of the holidays of the man of leisure, and of the busy Yankee, are correlated to their habits of life, and are so distinct that the former cannot comprehend how the latter finds a pleasure in rushing from place to place "doing" the globe. Why, your globe-trotter is the outcome of a manner of life which has rendered abundance of incident and excitement as necessary to him as opium is to the opium-eater.

It is not change from activity to idleness which is required, but change of interest, by which the mental energies are shunted to a fresh track, while the old one which does service for eleven months of the year is being repaired.

But this is a long drawn plea for shore-hunting, wherein paterfamilias (ay! both the pater and the familias) may find interest without excitement, and, dabbling among rock-pools, may become as one of his own boys, sharing their pleasure, but seasoning it with his own powers of reflection.

These short articles now commenced are not intended to afford an exhaustive guide to even the common objects of the sea-shore, but rather to give short descriptions of the more easily recognised members of a definite group, with the best methods of preserving them and treating them for examination.

The young collector, without exception, is at first confronted by two difficulties:—he is bewildered with the surprising and unlooked-for variety of organisms which he discovers lurking under every stone and in every rock-pool, and is at a loss to know where he may turn for aid in identifying these countless animals.

The first is a transient matter, but the second is incurable, unless he have a friend at hand who will refer him to the necessary books, and give him his first lessons in identification. It is my pleasant ambition to supply the place of that friend.

In the long run it can prove exhilarating to no creature to sit passive like a bucket and have facts pumped in, says Carlyle, and likewise, in the long run, it cannot but prove wearisome and as labour which has no end to go on collecting, identifying, and amassing a knowledge of external form without vitalising that knowledge with some information concerning the habits, structure, and above all life-histories of the animals so collected. At least it cannot but prove stale and unprofitable to the ordinarily constructed mind, though the odd individual out of ten thousand who can delight in collecting postage stamps, discovering how many times the word "moreover" occurs in the Bible, or solving prize puzzles, may think otherwise.

However, even to such would I extend a word of comfort, and that in the guise of a parable of facts. Certain ants of California in the process of forming their underground homes, cast out large quantities of earth. Working as they do in the loose deposit of surface denudation, they unavoidably and unknowingly turn out amongst their rubbish gems of gold and precious stones. The Indians have noticed this, and take advantage of the labours of the ant to pick out the stones they turn up.

But in truth all scientific workers are to a greater or less extent working in the dark, labouring in the dimness of chaos, endeavouring to replace it by order with the honest purpose of bringing perchance one jewel to the light in order that a mightier hand may place it amongst its kindred to complete the glory of our human crown of knowledge.

Let us remember how Darwin's glorious generalisations were made possible by, and built up from, the labours of countless workers, or turn to any monograph and observe how much of the material has been supplied by enthusiastic and unknown collectors, and go forth to the rock pools with a strong hope that we too may furnish something towards the building.

General Appearance and Anatomy of Sponges.

Starting about an hour and a half before low-water, so as to be on the ground a full hour before the tide commences to rise again, and choosing some sheltered nook among the rocks if the coast be a rocky one, or about the piles of a pier if it be an open one, you will be sure to find attached to the under surface of inclined stones, in clefts and crannies of the rocks, about the roots of sea-weed, in short, in any sheltered spot where there is good surface for attachment and where the sun does not strike too strongly, tenacious masses of a sponge-yellow, green, brown, or orange colour, and with large orifices on the surface. These are the easily recognised objects for which you are searching. Probably the first form which you will recognise will be one closely adherent to the rocks, very abundant on sloping surfaces not exposed directly to the waves or hot sun, and of a sponge-yellow colour shading into green on exposed parts. This is the common *Halichondria panicea*, the "bread-crumb" sponge of Ellis. Another equally common form is *Hymeniacidon sanguinea*, it is readily recognised by its salmon colour, and is also attached to rocks. It does not, however, form a mere crust with a smooth surface thrown into gentle hillocks, as does the Halichondria, but rises up into fistulous digitate projections, each of which bears a large orifice at its summit. These two forms are very hardy, occurring much farther above low-water than any other sponge. Neither, however, presents us with a simple type of sponge-structure, but as they are the most easily obtained and readily recognised forms, they will best serve to furnish us with a first object lesson on sponge anatomy. To avoid confusion, the following description will apply specially to *Halichondria panicea*, though the points described may be equally well worked over in *Hymeniacidon sanguinea*.

Pieces of the sponge should be removed as completely as possible and taken home in a considerable quantity of fresh sea-water. A pocket lens, a couple of needles mounted in holders, a pipette, and a microscope, with a few slips and cover glasses, are all that is required for the first examination. With their aid the following description can be easily followed.

The surface of *Halichondria panicea* is smooth, rising into low elevations, which are surmounted by crater-like openings. If the specimen be examined while quite fresh and healthy, the existence of strong currents streaming out of these openings or "oscula" may be readily demonstrated as follows—take a little carmine or Indian ink and rub it up with sea-water. Now, by means of a glass tube drawn out at one end, that is a pipette, place a little of the water with its suspended particles in the neighbourhood of an osculum, when the upstreaming current will bear it with it. Some of the particles will be drawn to the general surface of the sponge, and the finer ones penetrating by means of microscopical apertures or "pores," which occur in immense numbers, cause a distinct coloration, red or black, as the case may be, which will not wash off. Two opposite currents are thus shown to exist—one passing into the sponge by a great number of finely-divided streams, the inhalent currents, and another passing out of the sponge in comparatively few strong currents, by the oscula. This continual circulation of water through the animal serves to bring food, to carry out effete products, and for respiration. How it is maintained will be seen later.

Now examine the surface of the sponge with a lens—it will readily be seen to consist of a thin membrane, the "dermal membrane," supported by a reticulum of spicules. A thin flake of dermal membrane may be sliced off with the point of a razor, or sharp scalpel. A double-edged lancet however best serves the purpose—it is merely pushed under point first. After flattening it out beneath a cover-slip, examine with a low power; the reticulum of spicules will now appear as a network of interlacing bundles of spicules. These are imbedded in a gelatinous substance, which is the sponge-flesh, and lie more or less parallel to the surface of the animal; the spicules of the rest of the sponge are also gathered into interlacing bundles, but lie in all planes. The dermal membrane in this form is thus a very definite part of the sponge, with a higher power, ¼-inch ob. for instance; careful focussing should enable one to determine the shape of the individual spicule. Each will be found to have the form of a delicate, elongated, double-pointed rod. This rod is rounded in section, and its sides are more or less parallel throughout the greater part of their extent. It may be straight or slightly curved. These points should be accurately noted, since they serve in part to fix the species of the specimen under examination. Such a preparation however, in which the spicules are gathered in bundles and imbedded in a matrix, is not calculated to demonstrate spicular form with any great degree of accuracy. This is best done by completely isolating the spicules; and since they are composed of silica, and therefore highly resistant to the action of reagents, it is easily accomplished. The sponge-flesh may be macerated in dilute hydrochloric, sulphuric, or nitric acids, or dilute caustic potash. Perhaps the first-mentioned is best; whichever is used, the method of procedure is the same. Small pieces of the sponge are cut off and treated for some time with the reagent—on a water-bath if available—the sponge is completely disintegrated and the spicules form a sediment. The supernatant liquid may now be poured off, and the vessel (a test-tube for instance) filled up with water; after allowing to settle, this is also poured off, and the residue collected on a filter paper on which it is dried—a powdery mass of spicules resulting. A little of this may now be mounted in Canada balsam. Neither glycerine nor glycerine jelly should be used as mounting media, since they may be of the same refractive index as the spicules, which would then totally disappear. All the spicules of *Halichondria panicea* are of the same form—this is seldom the case.

Returning to the slice of dermal membrane, a ¼-inch ob. will show that the sponge-flesh does not form a continuous film. It is pierced at frequent intervals by round openings. These are the fine "pores" mentioned above, through which the inhalent currents stream.

A slice of dermal membrane should be lightly stained with picro-carmine, and mounted in Canada balsam to form a second reference specimen—the isolated spicules being the first.

The character of the skeleton other than that which supports the dermal membrane may be demonstrated by a hand-cut section at right angles to the general surface. The section can be mounted in Canada balsam unstained, and also examined in sea-water. By its aid it will be seen that the spicules are of the same form throughout, and that they are gathered into bundles which interlace to form an irregular network; that is to say, the network is of such a character that no strong structural lines are present; its strands are of much the same thickness throughout, and run irregularly in every plane. This is a distinctive feature.

We now have a fairly complete knowledge of the skeleton, dermal membrane, pores and oscula. It remains to follow the currents in their passage through the sponge, and to consider the histological structure. The pocket-lens and scalpel will demonstrate two facts, that the oscula are the orifices of large tubes into which open smaller canals, the lumen of the larger tube being eventually completely lost in the smaller ones; and that, beneath the dermal membrane, spaces exist into which the pores open. The oscula are one end of a series of internal canals and spaces of which the pores are the other termination. Through the multitude of pores the inhalent current pass, enter a number of delicate canals, and after traversing certain spaces which are enlargements of the lumen of the canals enter a series of larger canals, finally emerging as the exhalent currents of the oscula. These currents are maintained by the lashing movements of flagella which line the walls of the enlargements just mentioned.

To recapitulate. The fundamental structure of this sponge is as follows—it is composed of a sponge-flesh supported by a skeleton. The latter is composed of a network of delicate needles, gathered into interlacing bundles ; the former, that is the sponge-flesh, forms a mass which contains imbedded in it the skeleton, and is also honeycombed by a system of canals and spaces, all in complete intercommunication, the canal system. One extreme of the canal system is the pores, the other the oscula ; and through it a continual stream of water is flowing during the life of the animal setting from the pores to the oscula. This current is maintained by the action of flagella situated on the cells lining certain enlargements in the course of the canals, known as the "flagellated chambers."

The further anatomy of the sponge-flesh now remains to be dealt with under the heading histology. A more complete account of the canal system will then be given, and the sketch of the anatomy of *Halichondria panicea* will be complete.

W. B. HARDY, B.A.

GOSSIP ABOUT FORAMINIFERA.

PART I.

By EDWARD H. ROBERTSON.

IF the reader be a microscopist, hath it ever occurred to him what manifold advantages he possesses over his *confrères*, the geologist, the botanist, the physiologist, and the zoologist ? If not mere systematists, the abounding delights of their several pursuits may, and do, charm them into enthusiasm ; but there occur times and seasons when even their engrossing pleasures must, for obvious reasons, be laid aside or neglected. 'Tis never so with the genuine microscopist, for altogether independent of time or season—excepting in the case of serious illness—instrument in hand, he may, at his own sweet will, wander through Nature's unbounded realm, gleaning in every sweet field, and from even the most neglected corners and arid deserts, marvels of beauty to call forth his admiration and delight. Imprison him in a lonely cell and leave him but his microscope, and I trow he will have no cause to lament a lack of beauty within even its narrow confines. Nay, more, remove from its case the works of that triumph of human skill and contrivance, a watch, and tell him to accomplish the seemingly impossible task of filling its empty compass with a store of marvels that would require a life-time to examine, and it shall be done.

Smile not, reader—this is no exaggerated metaphor—'tis a literal fact, and I repeat more fully that, if he were to devote every moment of a long life to the study of the minute organisms that might be contained within the compass of an ordinary watch case—his thread of life would be severed in the very midst of his pleasant labours. And yet, haply, his treasures might consist solely of the very humblest forms of animal and vegetable life—foraminifera, polycystina, and diatomaceæ.

If the longest span of human existence would be inadequate to examine in detail his countless treasures, how many volumes would he not require in which to record his observations? How, then, shall the writer, within the small compass of a few columns in SCIENCE-GOSSIP, hope to convey more than the barest notion of one of the groups referred to? I shall not attempt so herculean a task, so well performed by students infinitely more capable than I, but shall content myself with a brief sketch of one of these three groups—the *Foraminifera*. In doing this, I wish to be regarded rather as a recorder, than as an expounder of certain curious facts with which the history of these wonderful and minute organisms abounds. When we commence our examination of them, we at once plunge into an infinitude of beauty, and are lost in wonder and admiration at their extraordinarily varied and graceful forms, often surpassing in symmetry the most costly productions of ceramic art. Yet, notwithstanding the beauty of their external coverings, would it ever have entered into the belief of the uninstructed that the inhabitants of these same beautiful structures are but homogeneous atoms of jelly, exhibiting no more definite organisation or structure than does the drop of glue, being even destitute of any investment? Yet such is indeed the case. These foraminifera occupy a place amongst the humblest forms of animal life, and are classed by naturalists with the *Rhizopoda*, that class of lowly organisms in which are placed the sponges, amœbæ, polycystina, etc.

The class *Rhizopoda* is one of the three great groups into which the sub-kingdom, *Protozoa* (Gr.) *protos*, first ; *zoön*, animal), is divided, and derives its name from two Greek words, *rhiza*, root, and *pous*, foot, from the fact of all the animals included in it possessing the power of throwing out, from the surface of any part of their body, processes termed "pseudopodia" (Gr. *pseudos*, falsity, and *pous*, a foot) which they employ in moving about and in obtaining food. Unlike the feet and arms of more highly-organised animals, these pseudopodia can be again withdrawn or absorbed into the substance of the body, leaving not a trace behind. This jelly-like protoplasm is termed "sarcode" (Gr. *sarx*, flesh, and *eidos*, form), and is a gelatinous, somewhat granular substance, resembling thin glue, or the white of egg.

As already stated, this substance exhibits no definite organisation, or structure, "so that," to quote the words of Dr. Carpenter, "the physiologist has here a case in which those vital operations, which he is accustomed to see carried on by an elaborate apparatus, are performed without any special instruments whatever—a little particle of apparently homogeneous jelly changing itself into a greater variety of forms 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 absorbent vessels or a circulating system, moving from place to place 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."

orbicular, pyramidal, straight, helical or spiral, spiral and discoidal, discoidal and produced (see Figures), and braid-like. Some forms are externally smooth, but many more are strengthened, and ornamented with ribs, spines, and bosses or tubercles, sometimes curiously sculptured, sometimes imperforate, except by a single orifice, but more frequently punctured by numerous holes, termed foramina, from whence they are called foraminifera : these foramina being often symmetrically disposed, and greatly adding to their beauty. Difficult as it may be to realise that in the coverings of such minute creatures the same contrivance to afford support to the walls under pressure has been applied as in the case of the cephalapoda, mollusca, echini, &c., it is undoubtedly the case, and in

oraminifera.—Figs. 3, *Geoponus stella-borealis* (after removal of shell by acid); 4, *Polystornella regina*: 5, *Lagena gracilis*; 6, *Lagena lævis*; 7, *Vertebratina striata*; 8, *Entoaclenia globosa*; 9, *E. squamosa*; 10, *Flabellina rugosa*; 11, *Cristellaria lanceolata*; 12, *Textularia Mariæ*; 13, *Rotalia Beccarii*; 14, *Polymorphina complanata*; 15, *Spiroculina Carpenteri*; 16, *Quinque-loculina*; 17, *P. Fichtelliana.*

Wonderful enough it will appear that these molecules of jelly, not invested by any membrane or integument, can exist in a fluid without disintegration, but infinitely more marvellous that such jelly atoms, destitute of organs, should construct habitations exhibiting previously unsuspected and often most elaborate structure, frequently traversed by a complicated system of canals, which seem to have an important function in the nutrition of the creature, and rivalling in beauty the most exquisite sculptured coverings of the "testacea," i.e. shell-covered animals ; yet so it is, and richly does their singular beauty merit all the enthusiastic attention lavished upon them. These tiny shells present an immense variety of forms, these shells, so small that thousands, or even tens of thousands, may be contained in a child's thimble, we yet here, also, see combined ornament and utility, lightness and strength, these external characters being usually so well marked as to be readily recognised, even with a common hand magnifier, notwithstanding their minuteness.

Some of the simple forms, monothalamia, "single-chambered," consist of a single chamber only, as in the *Lagena* and *Gromia* types.

Examples of these are shown in Figs. 5, 6, 8, 9. The greater number are, however, complex structures—these latter being called polythalamous, i.e., "many chambered," each chamber of the shell being distinct ;

communication between the several jelly bodies being afforded either through a single opening between the divisions or septa, or, more frequently, through a series of punctures by which they are perforated.

Each tiny shell may thus be considered to contain a colony of semi-independent beings. The method of increase in these shells appears to be an extremely simple one. From the original body of sarcode, a second, with its covering, is formed, and overlaps the first and so on, these shell-encrusted globules ever enlarging, and being developed on a straight or curved line in lineal order, or alternately in a braid or twist-like arrangement as may be seen in Fig. 12. These shells are included in the family *Enallostagidæ*. Another family, the *Entomostagidæ*, exhibits the chambers arranged in a double series in a spiral form.

The *Miliola* family includes those shells in which the chambers are arranged around a common perpendicular axis, in such a manner that each chamber occupies the entire length of the shell. (Figs. 15, 16.)

(*To be continued.*)

BIRD-LIFE.

By Dr. Crespi.

Formerly Editor of the "Sanitary Review."

SEVERAL years ago, after a dispiriting struggle with fortune, I left Birmingham and went to Exeter for six weeks. It was the 28th of April, and in South Devon the trees were in full leaf and summer was come. Several times a week, in the evening, I used to stroll through St. David's and along the Stoke Cannon Road, across Cowley Bridge, and out into the country. To the right were the richly-wooded heights, which delight the visitor approaching St. David's station from Taunton and Barnstaple, and to the left stretched the beautiful fields and noble woods of Upton Pynes, the well-known seat of Sir Stafford Northcote. The weather was, with some exceptions, charming, and again and again I wandered on for hours enjoying in perfection the sunshine, the soft air, the refreshing verdure, and, last but not least, the ceaseless songs of the birds. Devon is not usually considered rich in bird-life, so at least naturalist friends tell me; the nightingale, rather an over-rated bird, I fancy, never ventures west of the Axe, and some other species of familiar songsters are not common; but, however that may be, never, in the course of a life not very long, though varied enough, have I heard such inspiriting and continuous singing as that May and June. After the embittered strife of London, and the dingy skies and noisy streets of Birmingham, there was a seductiveness, a peacefulness, in those Devon rambles that I can never forget. Seldom did I meet any other wanderer, and for hours I seemed to have the country all to myself. To me, though I knew country life perfectly, having passed my childhood in a village,—it was a new experience, and as I listened to the rich notes of the blackbird and the throstle, the warble of the robin, the blackcap, the whitethroat and the hedge accentor, the melodious trill of the skylark, and the clear ringing call of the cuckoo, I wondered what country life would be worth without its birds. More brilliant climates than ours can be found; lands too where the vegetation, the scenery as a whole, and the mountains and forests have indescribable attractions, but where can you find such verdant valleys and deep sunny fern-adorned lanes as in Devon, or on the Welsh Borders, on one of those days (alas, so rare) when, as Lord Lytton says, all is so calm and beautiful below, and so blue and bright above; one of those English summer days with no peers elsewhere. I was once hurrying to America, and in the train sat a Mormon elder, a prosaic enough person, intent on money-getting and making converts, but when he spoke of English woodland scenery, the American, who had visited many lands and mixed with many strange people, became almost eloquent; his unprepossessing face lighted up, his dull eye brightened, and he poured forth a torrent of praise on scenes so beautiful and peace-giving, that he doubted if the rest of the world contained anything like them; he, at any rate, had seen nothing to compare with them, nor have I.

You cannot study birds in a museum: no matter how admirably the little creatures have been stuffed, nor how faithful the adherence to natural form and bearing; the resemblance is really not closer than between a corpse and a living, moving man. The only place to study birds is in their native haunts, loving them as did St. Francis, knowing them as did Mrs. Schimmelpenninck. Animals instinctively find out those who love them and feel for them, and they remember their friends with a tenacity rarely approached by human friendships. Think of Sir Walter Scott's love for his dogs, and of their attachment to him—happy if only he noticed them, and content to wait for hours for the walk so greatly enjoyed. Once get the affection of a dog and you may count upon it: it knows no diminution, no change, and ends only with its life.

In the rapturous song of the happy birds in May and June lies half the pleasure of a country ramble: the winter gloom is over, the foliage in the south-west is at its best, the decline of the year, with its golden harvest and lengthening shadows, is not come; and the birds, forgetful of the past and ignorant of the future, make the best of their opportunities.

A little thoughtfulness in feeding birds in frosty weather would preserve the lives of immense numbers. Many species cannot eat crumbs, but require animal food, and for their benefit I shall introduce a letter that appeared in the "Times" on this subject. It is dated January 24th, and signed J. P. Nunn, and refers to some letters on the supply of food in winter: it speaks for itself. "In the interest of little birds, may I add the word meat to berries? For some years, in cold weather, I have been in the habit of feeding little birds, and, in addition to their breakfast of bread and corn, I give them, as a standing dish a joint or two of beef, which I hang in a tree well out of the way of cats. The first supply of several pounds which I hung up at the beginning of December, is now quite exhausted, nothing being left but the bone. New Zealand mutton is not dear at 2½*d.* a pound, but meat as much to the taste of my feathered guests may be had at half that price. I fear birds have more enemies than friends, but if only one friend in each parish would feed them in this way a great number would be saved from starvation in severe weather."

Often in other days I have sat looking over the restless waves of the sea surrounding Lundy, when the birds had come in and the great gulls and Solan geese were darting like rays of light over the water below me, or soaring far above my head, and though the musical notes of the Crediton and Exeter lanes did not fall in such rich variety on my ear, I watched with keen interest the huge birds intent on their business, untiring in their activity, and investing the landscape and the sea-scape, which might otherwise have been common-place enough, with a charm peculiarly its own. Few birds are more majestic than the Solan goose, which, in rapidly decreasing numbers, breeds on Lundy—the lowest latitude, report says, where it makes its nest; as it sails along over the deep green waters, in the bright sunshine, it conveys a sense of tremendous power, of lordly contempt for space and time that makes feeble mortals envy it. Half-an-hour and those powerful pinions would traverse the distance from Lundy to Barnstaple, an hour or a little more and its vast strength would bear it to Cardiff or St. David's Cathedral: it is its own express train, and, calm or windy, dark or clear, its rapidity of flight and indifference to distance never desert it.

Only think of the keenness of observation and acute intelligence of birds: watch them eating crumbs scattered for them outside a window, and then admit how frolicsome are their gambols, how much character their conduct discloses. Fruit in Chili and other parts of South America is reported to have been in 1887, left entirely untouched by birds, while the sheep and cattle which were imprudent enough to feast upon it, paid with their lives for their temerity. These facts rest upon the high authority of the "Pacific Archives of Medicine and Surgery," and prove that the unfailing instinct of birds with respect to the wholesomeness of fruit is, as Michelet remarks, in his great work on birds, frequently an excellent guide for human beings. It is possible, though far from proved, that the peculiarities in the fruit of different years may have something to do with the outbreak and varying mortality of cholera epidemics.

We hardly understand, many of us, how supremely happy and busy birds are. No human community is more actively engaged; no man or woman goes to work with such merry voice and unaffected delight. It is a sad thought that birds of prey, in the no doubt wise economy of nature, destroy enormous numbers of little songsters every year. It has been computed that 20,000 sparrow-hawks live in the United Kingdom; if they, on the average, consume two little birds a day apiece, not fewer than 14,000,000 are thus destroyed every year. That we cannot help, but we can prevent the wanton and objectless destruction of these little messengers of good and peace. No fashion more hideous, more savouring of savage instincts and barbarous tastes can be conceived than adorning the hat, and fastening up the dress with dead birds. Ostrich plumes are undoubtedly most beautiful, and as they are now produced solely for purposes of dress on the great ostrich farms of the Cape, their use may pass without question, but to pin on a goldfinch, a yellow-hammer, a robin—though this atrocity I have never seen—a chaffinch, or a green linnet, is enough to make us wonder if we are more enlightened and refined than some Indian Brave decorating his neck with a string of the formidable claws of the grizzly bear. The great feature of bird-life is its constant movement. Watch a bird hopping across the lawn, mark its bright eye, observe its graceful actions and perfect symmetry of form, and then, when you have shot it and put a stop for ever to the quick beatings of its happy little heart, go up and look at the limp, tiny form lying still and bleeding on the ground: The contrast is too painful to dwell upon. It is more startling, because human life is confessedly so full of sorrow, than seeing some superbly proportioned and active man in the midst of his labours, and soon after standing by his bedside and gazing on the cold rigid face of death: all the hopes and fears of life over: that marvellous mechanism, the most perfect and complicated structure in the world, out of gear, and the spirit that gave beauty and interest to that glorious form and active mind gone on its last long journey we know not where. But the human being hopes that for him there remains a hereafter, a country where, though work will never cease, it will be less exhausting and worrying than here: a land where there will be rest; where, in short, the weary struggler will find that peace which the storm-tost soul of Dante sought in vain on earth. The little bird may have no such future. His brief existence perhaps ends here, and when his bright eye dims and his warm heart becomes cold and still, his enjoyment may be for ever over. Destroyed for the good of man, killed to supply necessary food, less objection may be made, but slaughtered to bedeck the bonnets and hats of people who make themselves hideous in consequence, who perchance have never seen the bird at home in his early summer happiness, who pay little heed to his fascinating ways, and care nothing for his surroundings, that is indeed too terrible. A touching and well-known passage occurs in Thomas de Quincey's works, in which he pathetically describes the death of a feeble little bird, and the not unnatural emotions which its last attempt to flutter and sing called forth. No wonder! And when we think of what country life owes to birds, when I remember the unmixed pleasure they have given me, the peace which the merry songs bring to the soul, I greatly marvel that anyone, calling himself civilised and refined, can seek pleasure in killing the winged messengers, which seem to belong more to Heaven than earth, and whose wholesale destruction would transform the melodious groves and mossy lanes of England into something like the silent, uninteresting and depressing wilds of Australia.

There are few pictures more fascinating than the life-long devotion of Gilbert White, of Selborne, to the denizens of that secluded and little changed district. The closeness of his observations, the accuracy of his generalisations and conclusions have never been improved upon: and his graceful letters remain, and always must remain, among the treasures of the language. Again, look at Waterton's life in the country, reading the mysteries which none knew better how to unravel, and, lastly, Frank Buckland's passionate love for animal life. There was nothing coarse or mean in his reverent eyes in anything that had come from the hand of the Creator. Animals, birds and insects were to him fellow-creatures, fellow-servants, fellow-worshippers of God. Then poor Thomas Edward, the humble Scotch naturalist, of Low Shore, Banff; who can refuse to sympathise with his self-sacrificing study of nature? Night after night in that bleak northern latitude watching creatures which could not be approached by day, and lying for hours in a cramped position not to alarm the timid little things that centuries of oppression had taught to regard man as their bitterest foe. Does not that poor shoe-maker's life teach a lesson of constancy and untiring industry that more than redeems the study of nature from the neglect at times heaped upon it? The love of birds doubles the joy of living.

Wimborne.

SCIENCE-GOSSIP.

Prof. H. G. Seeley, F.R.S., is about to deliver a course of lectures on the Practical Study of the Geology of the Country round London. This course is given at the request of students of the London Geological Field Class, and information concerning them may be obtained from Mr. William Dunn, 21 King William Street, Strand, W.C.

Royal Institution.—The following are the lecture arrangements before Easter:—Prof. Dewar, six lectures (adapted to a juvenile auditory) on Clouds and Cloudland; Prof. G. J. Romanes, twelve lectures constituting the second part of a course on Before and After Darwin (the evidences of organic evolution and the theory of natural selection); Prof. J. W. Judd, four lectures on the Metamorphoses of Minerals; Dr. Sidney Martin, four lectures on the poisonous action of Albuminoid Bodies, including those formed in digestion; Prof. J. H. Middleton, four lectures on Houses and their Decoration, from the Classical to the Mediæval Period; Prof. Ernst Pauer, four lectures on the Characters of the Great Composers and the Characteristics of their Works (with illustrations on the pianoforte); and eight lectures by the Rt. Hon. Lord Rayleigh on Experimental Optics (polarisation; the wave theory). The Friday evening meetings will begin on January 25th, when a discourse will be given by Prof. G. H. Darwin; succeeding discourses will probably be given by Prof. W. C. McIntosh, Sir William Thomson, Prof. A. W. Rücker, Mr. Harold Crichton Brown, Prof. Oliver Lodge, Prof. Archibald Geikie, the Rev. Alfred Ainger, the Rt. Hon. Lord Rayleigh, and other gentlemen.

We are sorry to have to record the death of another valued contributor to our columns—Mr. Henry Lee, F.L.S., of aquarium fame, at the age of sixty years. He was known also in scientific literature for his entertaining book entitled "The Octopus; or the Devil-Fish of Fiction and Fact." Mr. Lee was the first curator of the Brighton Aquarium.

It has been found that the retina absorbs light in much the same way that luminous paint becomes "fluorescent." This was beautifully demonstrated as follows:—The gaze was directed for some time at an object brighly illuminated by an arc light, or at the arc itself, and then the eye was turned to a camera—an accurate photograph of the object seen was the result. The experiment can be performed with the fresh dead eye of an animal, and the gleam of a cat's eye in the dark is probably due to this light-absorbing power. Any one who has examined an eye will be aware of the fact that there is a brightly iridescent coat at the back, known as the *tapetum*. The function of this is not at all obvious, but some time ago a theory was started which then seemed improbable that this served as a reflector to catch and concentrate the faint light of a starlight night, and condense it into a beam to illuminate and render more visible objects towards which the eye was directed. The present discovery shows that this old theory was not altogether without foundation.

Messrs. Swinburne have brought out a new invention for obtaining filaments for incandescent lamps from cabbage leaves. The essential novelty of the process consists in employing vegetable fibre for the "filament" or thread. Almost any plant leaf will do: but, after experiment, it has been found that the leaf of the common cabbage answers the purpose best, as it is tough, and fairly homogeneous in structure. Each leaf is first separately examined by polarised light to detect any flaws or holes, the smallest pin-hole rendering the leaf practically useless. It is then soaked in vinegar for twenty-four hours in order to neutralise the alkali in the fibre, and, after thorough washing, is ready for the next process. It is now laid out flat in a solution of mercury bromide ; a rod of specially-prepared shellac is then taken, and, after being raised to a high potential condition by treatment with a silk exciter, it is put into contact with the mercury solution. By this means the leaf is gradually electrolised, the potassium and sodium in the fibre combining with the mercury to form a coating of amalgam. In this state the leaf is a capital conductor, and the inventors have even succeeded in using it as a substitute for lead in secondary batteries. A heavy current is now passed through it so as to carbonise the vegetable fibre, the current being increased till every trace of amalgam is volatalised. It is then cut into filaments, and each is forced through a draw plate. As it is not of sufficient "resistance," resort has to be had to a process called "flashing." The consists in passing a mixture of ammonia and hydrogen gases over it while it is heated by the electric current. The resistance rapidly rises, and at the proper point the current is automatically cut off by an ingenious switch arrangement. The filament is now bent into horse-shoe form, and is ready to seal into the bulb. Perhaps the most important discovery made by Messrs. Swinburne, is the enormous increase in light that can be obtained for a given current by employing an atmosphere of slightly compressed oxygen in place of the complete vacuum hitherto customary ; and though by this means the life of the lamp may be slightly shortened, it is not considered important in view of the great gain in light. If this process, beautifully simple as a laboratory experiment, should prove commercially successful, large quantities of picked and selected leaf will be required, and Messrs. Swinburne contemplate inviting tenders from some of the leading growers in the county. The bulk of the plant has been already erected, and Messrs. Crompton & Co., of Chelmsford, who are working overtime, have got the machinery well in hand, and hope to complete delivery by the 24th inst.

MICROSCOPY.

"Journal of Microscopy."—(Edited by Alfred Allen.) The last number of this well-known journal contains the following papers, besides a host of notes, notices, &c. :—"The Air-bladder of Fishes considered as a Degenerate Lung," by Mrs. Alice Boddington ; "Development of the Tadpole," by J. W. Gatehouse ; "Fogs," by Beatrice Taylor ; "Economic Entomology," by James A. Forster ; "On the Male Generative Organs of Two Species of Cypris (*C. Cinera* and *C. minuta*)," by T. B. Rosseter ; "Pseudo-Helminths," by Jabez Hogg ; "The Microscope and How to use it," by V. A. Lalham.

Another Evening with the Royal Microscopical Society.—The Microscopical Society may congratulate themselves upon the success with which their "scientific evening," held in the library of King's College, on the 28th of November, passed off, in spite of the unpropitious weather. The principal item of novelty was the display, on a screen, in front of the oxy-hydrogen lantern, in a darkened room adjoining, of numerous negatives of microscopic objects photographed from the originals direct :—diatoms, bacilli, insect preparations, pathological specimens and botanical sections, all furnished illustrations of how soon, and how well, Dr. Crookshank's suggestions and example, at a former "scientific evening," had been followed up by Mr. A. Pringle and Mr. Charles Lees Curtis, who both deserve great credit. This display was the finest of the kind that I have ever seen or heard of. Only fancy! the image of half a frustule of *Amphipleura pellucida* was thrown on to the screen, so as to appear three feet long, or more, with the markings as distinctly shown as the bars of a Venetian window-blind. I should guess the magnification at not less than 20,000 diameters. Has anything been done like this before? I think not. I could mention many other objects they showed in rapid succession equally well ; but the naming of this one, so admirably displayed, gives an idea of the advanced stage of micro-photography these gentlemen have reached. In the library, very many curious things were to be seen. There was a fine specimen of *Braula cæca*, the rare parasite of the hive bee (something like a small sheep tick), shown by Mr. Mainland. He referred me to an article in Science-Gossip (May 1881), by Mr. Fedarb, on Braula ; and I have looked it up, with pleasure ; but I think Mr. Mainland might perhaps have something more to say about the insect, if he tried. Then there were numerous clever dissections of insects, one in particular, by Mr. Fitch (of the golden-banded fly), was universally admired. Mr. Rousselet had a new rotifer ; *Limnias Cornuella*. There were also other exhibits of rotifers, &c., by several gentlemen. Eye sections were numerous, of moth, spider, tadpole, and lamprey (pineal eye). Mr. Beck showed *Amphipleura pellucida*, and the cyclosis in Vallisneria. Messrs. Watson had an excellent display of fine pathological specimens ; and a grand slide of arranged diatoms, butterfly scales, &c. Mr. R. T. Lewis had a drawing of the rare coccid, *Lecanium acuminatum*, from British Guiana, but his most interesting contribution was a number of unknown larvæ, from Natal, alive. They appeared to be lepidopterous, and were remarkable from the fact that they had constructed portable houses for themselves, out of the grass stems upon which they feed, of an extraordinary character, looking much like the cases of caddis worms. It appears that the Caffirs regard the swallowing of one of these grubs by any ox that may be feeding on the grass where they live, as certain death to the poor ox. Within certain limits, upon the table before him, Mr. Lewis allowed these curious grubs to trot about, and they yielded no end of interest to the observers. Then, there was the pupa of a cat flea, showing, apparently, that the statement Mr. Lowe makes in his monograph of the anatomy, &c., of the blow-fly, that "all the tissues of the larva undergo degeneration, and the imaginal tissues are re-developed from cells which originate from the disintegrated parts of the larva," (page 116), holds good as regards the flea also. Mr. Michael told me that this view is pretty generally accepted by scientific people, as applying to all, or almost all, insects. Well, it may be; but I know one person, claiming to be thoroughly acquainted with all that is worth knowing about insects, who smiles incredulously when I talk to him of this fact. Mr. Michael had on view a very beautiful dissection of a small Staphylinus. The Rev. T. King showed two fine specimens of flies in amber under his microscope. How many thousands of years had they been entombed there? Ah! and yet they are as perfectly preserved as if they had been done up in balsam only yesterday. Several Fellows had remarkable specimens of foraminifera, &c. Mr. Priest showed the inner casts of some of these organisms. There was also a living spider exhibited by Mr. R. Facer, showing the action of the spinnerets. Mr. E. J. Smith showed numerous fine sections of rare minerals, and Mr. Suffolk, a scale of *Morpho menelaus*, under very high magnification.—*S. J. McIntire.*

FRONTAL SAC OF THE MUSCIDÆ.—The author of this important paper is Mr. W. Jenkinson, of the Sheffield Microscopical Society.

ZOOLOGY.

ANODONTA CYGNEA.—Mr. Roberts seems to have expected me to have replied to some strictures made by a correspondent on my paper, entitled "A Day's Shell Collecting," which was published in SCIENCE-GOSSIP last year. I had already virtually replied in my article, since I cannot class Mr. Webb with anyone else but Dr. Woodward for his knowledge of what constitutes a species and a variety. I scarcely then thought it worth my trouble, and I had not now said anything had not Mr. Roberts again opened the subject, especially, as Mr. Webb so well defended the points that ruffled him as to decry with all his force the "variety-mongerers," and at the same time want to make a variety of a species, a point of impudence which I may say they have never reached. In point of fact, Mr. Webb's ambition seems to me that of becoming a king, as it were, for his good works, among the race of conchologists whom he apparently so heartily despises. I can but refer Mr. Webb, since I am not going to occupy your space in teaching the elementary principles of zoological nomenclature, to one of the more modern zoological text-books, as Claus, for example, in order to give him more definite ideas as to what constitutes a species and what a variety. Mr. Roberts has very rightly remarked that "Dr. Woodward and a few other antediluvians . . . might as well argue that all the species of continental anodons are one, and that *Unio tumidus*, *Unio pictorum*, &c., are all one," and I might add to these all the Pisidia too, and *Limnæa peregra*, and *Limnæa auricularia* also. I am here again only going to make the dogmatic assertion, that *A cygnea* differs in its anatomy very essentially from *A. anatina.* I am not going to state these differences, since I shall doubtless publish on them before long in "The Journal of Conchology." But, in the meantime, Mr. Webb can easily dissect one or two for himself, and then when he has gained a scientific knowledge of what he is talking about we shall be pleased to hear from him again. A personal knowledge of a subject from actual work is of far greater value than raking up a host of old authorities, Mr. Webb. Had you been a little more modern, you would have known that on p. 65 of the fifth volume of "The Annals and Magazine of Natural History," Mr. Lloyd described some anatomical differences between *Anodonta cygnea* and *A. anatina.*—*J. W. Williams.*

ANODONTA CYGNEA, LINNÉ.—Mr. George Roberts appears to forget that opinion, however weighty, is not evidence; and that authorities were quoted in my note not to prove that *Anodonta anatina* was a bad species, but to show that a statement to such effect could not rightly be called an "uncanonical assertion." Again, the fact that earlier conchologists confounded together two species of Helix is no argument whatever that they also confounded two species of Anodonta. The point in question depends upon the recognised meaning of the word Species. Zoologists and botanists of the present day know perfectly well that there is naturally no strict line of demarkation between closely allied forms which they place together and call a Genus; but, for convenience in classification, the name species is kept by them to denote a form which can be separated from its relations by well-ascertained anatomical differences. Unfortunately, there are many shell-collectors who do not know this, and the few that have mastered it no more understand why and for what the term "variety" was instituted than the mass of their brethren do. The reason is not very doubtful, for these collectors follow like sheep the precepts of certain Continental and the Leeds schools, which recognise what they call a variety created by a disciple ignorant of Zoology out of some casual variation, interesting, perhaps, but so insignificant that the name of its describer—who is usually conceited enough to allow it to be printed—is covered with ridicule. An example of ignorance, worse, perhaps, than this, is to be seen in the note next but one before that of Mr. George Roberts, for here its writer says the balance is in favour of according *Helix hortensis* generic rank.—*Wilfred Mark Webb.*

H. VIRGATA, VAR. ALBA.—It may interest Mr. Brockton Tomlin to know that I have specimens of this variety from Dorking, Rusk, co. Dublin, and have lately received two from Mr. Thos. F. Burrows, found at Brading, Isle of Wight. From the Dublin locality I have the same variety of *H. Pisana*, a still more uncommon shell.—*F. G. Fenn, Isleworth.*

BOTANY.

THE BRITISH MOSS-FLORA.—All botanists will be glad to hear that Part II. of this remarkable work has just been issued. It is devoted to the important family Grimmiaceæ, and contains eight exquisitely drawn plates showing the characters and microscopical structures of each species. Never before has our native moss-flora been so carefully figured and described, and that by an acknowledged authority on the subject. These parts can only be obtained from the author, Dr. R. Braithwaite, at 303 Clapham Road.

PLANTS NEAR CLIFTON.—In SCIENCE-GOSSIP, November, page 259, I gave a list of upwards of fifty wild flowers noticed in a day's ramble in the vicinity of Clifton. In SCIENCE-GOSSIP, December, page 279, Mr. James Walter White disputed the identity of six plants in courteous yet authoritative words; in reply, I beg to state as follows: (1.) *Pimpinella magna.*—The specimen I alluded to was not actually from the gorge of the Avon. It was a plant of great size growing in a cutting within a few miles of Clifton Bridge (Somerset side). I stated my reason for applying the specific name, and still maintain the opinion. I was purposely vague with precise habitat in this and other cases; I have learned that it is necessary, to prevent extermination. (2.) *Anthriscus vulgaris.*—I think Mr. White might find this plant next season on the waste grounds beyond Leigh Court. (3.) *Calamintha nepeta.*—The plant I gathered was a distinct variety of *C. officinalis*, new to me. Having identified the specimen on my own account, I forwarded it to a collector with an extensive herbarium. It was new to him; and he replied, "There is no doubt about your *C. nepeta.*" Perhaps Mr. White will search the quarries he knows so well for confirmation of this. It may be a new plant will be added to the local flora. (4.) "Wormwood" was a loose term; *Artemisia vulgaris* is what I saw. (5.) *Diplotaxis muralis* certainly appears under two distinct forms at Clifton. I am loath to believe the two species named in my notes are not there; the leaves and stems are so different. If Mr. White, knowing the district well, is quite certain, I will accept the correction. (6.) *Thalictrum alpinum* was a palpable slip for *T. flavum.* I cannot account for having written the wrong specific name. It "met the eye" at some distance from Clifton, not on the downs. I deliberately mis-stated precise locality, perhaps wrongly; for I did not at the time realise that Somerset and Gloucester were divided by the Avon, and that, by transferring plants from one side to the other, the distribution of the two counties' flora was interfered with. With one glaring exception, my notes were, I think, substantially correct. I am obliged to Mr. White for giving me the opportunity of avowing the error. I do not claim great critical knowledge; the wider my experience, the more profoundly ignorant I feel. "We see through a glass darkly," picking up what grains of learning we may attain. I hope this will be also considered "bright and chatty."—*Wayfarer.*

FOLK-LORE OF PLANTS.—In some parts of the Principality, a common Welsh name for the foxgloves (folk's-gloves) is *Menyg yr Ellyll* (comp. elf), *i.e.* the fairies' gloves.—*G. Rees, Aberystwyth.*

WHITE VARIETIES OF PLANTS.—I generally make a note of variations from the normal colour in plants when I see them, and a few remarks on the subject, perhaps, will not be considered out of place. For four years past I have observed a number of white specimens of *Stachys palustris*, the flowers of the usual size, and pure white in colour. The normal type flourished near, but not in the same clump. A further departure occurred, which would seem almost structural; the upper lip of the corolla, instead of being entire, as I believe it always is in the coloured *Stachys palustris*, was deeply cleft. I should be glad to know if this form has been observed elsewhere by field botanists. *Veronica chamædrys* sometimes sports to white; a patch in a meadow near here has shown white flowers for three successive years. The flowers are distinctly smaller than the blue specimens which grow among them, but from different roots. I am inclined to think that cross fertilisation may be the cause here, pollen from some white flower near (not Veronica) affecting the colour; certainly soil has nothing to do in accounting for the change. *Geranium molle*, too, I have often seen growing with pure white blooms in company with plants of the usual colour. The question is a very interesting one, and needs much fuller investigation.—*F. J. Porter, Perranarworthal, Cornwall.*

GEOLOGY, &c.

Discovery of a Conifer in Chalk.—I have recently found in the chalk of our neighbourhood, some interesting specimens of cones in a conifer, allied to Taxus. R. Etheridge, F.R.S., of the British Museum, thus writes:—"The chalk specimen is a cone probably of a Taxus."—*B. Piffard, Hemel-Hempstead.*

The Geologists' Association.—The last number of the Proceedings of the above society contains the following papers:—"On Palæozoic Arcidæ," by J. Logan Lobley; "Notes on Pterodactyles," by E. T. Newton; "Observations on the Natural History of Gypsum," by J. G. Goodchild; and, "The Clays of Bedfordshire," by A. C. G. Cameron. It also contains short reports of the ordinary meetings.

Preserving Gault Fossils.—I should advise J. H. A. Verinder to apply to his fossils, as soon as possible after they are dry, a thin coat of "Picture Mastic Varnish," using a soft camel's-hair brush. I have now some fossils taken from the gault at Folkestone nearly twenty years ago, in a perfect state of preservation, whereas those that did not undergo the process, crumbled away in the course of a few weeks.—*W. E. Windus.*

The Underground Geology of London.—At a recent meeting of the Geological Society, Mr. W. Whitaker, F.R.S., F.G.S., exhibited a series of specimens from the deep boring at Streatham, and made some remarks upon the results obtained, of which the following is an abstract:—After passing through 10 feet of gravel, &c., 153 of London clay, 88½ of Lower London Tertiaries, 623 of chalk (the least thickness in any of the deep borings in and near London), 28½ of Upper Greensand, and 188½ of gault, at the depth of 1081½ feet hard limestone, mostly with rather large oolitic grains, was met with. This, with alternations of a finer character, sandy and clayey, lasted for only 38½ feet, being much less than the thickness of the Jurassic beds, either at Richmond or at Meux's boring. The general character of the bores showed a likeness to the Forest Marble, and the occurrence of *Ostrea acuminata* agreed therewith. At the depth of 1120 feet the tools entered a set of beds of much the same character as those that had been found beneath Jurassic beds at Richmond, and beneath gault at Kentish Town and at Crossness. The softer and more clayey components were not brought up; the harder consist of fine-grained compact sandstones, greenish-grey, sometimes with purplish mottlings or bandings, and here and there wholly of a dull reddish tint. With these there occur hard, clayey, and somewhat sandy beds, which are not calcareous, whilst most of the sandstones are. Thin veins of calcite are sometimes to be seen, and at others small concretionary calcareous nodules; but no trace of a fossil has been found. The bedding is shown, both by the bands of colour, and by the tendency of the stone to fracture, to vary generally from about 20° to 30°. In the absence of evidence it is hard to say what these beds are, and the possibilities of their age seem to range from Trias to Devonian. It is to be hoped that this question may be solved, as on it depends that of the possibility of the presence of Coal-measures in the district; and Messrs. Docwra, the contractors of the works, have with great liberality undertaken to continue the boring-operations at their own expense for at least another week. Details of the section will be given in a forthcoming Geological Survey Memoir, in which, moreover, the subject of the old rocks under London will be treated somewhat fully.

NOTES AND QUERIES.

The Sunflower.—Are Mr. Lett's observations to be taken as conclusive, and the common belief which Moore gave expression to in the well-known lines,

> "As the sunflower turns to her God when he sets,
> The same look which she turned when he rose—"

to be dismissed as a poet's fancy? Dr. M. C. Cooke in his very interesting little book entitled "Freaks and Marvels of Plant Life," referring to heliotropism, observes as follows: "Sir Joseph Hooker says, that when traversing the prairies with Professor Asa Gray, in 1877, he watched the position of the leaves of many hundred plants from the window of a railway car, and after some time persuaded himself that the younger, more erect leaves especially, had their faces parallel approximately to the meridian line. At the same time he says that he convinced himself that the flower heads of the varieties of the great *Helianthoid Compositæ*, such as that which we call the sunflower, that grew in hosts on the prairies DID follow the sun's motion in the heavens to a very appreciable degree, their morning and evening positions being reversed."* A neighbour of my own is a grower of sunflowers. He is a very intelligent and observant man, whose chief delight is the cultivation of his garden. He assured me that he is convinced from careful observation that the sunflower turns towards the sun. I suggested that we should take a turn in his garden, as the sun was shining brightly at the time. Every sunflower, except one, in his garden had the face of its flowers turned towards the south whence the sun was shining at the time. I only mention this as a casual, and, if you please, very inadequate piece of evidence and ask you to take it *quantum valeat.* The subject is so replete with interest that I have felt justified in sending you the above remarks, in the hope that some of your readers, who have time at command, will be induced to make careful observations, and give us the benefit of them.—*W. G. Wheatcroft.*

A Good Hunting-Ground for Orchids in Kent.—On very many occasions, both in late spring and early summer, I have spent a considerable time on the hills and in the woods of Kent—botanizing. In the course of these rambles, the locali-

* J. D. Hooker, in "Gardener's Chronicle," January 15, 1881.

ties of which are widespread, in one respect none has yielded me such an amount of interest, within a very narrow limit, as the district just round the small, peaceful village of Crundale, which lies nestling in a valley about two and a half miles east of Wye, and two miles south of Chilham. The village lies, as I have stated, in a valley; one long range of downs runs on its eastern side, and, on its western, another range, both of which have thick woods on their sides in many parts. The exact locality of which I wish to speak occupies an area of very few miles—merely a radius of not more than one mile from the village itself, and my object for drawing attention to the spot is that it is one of the richest for orchids which, in the small space, it has been my good fortune to visit. Amongst the masses of flowers that carpet the woods, *Listera ovata* (common wavy blade) grows profusely, its long dense spike of pale greenish flowers, and its two large ovate leaves, growing opposite each other at a height of about four inches from the ground, forming a very conspicuous object amongst the tangling underwood. By its side, between the bluebells and primroses, from amongst the thick bed of *Mercurialis perennis*, I have gathered quantities of *Orchis mascula* (early purple orchis), whose magnificent spikes of purple blossoms form such an exquisite contrast of colour to all the plants surrounding them. One drawback there is to this plant—it has a most offensive scent. Plentiful too is the lesser butterfly orchis (*Habenaria bifolia*) and the spotted palmate orchis (*O. maculata*), the former bearing a handsome lax spike of delicate yellowish white blossoms—deliciously scented towards night—the latter, a short dense spike of rose-coloured flowers. The leaves of the latter are the handsomest of all the orchids, I consider; they are of a beautiful soft tone of green, with rich deep purplish-brown spots—the whole very glossy. In a sheltered hollow on the downs above Crundale, on the east about a quarter of a mile beyond the church, is a spot covered with *Orchis fusca* (great dark-winged orchis), both a rare and local treasure. I found two specimens of the same plant on the opposite hills, but they were nothing like so fine. This plant grows about 1–3 feet high, has large oval oblong leaves, mostly radical, and a short dense, obtuse spike, usually of a deep maroon brown colour at the apex, where the flowers are unopen. Below the flowers are a delicate pale purple, sometimes almost white. Its scent is something like vanilla. *Ophrys apifera* (bee orchis), *Ophrys aranifera* (early spider orchis), and *Aceras anthropophora* (man orchis) grow abundantly on the same downs, just at the foot of the hills especially. All are local and, with the exception of *O. apifera*, not over common. Of *Herminium monorchis* (musk orchis) and *Epipactis latifolia* (broad-leaved helleborine) only one specimen of each has come to my hand; the latter, though, is fairly plentiful. *Gymnadenia conopsea* is common. Other kinds do grow there, but, as yet, I have not found them. I have taken the opportunity of writing these few lines in order to let those, who did know before of a good orchid district, know where to hunt if they wish to procure good specimens.—*K. E. Styan.*

Flowers for Drawing-room and Boudoir.—In the selection of vases for these rooms, those of medium size should never be exceeded, unless the room be of unusual proportions. We much prefer vases of small dimensions for every-day use; any vase that is large enough to hold an ordinary-sized bouquet being ample, in our opinion. On special occasions those of larger size could be used, perhaps, with advantage when it is desirable to congregate a larger quantity of flowers together. Greater variety in form and material of the vases that are utilised would be admissible, no two in fact need be alike in any way. Many vases that would be too massive and heavy for the dinner-table could be turned to a good account for special occasions. For general purposes glass vases will be found the best in every way. Large-sized specimen glasses are very useful for sprays of Orchids, or any special flowers that it is thought desirable to keep by themselves. Vases of china or other heavy material require greater discrimination in the selection of flowers. Those in which dark shades predominate should be chosen for light-coloured flowers, and *vice versâ*. Take, for instance, one of the gorgeous blossoms of *Magnolia grandiflora*; for this a vase either black or of dark colour should be chosen, whilst for the Pæonias with flowers of light shades of pink and rose, we would prefer a dark-blue vase. With a bunch of dark-coloured roses we should seek for a receptacle of pale tint. For the tea-scented roses of light shades a vase of a bronzy or pale-brown colour would give a good contrast. Rustic baskets look exceedingly pretty when not over-crowded, and are suited for roses, primroses, daffodils, and anemones, with other similar flowers. These baskets, too, have a most pleasing effect with a few bulbs placed in them during the spring-time, and some Selaginella to carpet the same, or a small pot of a dwarf-growing fern placed in the centre. A few roots of the primrose, or other spring-flowering plants, could be chosen as a change, with nice fresh moss or shoots of a small-leaved ivy to entwine about the same. Those flowers which are in most cases only to be had with very short stems, such as the Stephanotis and Gardenias, can be advantageously arranged in a flat dish, placing some moss in the latter with the necessary quantity of water. In such dishes a few flowers of the Gardenias, and the tea-scented rose Madame Falcot, look very well, each with a little of their own foliage.—*From Cassell's Popular Gardening* for December.

Egg-drill and Blow-pipe.—I should be much obliged if any reader would tell me where I can procure an egg-drill and blow-pipe, such as are figured in "Notes on Collecting and Preserving Natural History Objects." Also, is there any great advantage in covering the hole of a blown egg with paper?—*K.D.*

The Mild Weather.—As evidence of the mild weather which prevailed in November and December last, the following list of twenty-seven wild plants found in full flower on November 25th, within a short walk will show: *Ranunculus acris*, L. (buttercup); *Ranunculus repens*, L.; *Sisymbrium officinale*, L. (hedge mustard); *Sisymbrium alliaria*, Scop. (Jack by the hedge); *Brassica campestris*, L.; *Capsella Bursa-Pastoris*, DC. (shepherd's purse); *Cerastium triviale*, Link; *Stellaria media*, L. (chickweed); *Stellaria holostea*, L. (stitchwort); *Arenaria serpyllifolia*, L.; *Geranium dissectum*, L.; *Geranium Robertianum*, L. (Herb Robert); *Trifolium procumbens*, *L.*; *Hedera helix*, L. (ivy); *Galium aparine*, L. (cleavers); *Bellis perennis*, L. (daisy); *Matricaria chamomilla*, L. (wild chamomile); *Senecio vulgaris*, L. (groundsel); *Taraxacum officinale*, Wig. (dandelion); *Sonchus oleraceus*, L.; (sow thistle); *Hieracium murorum*, L.; *Hieracium sylvaticum*, Sm.; *Veronica agrestis*, L.; *Laminum purpureum*, L. (red nettle); *Lamium album*, L. (white dead-nettle); *Urtica dioica*, L. (stinging nettle); *Euphorbia peplus*, *L.* (spurge).—*R. Scott.*

Nightjar.—A pair of these birds were observed at Heslington, near York, as late as the third week in November. One of them was picked up in the garden of Heslington Hall, having almost succumbed to the severe weather. It revived on being warmed before the fire; it was preserved by Mr. Allen, of York, and is now in the possession of Mr. Hornby, of Heslington.—*J. A. Wheldon.*

SAND PICTURES.—If J. M. C. will apply to Mr. Cotton, Alum Bay, Isle of Wight, I have no doubt he will be able to obtain the bottles of coloured sand arranged as pictures, at a moderate price.—*W. E. Windus.*

STRENSALL COMMON.—This notable Yorkshire locality has undergone a great change during the last two years, having been transformed into a military camp by the Government. Owing to draining operations the appearance of the surface has become entirely changed. The first bird to take alarm was the black-headed gull, which formerly bred here in immense numbers. All the extensive splashes or patches of marsh are now almost quite dry in summer, and the gulls have migrated to other commons in the district. The teal and wild duck appear to have also left their old summer haunts, though the latter appear regularly in the winter months. The little grebe and snipe are much scarcer, as also the redshank, although a few of the latter still breed on the common. Many of the rarer plants are found in greatly diminished numbers, and the extermination of some of them is probably only a matter of time. I searched in vain this summer for *Andromeda polifolia*, and we shall probably soon see the last of *Drosera intermedia*, *Hypericum elodes*, *Mentha pulegium*, *Radiola millegrana*, *Pilularia globulifera* and others. *Gentiana pneumonanthe* appears to hold its ground so far. Some of the freshwater shells are already scarce. The very large examples of *Limnea stagnalis* and *Planorbis corneus* are not to be found now, but *Limnea glabra* and *truncatula* are still very fine and abundant. I hear also that a portion of Askham Bog is about to be improved off the face of the earth; several pools are to be filled up, and converted into grazing ground. This portion of the bog was a rich conchological resort, producing several rare shells, and I believe also some very good aquatic beetles. Fortunately the improvement will not extend as far as the haunts of *Carex paradoxa*, *Myrica gale*, *Osmunda regalis*, *Lastrea thelypteris*, &c. It would be a severe blow to local naturalists to entirely lose this tract of aboriginal ground, immediately after the destruction of Strensall Common.—*J. A. Wheldon.*

NOTICES TO CORRESPONDENTS.

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

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

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

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

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

E. T. H.—In all probability the pebble containing Rhynconella, found at Southbourne, was a bit of rolled greensand from the Isle of Wight.

"ALUM BAY SAND."—Bottles (bluebell shaped) and paper weights of this variegated sand are sold all over the Isle of Wight. The maker lives at Totland Bay, but a letter addressed to "The Naturalist, The Pottery, &c., Hut, The Pier, Totland Bay, Isle of Wight," would doubtless find him. He also sells Isle of Wight fossils and pottery. A fair sized bottle of sand may be got for 1*s*., and the one representing "The Needles" is about the most interesting.—*George P. Best, Chelsea, W.*

W. HODGES.—The coloured illustrations on Graphic Microscopy were given up on account of their great expense. Remember that SCIENCE-GOSSIP is published at 4*d*.

E. E. LOWE.—Get Dr. Ahn's "First Course in Spanish," price 1*s*. or 1*s*. 6*d*.

J. WORLLEDGE, Woodbridge.—From your sketches and description, we do not think the creature is a rotifer, but a stalked infusorian, probably a species of Ophridium.

J. S. T.—One of the best places to find carboniferous limestone fossils is the neighbourhood of Castleton, Derbyshire.

T. SUMMERS.—Get the shilling edition referred to in our present list of "Books Received," on "Land and Freshwater Shells."

R. W. HOOLEY.—Huxley and Martin's "Biology" (published by Macmillan) is the best elementary book.

F. L. TANNER.—Get Swift's Second Series. Zeiss's are good, and, perhaps, cheaper.

A. SKIPTON.—See the notice in our Science-Gossip column of Professor Seeley's lectures. We would strongly advise you to join the class. Thereby you would get to know directly all you ask about.

R. COUPAR.—Address the Hon. Sec. Bradford Naturalists' Society, Bradford, Yorkshire.

J. KIRBY.—From the capital sketch of the fish you sent, we have no doubt it is *Ostracion cornutus*, one of the Berycidæ peculiar to tropical seas now.

MRS. B.—Write to Messrs. George Bell and Sons, 4 York Street, Covent Garden, about the "London Catalogue," and to Mr. John Eggleston, Naturalist, Sunderland, about the botanical labels for British plants. A few years ago a book was published of such labels, printed on one side.

J. EYRE.—Your article will appear in due course.

G. HOGGETT.—Write to Mr. John Browning, 63 Strand, London, about the telescope.

"BEN NEVIS."—Will some Kentish botanist inform this querist as to the best "Flora of Kent"?

MISS HELLMAUN.—Your note appeared in the December number of SCIENCE-GOSSIP.

H. D. GOWER.—A capital work is now being issued in monthly parts, price 7*d*., with coloured plates, by Dr. Carl Russ, entitled "The Speaking Parrots," published by L. Upcott Gill. There is also a cheap work, called "Parrots in Captivity," published, we believe, at the "Bazaar" office.

TO OUR FRIENDS.—Owing to our having to go to press this month very early on account of the Christmas holidays, many queries and exchanges have to stand over. We have received various complaints from subscribers that SCIENCE-GOSSIP comes out so late. The complaint is a gratifying one to the Editor; it shows that his subscribers are anxious to get SCIENCE-GOSSIP as soon as possible. The Editor intends that with the new year the magazine will be out nine days earlier than heretofore. No exchanges inserted after the 10th of each month.

EXCHANGES.

WILL exchange the following eggs, side-blown, one hole:—Common crossbill, rosy bullfinch, dipper, Squacco heron, Dartford warbler, and black-headed gull, for one-hole blown woodcock, turnstone, bittern, great bustard, and others. Please send lists. Henry Booth, Upcerne Road, Chelsea.

OFFERED.—"Course of Time" (Pollock), "Life of Kitto" (Eadie), "Elements of Zoology" (Rhind), "Young Fur Traders," "Tours to the British Mountains, 1824" (Wilkinson), "Iron and Heat" (Armour), "Life and Travels of Humboldt," "French Grammar" (Wolskie), "Leisure Time Studies," chiefly biological (Wilson), "Life of a Scotch Naturalist"—Edward (Smiles), "Die Waldenser im Mittelalter (in German). Wanted.—"Conchology" (Woodward), "Manual of Mollusca," "Siluria" (Murchison), "Western Islands" (McCulloch), "Principles of Geology" (Lyell), "Antiquity of Man" (Lyell), "Monograph of Fossils" (King), "Geology of Arran" (Bryce), "Prehistoric Times" (Lubbock), "History of Rutherglen and East Kilbride" (Ure), "Volcanic Islands" (Darwin), and "Catalogue of British Fossils" (Morris).—J. Smith, Monkredding, Kilwinning.

CAST of a hammer-headed shark (*Zygæna malleus*) of the Mediterranean. Desiderata, curios, other eggs than birds', foreign shells, especially snail's. Curios to exchange; description will be sent with head, which is very rare.—Archibald Hy. McBean, S. Denys, Southampton.

FOSSILS from Barton and Hordle to exchange for others from various formations. Send lists to—Miss Hinuber, Belmore, Lymington, Hants.

WANTED, books on Microscope, recent editions; will give others in exchange.—W. T. Porter, 19 Otley Road, Headingley, Leeds.

FOR exchange, thirty-two last parts "Journal of Geological Society," and other scientific works. Wanted, "Journal of Chemical Society," and other standard scientific works.—G. Freeman, 51 Danby Street, Denmark Park, London, S.E.

Sph. ovale and *Pl. dilatatus* from an entirely new Lancashire locality, *H. pomatia*, *L. peregra*, var. *solemia* and *Boisii*, and others. Desiderata, British and foreign land and freshwater shells.—W. Hy. Heathcote, M.C.S., East View, Preston.

I SHOULD be very glad to receive heads of any animals or birds, recently dead, for dissection.—A. W. Harrison, Assist. Demonstrator of Anatomy, Westminster Hospital Medical School, Caxton Street, London, S.W.

FORTY varieties of animal hairs, mostly foreign, in exchange for six good slides.—Arthur H. Williams, Hythe.

OFFERED, *Helix Cantiana, virgata, rotundata, hortensis, Zonites cellarius, Physa hypnorum, Anodonta anatina, Planorbis contorta, corneus, Bythinia Leachii, tentaculata, Pupa umbilicata, Paludina vivipara, Lemnæa glabra*, in exchange for other shells.—J. A. Wheldon, York.

OFFERED, *Bartramia pomiformis*, var. *crispa, arcuata, fontana, Œderi, Sphagnum rigidum, compactum, rubellum, tenellum, Pottea truncata, Neckera crispa, Tetraplodon mucoides, Hedwigia ciliata, Schistostega osmundacea, Grimmia apocarpa*, var. *rivulare, Racomitrium lanuginosum, Climacium dendroides, Hyp. cordifolium, uncinatum, aduncum, commutatum, molluscum.* Wanted, many common mosses and lichens.—J. A. Wheldon, York.

WANTED, British or foreign insects in spirit (correctly named), recent specimens. State wants; good exchange in various unmounted micro material; many good things offered for suitable specimens. Address with list and sample—R. M., 24 Park Road, Clapham, London, S.W.

"NATURE," Vols. 23 and 24, bound, in splendid condition; what offers? Will take botanical micro slides, various, &c.—J. Hunter, Sea View, Buncrana, near Londonderry.

L. stagnalis, very large, *Bulimus acutus*, var. *bozona* of *Bulimus acutus*, also *H. virgata*, and var. *submaritima* of *H. virgata* and *L. glabra*, also eggs of thrush, blackbird, starling, water-hen, partridge, missel thrush, &c. &c. Desiderata very numerous.—W. Hewett, 3 Wilton Terrace, Fulford Road, York.

WANTED, Teall's "British Petrography," Phillips's "Ore Deposits," Daubrée's "Géologie Expérimentale," and the "Quarterly Journ. Geolog. Society" for Nov. 1883, and other numbers.—X. Y. Z., 103 Hill's Road, Cambridge.

OFFERED, a well-preserved specimen of a scorpion, quite perfect and recent. Wanted, micro material, marine objects preferred, sponge spicules, or material of a similar character, algæ or good zoophytes, British or foreign; all must be correctly named, unmounted.—R. M., 24 Park Road, Clapham, London, S.W.

WANTED, physiological and scientific micro slides in exchange for polarising, opaque, and other popular objects.—Henry Ebbage, 344 Caledonian Road, London.

WANTED, entomological material in quantity, suitable for microscopical mounting; good micro slides or otherwise given in lieu. Communicate before sending.—H. Francis, 14 York Place, Clifton, Bristol.

WANTED, fossils from crag, Woolwich beds, London clay, Thanet sands and Bracklesham beds, in exchange for those from the chalk, greensand, coal measures, and a few American eocene fossils; also about sixty coloured plates of fossil shells. Send lists.—Geo. E. East, jun., 10 Basinghall Street, London, E.C.

OFFERED, Vols. i., ii. and iii. of Cassell's "Technical Educator," bound edition. Wanted, natural history books, specimens (not entomological) or micro accessories.—G. P. Best, 33 First Avenue, Harrow Road, London, W.

"FAMILIAR Birds' Eggs and Nests," by H. G. Adams, with sixteen coloured plates, beautifully bound as new; will exchange for side-blown birds' eggs. Please send list of eggs in exchange to—Henry T. Booth, Upcerne Road, Chelsea.

A FEW specimens of *Euplectella aspergillum* in exchange for scientific books, "Quekett Microscopical Journal," Vols. i. and ii., 2nd series, wanted particularly, or offers.—W. H. Harris, 44 Partridge Road, Cardiff.

OFFERED.—L. C., 8th ed.: 229, 351, 552, 538, 662, 919, 931, 970, 986, 1046, 1162, 1269, 1330, 1335, and 1558, in exchange for others.—A. Sangster, Ivy Cottage, Cattie, Old Meldrum, N.B.

WILL exchange a small collection of about a hundred different species of mosses and lichens, from Belgium and Luxemburg, for natural history specimens, starfish or echinoderms preferred, not necessarily British.—Hugh B. Preston, 54 Lexham Gardens, Kensington, W.

WILL exchange unset British butterflies, also set specimens of the Apollo butterfly (*Parnassias Apollo*), for natural history specimens, starfish or echini preferred, not necessarily British. Hugh B. Preston, 54 Lexham Gardens, Kensington, W.

Hooker's "Student's British Flora," 2nd edit., Watter's "Birds of Ireland," "Wild Life in a Southern County," &c., in exchange for other books, or offers.—Rev. W. W. Flemyng, Clonegam Rectory, Portlaw, co. Waterford.

ANY of the following eggs for clutches of many other species: clutches of sparrow hawk, kestrel, common buzzard, American robin, sedge warbler, gold crest, great tit, jackdaw, magpie, red-backed shrike, reed bunting, tree and meadow pipit, skylark, nightjar, golden-winged woodpecker, moor hen, coote, ringed plover, lapwing, curlew, sandpiper, common snipe, common, Arctic, sooty and Rüppell's terns, kittiwake, common L. B. B. and G. B. B. gulls, great skua, little grebe, mute swans; and eggs of sheldrake, pheasant, partridge, hen harrier, honey buzzard, dipper, grasshopper and Dartford warblers, corn crake, water rail, oyster catcher, whimbrel, dunlin, puffin, razor bill, guillemot, stormy petrel.—J. B. Young, 2 Elgin Villas, Rodwell, Weymouth.

WANTED, all or any of the following shells: *Pholadidea papyracea, Pholas crispata, Scalaria Turtonæ, Ianthina exigua, I. rotundata, Buccinum Humphreysianum, Pinna pectinata, P. rudis, Isocardia cor*, five kinds of *Fususes, Pecten glaber* (*tigrinus*), *Venerupis iris, Gastrochæna modiolina, Anomia striata, A. patelliformis, Avicula tarentina, Emarginula crassa*, and *Xylophaga dorsalis*. Good exchange given in other British shells, minerals, fossils, polished Devonian corals and sponges, thin sections for micro purposes, &c.—A. J. R. Sclater, M.C.S., 23 Bank Street, Teignmouth.

OFFERED, upwards of seventy numbers of "Band of Hope Review," dating from 1881 to 1888; would make a good volume of interesting reading if bound together, or otherwise, in exchange for rare foreign stamps.—A. J. R. Sclater, M.C.S., 23 Bank Street, Teignmouth.

A DUPLICATE collection of British mosses, over 300 species, correctly named and mounted, in exchange for foreign mosses, hepaticæ or algæ (algæ especially wanted), or exchanges in these plants solicited.—J. Miles, 25 Sudeley Place, Kemp Town, Brighton.

WHAT offers for "Biological Atlas," "A Guide to the Practical Study of Plants and Animals," 423 coloured figures and diagrams, by D. M'Alphine, quite new.—Walter Hollebon, Newark House, Langney Road, Eastbourne.

WANTED, varieties of *H. nemoralis* and *hortensis*, and living slugs, in exchange for other land and freshwater shells.—F. G. Fenn, Isleworth, Middlesex.

VOLS. I.–IV. of SCIENCE-GOSSIP, bound, and choice microslides of parasites, diatoms, botanical, double-stained, &c., in exchange for other choice slides.—R. Suter, 5 Highweek Road, Tottenham.

TWENTY-FOUR good microscopic slides in cloth-covered rack box; will exchange for three first issue Jubilee sixpences.—W. Mathie, 127 Buchanan Street, Glasgow.

WANTED, to exchange N. American or European plants, for Australian, Indian, African, or S. American; also British and Continental plants for N. American.—A. E. Lomax, 56 Vauxhall Road, Liverpool.

THE "MYRIAPODA."—The undersigned is very desirous of communicating with some one who has made a study of this group, for the identification of an apparently undescribed form, which is marine (three to four fathoms).—J. Sinel, Cleveland Road, Jersey.

CLEAN, washed, and picked foraminifera, from Atlantic mud, with locality and depth, in exchange for good objective.—A. H. Delap, Clonmel.

BOOKS, ETC., RECEIVED.

"The Eulogy of Richard Jeffries," by Walter Besant (London: Chatto & Windus).—"Truth for its own Sake—The Story of Charles Darwin," by W. Mawer (London: Swan Sonnenschein).—"Land and Freshwater Shells," by J. W. Williams, J. W. Taylor, and W. Decissar Roebuck (London: Swan Sonnenschein).—"Catalogue of the Collection of New Zealand Birds, Manor House, Letcomb Regis, Wantage," by Sir W. L. Buller (London: E. A. Petherick).—"Electric Bells and all about them," by S. R. Bottone (London: Whittaker & Co.).—"Book Chat."—"The Amateur Photographer."—"The Garner."—"The Naturalist."—"The Botanical Gazette."—"Journal of the New York Microscopical Society."—"Belgravia."—"The Gentleman's Magazine."—"American Monthly Microscopical Journal."—"The Essex Naturalist."—"The Midland Naturalist."—"Feuilles des Jeunes Naturalistes."—"The American Naturalist."—"Journal of Microscopy and Nat. Science."—"*Ottawa Naturalist*."—"Scientific News."—"Wesley Naturalist," &c. &c.

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

COLOUR DEVELOPMENT IN LEAVES AND FLOWERS.

By A. G. TANSLEY.

I AM very glad to see (Science-Gossip, October and November) that Mr. Bulman has argued in some detail in support of his rather sweeping charges against the theory of colour development in flowers by means of insect selection. In my former paper (Science-Gossip, June, 1888), I briefly pointed out a line of defence of the points attacked by Mr. Bulman; I will now proceed to consider his "Reply."

In comparing the colours of leaves and flowers, with a view to finding out the causes of their existence, we are, I think, at once struck by the fact that the bright colours of leaves, which appear in the autumn, are the attributes of a period of decay, depend in point of time on that period, and are therefore presumably most intimately connected with it in causation: this we know on good authority to be the case. When, on the other hand, we turn to the colours of entomophilous perianths, we see that they last during the period from expansion to fertilisation; that is to say, the period when the organs of the flower are preparing for the exercise of their function. The inference here also is clear; either the colours are connected in causation with this functional activity, or, whatever the cause of their original appearance, they at present exist in virtue of the exercise of some function of their own. Now it is not *à priori* likely, from the great variety and complex distribution of these colours, that they can be accounted for as the mere result of the chemical processes connected with pollen and ovule development; but, however this may be, it has not, so far as I know, been done or attempted; we are, therefore, driven to the other alternative, that they have a function of their own. The question now becomes, what is their function? From observation of the habits of insects in visiting flowers, and from the knowledge of the benefits conferred by cross-fertilisation, which we further know these insects are constantly effecting, we are led to believe that the function of the colours of flowers is to attract insects. This leads at once, by the help of the theory of natural selection, to what we may call the general theory of colour development through insect selection.

It is thus plain that the difference between the colouring pigments of leaves and flowers, which, Dr. Sorby tells us, are often chemically identical, is a difference in functional significance. Mr. Bulman is quite right in saying that "the fact, that the colour is in both cases due to the same chemical changes, does not make the suggestion (that colour in flowers is not developed by insect selection) less probable." I ought not to have said that Dr. Sorby's statement "fully meets" Mr. Bulman's objection, but rather that it is answered by this fact of the difference o functional significance, which was of course the assumption upon which my argument was based. Dr. Sorby's statement, however, in one sense, does meet Mr. Bulman's objection:—"We are just as much bound to account for the colours of these (leaves) as of the varied hues of the blossoms," Mr. Bulman says; and Dr. Sorby's statement does account for them—chemically—in the same way as for those of the flowers, but it is no part of his province to point out, what seems fairly obvious, the great difference between them in respect of functional significance.

Here, in fact, lies the fallacy of Mr. Bulman's original argument, the assumption that, because the colours of leaves have not been developed by means of insect selection, therefore there is no need to suppose that those of flowers, which appear, as I have shown, under totally different conditions, and therefore require, from a physiological point of view, a wholly different explanation, were originated by this means.

Here I may conveniently deal with some remarks of Mr. Bulman's in his recent papers, bearing on this point. He says, for instance, that his conclusion that a brilliant red may be developed in a plant without the selective action of insects, "does not prove the selection theory impossible, but it does show that it is not necessary." Again, in referring to the cases of the appearance of red in the stigmas of Poterium and Corylus, he remarks that if these cases can be effected without insect agency, "it is simple dogmatism to say that petals might not be so also." Lastly, "It is doubtless unwise to argue from the existence in flowers of certain colours which cannot have been influenced in their development by insect selection, that the colours of flowers in general cannot have been so developed; it is, however, a legitimate and necessary conclusion, that they may have been developed without the selective action." Are not all these remarks permeated by the same fallacy? Of course the colours of petals *may* have been developed without insect selection; the question is, is it likely, considering the circumstances under which they appear, and the varied nature of the colours themselves? And does the fact of the appearance, a brilliant red in leaves, render the selection theory unnecessary? Surely not, unless there is a reasonable theory to explain the development of the colours of flowers through chemical causes connected with some process going on in the plant, such as we have in the leaf, and adequate in each case to produce the particular distribution of colour in each species. Has this been done, or is it likely to be done?

The case of the stigmas of *Corylus*, quoted from Hermann Müller, simply enforce this view. Müller considers "that the red colour of the stigmas is solely an effect of chemical processes connected with the development of the female flowers to maturity." Has such an explanation been attempted of the colours of entomophilous perianths? To put the case in other words, in each female hazel plant the red colour in the stigmas is brought about by something which must happen in the economy of the plant, whereas in entomophilous corollas we suppose the colour to have been brought about by the laws of heredity, themselves brought into play by the selective action of insects. It is therefore apparent that my objection that the red of the leaf is not fixed,—in the sense of hereditary in the species—*can* be urged against this example, and that the red colour in the stigmas of *Corylus* and *Poterium* is brought about every year by chemical causes connected with vital processes, and is *not* "stereotyped and perpetuated," i.e. made permanent in the species from a functional reason.

Mr. Bulman says that the connection in which I use the word "development" "seems to imply that the colouration of the flower was as completely effected as that of the leaf before insect selection came into play to stereotype and perpetuate it." Now I did not mean to imply anything of the kind; I used the word "development" here to mean simply the appearance of the colouring pigment, that is to say, chemical development. I am sorry that Mr. Bulman has misunderstood me, but I cannot say that I think the passage is ambiguous. "The development of the coloured pigments in both leaves and flowers is due to the same primary chemical set of causes." Is there anything in this sentence which "seems to imply that the colouration of the flower was as completely effected as that of the leaf before insect selection came into play to stereotype and perpetuate it?" Surely it is clear that my statement has nothing whatever to do with intensity of colouration.

Again, Mr. Bulman frequently alludes to a supposed "stereotyping" theory of mine; in one place, indeed, after instancing the development of colour in the monkshood, quoted from Mr. Grant Allen, as a case of the sort of process he (Mr. Bulman) understands when he speaks of the colour development through insect selection, he expresses the opinion, that this is "more in accordance with Darwinism" than my "theory."

Now, in the first place, I have no independent theory to account for the colours of flowers; and, secondly, the word "stereotype" is a word which I find I have unconsciously borrowed from Mr. Grant Allen, and which I used in the same sense that he does, simply to mean the making permanent in a species a useful variation, by means of natural selection. In this case the process would doubtless result in intensification of the colour, but the point which the word in question is intended to emphasise, is its becoming hereditary. My "stereotyping theory" then, at least as far as the "stereotyping" goes, is identical in all respects with Mr. Grant Allen's, and therefore can hardly be less in accordance with "Darwinism!" How Mr. Bulman, from my sentence quoted above, and another remark that the colours of flowers were stereotyped and perpetuated in the species by insect selection, while those of leaves were not, came to the conclusion, that I considered that the colours were "*only* stereotyped and perpetuated" by the insect selection, I cannot understand.

Mr. Bulman next informs us that my statement, that "the contention of the upholders of the theory is that they (bees) have learned to consider blue or red as an index of high specialisation," and that this is the reason of their preferring these colours, deals a death-blow to the theory I am defending. He goes on to enforce this idea, by considering the time when flowers according to the theory had not become blue. "The bees' taste for blue being simply the result of experience, does not exist. So the few flowers with a chance shade of blue . . . are not specially selected by the bees visiting the blooms for honey, and do not obtain any advantage: the chance variations towards blueness, not conferring any benefit, are not seized upon by selection—they disappear." With regard to this statement, we should remember one or two things; in the first place, the "bees" were not bees at all, the co-adaptations which now exist between them and the flowers they visit, and without which the colour in itself would be meaningless, were for the most part not yet evolved. It should be remembered that while these variations of colour were first appearing, the co-adaptations which we see in such beautiful perfection at the present day, were appearing as variations. In Hermann Müller's words: "The first traces of adaptation to insects, could only be due to the influence of quite short-lipped insects with feebly developed colour-sense. The most primitive flowers are therefore for the most part (except, for instance, *Salix*) simple, widely open, regular, devoid of honey or with their honey unconcealed and easily accessible, and white or yellow in colour (*e.g.* most *Umbelliferæ* and *Alsineæ*, many *Ranunculaceæ* and *Rosaceæ*). . . . Gradually from the miscellaneous lot of flower-visiting insects, all much alike in their tastes, there arose others more skilful and intelligent, with longer tongues and acuter colour-sense; and they gradually caused the production of flowers with more varied colours, honey invisible to or beyond the reach of the less intelligent short-tongued guests, and various contrivances for lodging, protecting, and pointing out the honey." We can thus see how the new colours would become correlated with increasing complexity of structure, and would at last come to be recognised by the developing bee as the outward marks of flowers suited to it in structure; the eventual taste for blue arising from the selection of the varieties visited because of their gradually increasing specialisation, and the neglect of the more primitive yellow or white forms.

Mr. Grant Allen goes so far as to say, that the appearance of the colours followed a regular law of progressive colouration—yellow, white, red, blue.—which would thus be correlated with increasing complexity; in his own words: "Bees and butterflies are the most highly-adapted of all insects to honey-seeking and flower-feeding. They have themselves on their side undergone the largest amount of specialisation for that particular function. And if the more specialised and modified flowers, which gradually fitted their forms and the position of their honey-glands to the forms of the bees or butterflies, showed a natural tendency to pass from yellow through pink and red to purple and blue, it would follow that the insects which were being evolved side by side with them, and which were aiding at the same time in their evolution, would grow to recognise these developed colours as the visible symbols of those flowers from which they could obtain the largest amount of honey with the least possible trouble. Thus it would finally result that the ordinary unspecialised flowers, which depended upon small insect riff-raff, would be mostly left yellow or white; those which appealed to rather higher insects would become pink or red; and those which laid themselves out for bees and butterflies, the aristocrats of the arthropodous world, would grow for the most part to be purple or blue" ("Colours of Flowers," pp. 23, 24). If then the theory is to stand at all, it must rest upon the supposition that bees grew to recognise "blue or red as an index of high specialisation," for we cannot assume the then not fully-evolved bee to have acquired his taste for blue (this of course must be distinguished from the power of discriminating the colour blue from other colours) from any other source. And even if we do not absolutely accept Mr. Grant Allen's "Law of Progressive Colouration," there is good reason for believing with Hermann Müller that red and blue appeared later than white and yellow, and would therefore be correlated with the more complex structures.

Thus the statement under which, according to Mr. Bulman, "the whole theory collapses" is absolutely necessary for its support.

I think, from what I have said above, it will hardly be necessary now to refute Mr. Bulman's idea, that Mr. Grant Allen believes bees to be attracted by blue "simply as a colour"; his quotations merely amount to the statement, that every time Mr. Grant Allen speaks of the "azure-loving bee," he does not explain the origin of its love for azure, which could hardly be expected of him. The following passages from the "Colours of Flowers" are, however, explicit enough: "The fact is, blue flowers are, as a rule, specialised for fertilisation by bees, *and bees therefore prefer this colour*" (p. 19). "Bees show a marked taste for blue, *because blue is the colour of the most advanced flowers*" (p. 119).

(*To be continued.*)

OUR SCIENTIFIC SOCIETIES.

WANT of space prevents us from giving more than a general list of the chief articles in the "Transactions," &c., of the following societies. ——*County of Middlesex Natural History and Science Society:* "The Chemistry of London Clay," by W. Mattieu Williams; "Appearance in London of *Ephestia Kühniella*, and the Remedy provided by Nature," by Sidney J. Klein; "Horns and Antlers," by Professor Flower; "Fossils of the Flint, or the Wonders Lying at Our Own Doors," by George Barraclough; "On Some Methods of Collecting and Keeping Pond-life for the Microscope," by C. Rousselet.——*The City of London College Society:* "The Use of Experiment in Biology," by Professor G. S. Boulger; "The New Darwinism, or the Segregation of the Fit," by J. W. Gregory.——*Hackney Microscopical and Natural History Society:* "The Migration of Internal Parasites," by W. Smart.——*Bristol Naturalists' Society:* "Dolomitic

Conglomerate of Bristol," by Joel Lean; "The Mendips, A Geological Reverie"; "The Stones of Stanton Drew, Their Source and Origin," and "Elimination and Selection," by Professor C. Lloyd Morgan; "Remarks About Seals, and their So-called 'Ballast-bag,'" by A. J. Harrison; "Researches on Evaporation and Dissociation," by Professor William Ramsay, and Professor Sydney Young; "The Crossing of Ferns," by Colonel Arthur M. Jones; "The Illumination of the Eclipsed Moon," by G. F. Burder.——*Chichester and West Sussex Natural History and Microscopical Society:* "Notes from a Berar Camp," by Rev. C. D. Ash; "The Use of Natural History Collections," by A. Lloyd; "Nummulites," by Dr. Panton; "The Antennæ of Lepidoptera," by J. Anderson, jun.; "Phyto-Geography of the South Coast," by Rev. F. H. Arnold; "A Chapter from the History of Oils," by Rev. J. Fraser.——*Dumfriesshire and Galloway Natural History and Antiquarian Society:* "Atmospheric and other Influences on the Migration of Fishes," by J. J. Armistead; "The Graptolites of the Moffat District," by James Dairon.——*Hertfordshire Natural History Society and Field Club:* "The means of Protection possessed by Plants," by F. Maule Campbell; "On *Walckenaëra interjecta*, a New Spider from Hoddesdon," by Rev. C. P. Cambridge; "A Record of Water-level in a Deep Chalk Well at Barley, Herts," by H. George Fordham: "Some Methods of Moth-collecting," by R. M. Bowyer.——*Leeds Geological Association:* "Oceanic Deposits," by Thomas Tate; "The Occurrence of Quartzite and other Boulders in the Lower Coal Measures at Wortley, near Leeds," by C. Brownridge.——*Liverpool Geological Society:* "Local Historical, Post-glacial and Pre-glacial Geology," by G. H. Morton; "A Theory to Account for the Airless and Waterless Condition of the Moon," by Rev. F. F. Grensted; "Geological and Physical Notes on the above," by T. Mellard Reade; "Stanlow, Nice, and Frodesham Marshes," by G. H. Morton: "Notes on Glacial Deposits and Markings in the South of the Isle of Man," by W. Hewitt; "Notes on the Geology of St. David's, Pembrokeshire," and "Notes on a Large Boulder found in Driving a Sewer Heading in Oxford Road, Manchester," by T. Mellard Reade; "Geological Notes on the Preston Dock Works and Nibble Development Scheme," with illustration and plan, by E. Dickson; "Examination of Quartzite from Mills Hill, Pontesbury," by P. Holland and E. Dickson; "On the Colouring Matter of the Mineral 'Blue John,'" by A. Norman Tate; "Some Irregularly Striated Joints in the Keuper Sandstone of Lingdal Quarry," with plans, by H. C. Beasley.——*Penzance Natural History and Antiquarian Society:* "The Mosses of East Cornwall," by R. V. Tellam; "Notes on the Echinodermata of Mounts Bay," by G. F. Tregelles; "Additions to the recorded Fauna and Flora of West Cornwall."

HORNS AND ANTLERS.

A LECTURE recently delivered by Professor Flower, Director of the British Museum, to the County of Middlesex Natural History and Science Society, on the above deeply interesting subject, is given in full in the last issue of the "Transactions." We extract the following paragraphs (illustrated by the original block used in Professor Flower's lecture), and for the loan of which we are indebted to the Hon. Secs.:—

It is among the ruminating section of the even-toed or Artiodactyle ungulates that frontal appendages are most universally developed. In some of these, however, as the Tragulidæ, or Chevrotains, and Camelidæ, camels and llamas, they are absent. In the great group of Bovidæ, consisting of oxen, sheep, goats, and antelopes, they are present in the form of true horns. These are permanent, conical, usually curved, bony processes from the frontal bone, into which air-cells from the frontal sinuses commonly extend, called the "horn-cores," ensheathed in a case of true horn, an epidermic development of fibrous structure, which grows continuously, but slowly, from the base, and wears away at the apex; but is not shed entire. Its structure is very much the same as that of a nail, hoof, or claw. When the horn is removed from the core, the basal part is seen to be hollow, the terminal portion beyond the core alone being solid. This part may be cut without giving rise to more sensation than cutting nails or hair. The surface of the core itself is soft, vascular, and sensitive. As with most similar appendages, horns are not present at birth, but begin to grow soon after. The males of all existing Bovidæ possess them, and they are also present, though usually not so fully developed, in the females of all except certain genera of antelopes. In one species, the Indian four-horned antelope (*Tetraceros quadricornis*), there are two pairs; in all others only one pair. They vary immensely in size, form, and curvature, sometimes being perfectly straight, sometimes spirally twisted, sometimes coiled almost in one plane, as in the familiar ram's horn (*Cornu ammonis*). Sometimes the surface is smooth, and sometimes covered with annular ridges, or a series of projections or knobs on one side only, but they are never branched.

A single species, the North American prong-buck (*Antilocapra Americana*), differs from all the true Bovidæ, in possessing horns composed of fibrous epidermic material ensheathing a permanent bony core, but which is bifurcated at the end, and is regularly and periodically cast off and replaced by a new horn growing from the surface of the core beneath the old one.

In the family Cervidæ, or deer, the frontal appendages take the form of "antlers," which must be carefully distinguished from the horns of the bovine ruminants. These are the outgrowths of true bone, covered during their growth with vascular, sensitive integument coated with short hair, technically called "the velvet." When the growth of the antler is complete, the supply of blood to it ceases, the skin dies and peels off, leaving the bone bare and insensible, in which state it is well adapted for a fighting weapon. After a time, by a process of absorption near the base, it becomes loosened from the skull and is shed. A more or less elongated portion, called the "pedicle," always remains on the

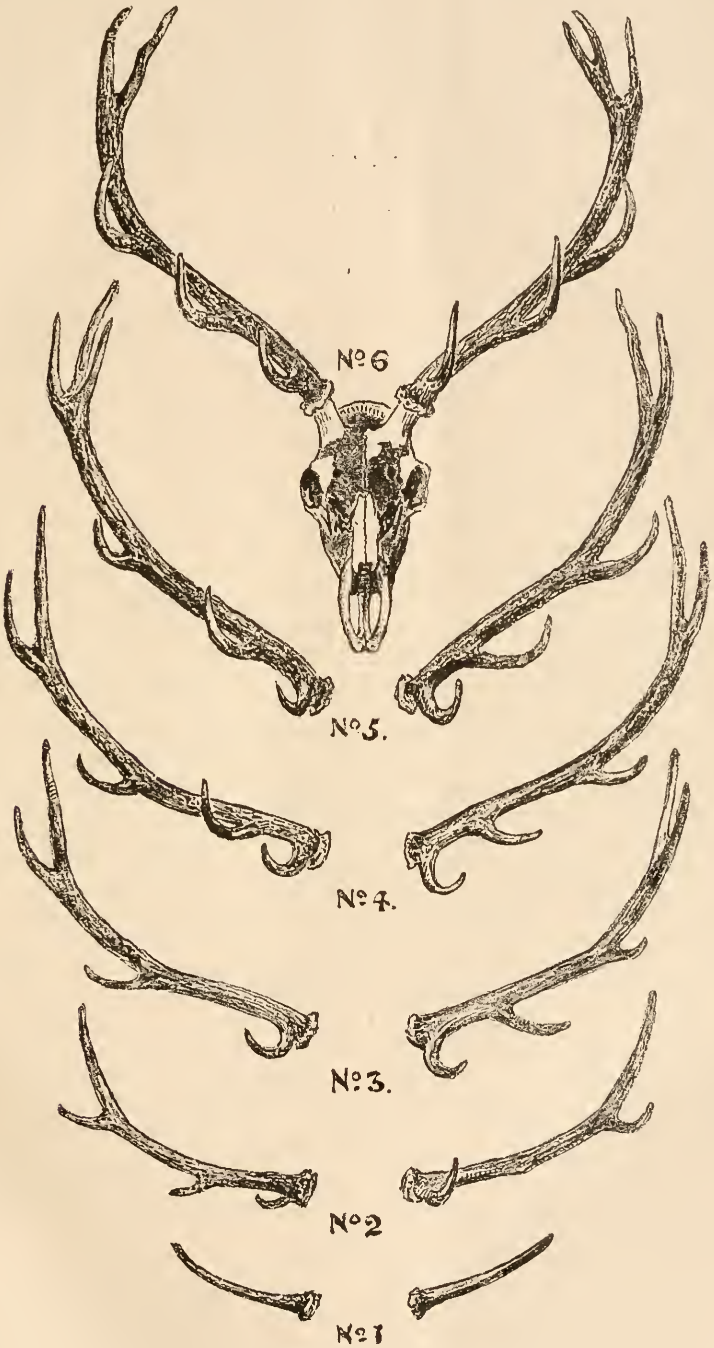

Fig. 18.—Figures illustrating the growth of Antlers.

skull, from the summit of which a new antler is developed. In most existing deer this process is repeated with great regularity at the same period of the year. Even the great horns of the wapiti, and, judging by all analogy, those of the Irish elk (Megaceros), the pair of which weigh seventy pounds, more than all the bones of the skeleton put together, are produced in the course of three or four months.

The antler may be small, simple, straight, subcylindrical, tapering, and pointed, as in certain South American deer (pudu and brocket); but more often it sends off one or more branches, called "tynes" or "snags." In this case, the main stem is termed the "beam." Commonly, all the branches of the antler are cylindrical, and gradually tapering. Sometimes, as in the fallow deer and the extinct megaceros, they are more or less expanded or flattened, the antler being then said to be "palmated." In young animals the antlers are always small and simple, and in those species in which they are branched or palmated, their complete development is only gradually acquired in several successive annual growths. This process is exceedingly well illustrated by a series of specimens exhibited in the Natural History Museum (to which they were presented by W. H. St. Quintin, Esq.) of the antlers of the same stag (*Cervus elaphus*) grown and shed in six successive years (see Fig. 18). The animal was born in June, 1880, and was kept under careful observation in a park in Yorkshire. In the year of its birth it had no antlers, but in the summer of 1881 those represented in No. 1 were grown, and shed in the following spring, 1882, when the animal was nearly two years old; No. 2 were grown in 1882, and shed in April, 1883, and so on with the others, until in August, 1886, the animal was killed with its newly-grown sixth pair of antlers. This series shows not only that the antlers on the two sides are not always symmetrical, but also that the tynes on the same side do not necessarily resemble those of the preceding or succeeding years. No. 3 of the right side, for example, want the second or bez-tyne, and the same tyne is only indicated by a slight projection in No. 2 on the left side. No. 5 has three tynes on the crown or top of the beam on the right side, and but two on the left; in No. 6 these numbers are reversed.

An interesting parallel has been shown here, as in so many other cases, between the development of the race and that of the individual. The earliest known forms of deer, those of the Lower Miocene, had no antlers, as in the young of existing species. The deer of the Middle Miocene had simple antlers, with not more than two branches, as in many existing deer of the second year. Species occur in the Upper Miocene with three branches to the antlers; but it was not till the Upper Pliocene and Pleistocene times that deer were met with having antlers developed with that luxuriance of growth and beauty of form characteristic of some of the existing species in a perfectly adult state.

Among recent Cervidæ antlers are wanting in the musk-deer (*Moschus moschiferus*) and the Chinese water-deer (*Hydropotes inermis*), but their absence in both these forms is compensated by large canine tusks in the male animal. In the reindeer (*Tarandus rangifer*) alone the female carries antlers as well as the male; in all other deer they are present in the male only.

A CHAPTER ON PHOTO-MICROGRAPHY.

THE art of taking pictures of objects under the microscope by means of photography has been generally regarded as beyond the scope of the ordinary microscopist. In the first place the cost of the apparatus is considerable; the ordinary "photo-micrographic camera," being set down in the optician's list at prices varying from £7 to £10, and this is exclusive of plates, chemicals, and all those other articles which form the equipment of an ordinary photographer. In the second place, comparatively few men have that competent knowledge of both photography and microscopy which the union of the two sciences demands.

But while few have this two-fold knowledge themselves, there cannot be many microscopists who have not a friend who photographs, and these two may co-operate, and without purchasing any special apparatus obtain very fair results. The writer of this paper is a microscopist of some experience, but has little knowledge of photography; but working with two photographers who are quite unskilled in microscopy, the joint union has produced some very respectable photo-micrographs.

We propose then to narrate the process by which the writer, together with two photographic friends—Mr. P. L. Foster, and Mr. R. H. Tahourdin—obtained the photographs enclosed.

Our apparatus was of the simplest—A "Star" microscope by Messrs. Beck (with rack and pinion coarse adjustment), and an ordinary camera by the Stereoscopic Company. (We may here remark, that the cheapest form of camera would do equally well, as no use is made of the lens.) The light used was that of a small paraffin microscope lamp, attached, as usual, to a rod on which it could slide up and down.

The actual process is as follows:—

Remove the lens from the camera, place the microscope in a horizontal position, and place the eye-piece end of the microscope about half an inch inside the hole of the camera. (In some books it is recommended to remove the eye-piece, but we found that we got a better image when it was left in.) Cut out a circle in a sheet of black cardboard so that the tube of the microscope fits tightly into it, and let the sheet be of such a size as to more than cover the lens-hole of the camera. Now slide this along the tube until it reaches the eye-piece; it will then make the camera perfectly light-tight. As an extra precaution, wrap a space focussing cloth round the whole. Remove the ground glass of the camera and make sure (1) That no light enters the camera except through the eye-hole; (2) That the eye-hole is exactly in the centre of the lens aperture; then replace the ground glass screen.

Screw the substage condenser into the fitting of the microscope, and place lamp behind it, interposing a bull's-eye condenser between the lamp-flame and the substage condenser. Focus these condensers and move the lamp, until the object to be photographed is as brilliantly illuminated as possible.

An inch objective is perhaps the best for general use. Focus the object very carefully on the ground glass screen, altering the focus by means of the microscope coarse and fine adjustments, and not by moving the camera. Examine the image formed under a magnifying lens, and make sure it is as perfect as possible. Then put in the dark slide. With the inch power the exposure is best made by capping the object glass in the same way as is done with the ordinary lens; in the employment of higher powers exposure must be made by means of the shutter. For the duration of the exposure no certain rule can be given; much depends on the luminosity of the flame, on the thickness and colour of the object; but under the inch power one to two minutes is about right. A photometer will be of great service to determine the exact exposure.

The negative is then developed and the print obtained in the ordinary way; the pyrogallic acid developer is perhaps preferable for this work to the ferrous oxalate, since it permits greater laxity in the matter of over or under exposure.

Enclosed I send two half-plate photographs taken in the manner described above; the one of the head of a female gnat, and the second of a double stained-section of the plane wood; both of my own mounting.

I shall be most happy to give any further information on the subject to any who care to pursue this fascinating union of the camera and microscope.

A. C. DEANE.

Wellington College, Wokingham.

ASTRONOMY.

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

AT the last meeting of the Royal Astronomical Society, it was stated that the director of the Lick Observatory had presented to the Society a photograph of the moon more than two feet in diameter, in which the lunar details are very sharply defined. The image of the moon, of which this photograph is an enlargement, was taken with the great Lick telescope.

A paper by Mr. J. Roberts was read on photographs he has taken of the great nebulæ in Andromeda, which he considers afford striking evidence of the truth of Laplace's nebulæ hypothesis. Mr. Roberts considers that the small nebulæ H 44 and H 55 have both been thrown off by the great nebulæ, and may be looked on as planetary nebulæ in course of condensation. Mr. Frank McLean read a paper on some photographs of the red end of the solar spectrum from the D to the A line, about one half of the visible spectrum. The photograph is in seven sections, each about fifteen inches long. They were taken with a refraction grating having 17,300 lines in the inch, and are the second order of the spectra.

Messrs. Alvan Clark have undertaken to construct a telescope for the United States Government with an object-glass forty-two inches in diameter. This telescope is to be erected in Southern California, and is expected to be completed in about five years.

Accounts from San Francisco of the total solar eclipse of January 1st, state that it was successfully observed at Brass Valley and many other stations. It would require far more space than is at my disposal to give a brief account of the various observations, but I may say that Professor Toll took a number of fine photographs of the eclipsed sun, showing the corona extending from ten to twelve degrees.

Twenty-five negatives were taken at Winnipeg to measure the brightness of the corona and its surroundings.

At the Lick Observatory successful observations were made, and several photographs were taken. The thermometer fell at different places from seven to ten degrees during totality.

There will be no occultation of interest in February.

At the beginning of February Ursa Major, Lynx, Cancer, and part of Hydra will be on the meridian about midnight.

Mercury will set on the 1st at 6.32 P.M., on the 15th at 5.13 P.M.

Venus will be an evening star, setting on the 1st at 9.10 P.M. and on the 28th at 10.8 P.M.

Mars will be an evening star, setting on the 1st at 8.4 P.M. and on the 28th at 8.17 P.M.

Jupiter will rise on the 1st about 5.13 A.M. and on the 28th at 3.48 A.M.

Saturn will rise on the 1st at 4.58 P.M., and on the 3rd he will rise about sunset; on the 12th he will set about sunrise.

EARTHWORMS.—Is there more than one British species? The large ones seem very different from the darker coloured and more cylindrical small worms, I have seen the latter performing the functions of the adult. They are said to be oviparous, how are the eggs to be found and recognised?—*W. A. Gain.*

THE WOOD ANTS (*FORMICA RUFA*).

By J. Bowman.

I REMEMBER well, how, that years ago, when I was merely a boy, one of the most pleasant walks in the neighbourhood of my native town, Morpeth, was always a source of wonder to me, owing to its being frequented by thousands of wood ants, many of whom were every day crushed to death by the feet of passers-by, the pedestrian being in most cases unconscious of the fact that his track, like the track of the car of Juggernaut, was made prominent by the dead bodies of his victims, though, as a matter of fact, he was in no wise to blame; it being a matter of extreme difficulty, nay, of absolute impossibility to put one's feet down without grinding the life out of some poor unwary ant. They were present in their thousands, and amongst them there were no lazy, basking, idlers, but each and every one seemed to emulate his neighbours, in their business-like appearance as they hurried to and fro in endless trains.

My ambition was, as I became acquainted with them, and their huge heaped-up nests, to secure one of these latter with its occupants, and to study more closely the habits of these busy little creatures.

This seemed to me to be a rather difficult undertaking, and in truth I have not personally attempted it, as yet.

About two years ago, however, it occurred to my mind that I had not yet attained the wish of my boyhood as a naturalist—a wood ants' nest; and accordingly I wrote to a Mr. Walton, a friend of mine at that time living in Morpeth, requesting him, if possible, to secure me one and to send it on to me by parcels post. This my friend essayed to do, and his experience of hunting ants' nest, as he afterwards related it to me, was a most amusing one.

He set off early one morning, armed with a stout cardboard box, and duly arrived at his destination, somewhere in the Bothal Woods. There was the ants' nest in perfect condition literally swarming with its inhabitants. He carefully picked his way towards the nest, and when within a few feet of it he chanced to look down at his feet, he was horrified to see that his boots and the bottom part of his trousers were completely covered with ants. Having an unpleasant remembrance of being at one time the victim of an ant's bite, and that ant being only one of the lesser species, he quickly beat a retreat, and was soon engaged in getting rid of the would-be explorers.

He was not to be entirely balked by such puny antagonists, and after carefully tying his trousers at the bottoms, so as to preclude the possibility of any adventurous ant getting up the inside, he once more advanced towards the nest, and this time succeeded in getting near enough to fill his box full of ants and the nest material together. He immediately conveyed his prize down to the path from which the nest was a few yards distant; but, alas! on reaching it, he found that in his hurry he had neglected to fasten the box-lid securely, and the ants had swarmed out in all directions. With the indomitable perseverance of a true Briton, he once more returned to the charge, and this time he succeeded in securing and retaining a goodly number of ants, and also of nest material, which he fastened up securely, and, as quickly as possible, consigned to the care of the post-office officials, and in due course I received the precious parcel.

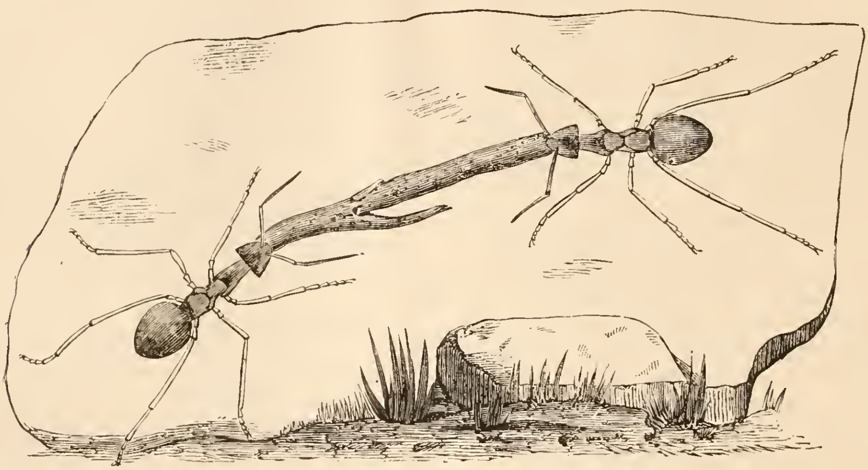

Fig. 19.—Two members of the *F. rufa* family engaged in pulling against each other for the possession of a twig.

One of the instructions which I most carefully impressed upon his mind, he unfortunately neglected to fulfil; that was, to be sure and enclose as many of the pupæ as he could find, and thus my nest was without one of its most essential characters.

After receiving the box and its contents, the first difficulty which I experienced was in transferring the ants from the box to a larvæ-breeding cage, whereby I could gain a better insight to their movements. This difficulty I surmounted by placing the box containing the ants on a stand situated in the centre of a tin full of water, and then transferring its contents to the larvæ-cage by means of a spoon. Of course, any of the ants chancing to drop from the spoon fell into the water and were easily captured.

As a natural sequence of the rude behaviour to which they had been subjected, the nest and its occupants were in a state of considerable confusion, and it was difficult to believe that such apparently puny creatures could create cosmos out of the state of chaos presented to my view.

The natural instinct of the insect, soon, however, asserted itself, and a few minutes after the time of their transfer the ants were all busily engaged in dragging about the pieces of twigs and leaves of which their nest is principally composed.

It was some time before they pitched upon the exact situation for their new abode, and, so far as I could judge, they seemed to over-estimate the quantity of their materials, for many of them crept up the sides of the cage and attached pieces of twig, far above the level to which the top of their nest could attain. These pieces they seemed to fix to the side by means of a gummy secretion, and they never afterwards attempted to remove them.

The nest soon began to assume its natural form as the busy builders applied their combined strength to the task, and everything in the shape of food dropped into the cage speedily disappeared into the cavity which formed the entrance to the chambers of the nest.

On one occasion I dropped into the cage a piece of bread of such large dimensions that, after repeated efforts, the ants found it was impossible to remove it, and I felt certain that they would have to give up their efforts, and was just about to remove it from the cage when I was called away. I did not see the nest again till next day, and when I did so, I found that they had entirely covered up the bread with material from the nest. In order to do this they must certainly have worked pretty nearly all the night, as the time when I had last seen them, and when the bread was at no part covered, was nine o'clock at night and was then almost dark. I saw them again immediately after rising, and then the bread was entirely covered. Now to show the prodigiousness of their work, I took the following proportions:—

Length of the wood-ant (*F. rufa*) three-eighths of an inch, measurement of bread was three inches by two inches, whilst the average length of the twigs used in covering $1\frac{1}{4}$ inches, and some even as long again.

Many of the twigs would be conveyed to their position by more than one ant, but this would be seldom, and even in most cases where this was done it would not tend to lessen the labour, for I have often noticed, that if at any time the wood ant showed any lack of reasoning power it was when two or more of them were endeavouring to drag the same object to their nest, as almost invariably in those cases, they each endeavoured to pull in opposite directions, and thus all progress was retarded.

Artificial light seemed to have attractions for them, much in the same way as it has attractions for night-flying moths, and whenever I approached them with a lighted candle or taper, or indeed whenever the gas was lighted far above them, they would gather in great numbers on the glass window of the cage, and remain there until the light was put out.

I have noticed too that their sense of hearing was very acute, and on the occasion of any uncommon noise in my room, they would, to an ant, rise on their two hind legs in a menacing attitude, as though awaiting the approach of an enemy.

I was not, unfortunately, permitted to keep my ants for any great length of time, for soon after getting them I was obliged to have my holidays out of town, and when I returned my ants were gone, and how much I mourned their loss no one can tell. I have not to this day learned their true fate, though I have long suspected that some of my nervously constituted friends were the cause of their disappearance, as I had heard one or two of them express their fears, in an aside, that in case of their escape from the cage, the ants would prove decidedly unpleasant neighbours.

I did not intend to allow this comparative failure to deter me from further observation in the direction of Heterogyna, and accordingly the following summer when staying in Morpeth I bent my steps in the direction of the Bothal Woods, where I knew I should find *F. rufa* in abundance.

The walk leading through these woods will class with any for beauty of scenery, a freshly delightful picture being disclosed to view every few yards of the journey; pictures of nature which hold spell-bound even the veterans of the paint-brush and palette. On the occasion of my visit in search of *F. rufa*, as I was wandering along by the side of the river, my curiosity was aroused by seeing an unusual commotion in the water, and on creeping nearer to ascertain what it was, I was delighted to see that an otter was fishing in the waters, and that its frequent dives after fish had caused the commotion which had placed my inquisitive senses on the *qui vive*.

I stood silent for a few moments, and presently its head appeared above water; the head disappeared, and, immediately following, part of its back came to view, that too, disappeared beneath the water, and I knew that it had gone in search of some luckless trout. I was right; in a few moments it was back to the surface again grasping a large trout in its jaws. It swam swiftly to shore and proceeded to devour its captive, and I left it to enjoy its rich feast in peace.

This, however is a digression for which I must apologise, and having done so I hasten back to my gossip about my favourite Formica.

I was first made aware of the fact that I was approaching a colony, by seeing a group of ants gathered round the dead body of one of their fellows. The living ants, by the action of their antennæ, seemed to be holding a consultation over their dead comrade, and after due consultation, the corpse was seized by one of them and carried off to the nest.

As I got nearer, I found that the approaches to the ant-hill are like the approaches to a great city, well-beaten tracks on which the population were travelling to and from the nest in endless trains.

Even before I had optical revelation as to the exact whereabouts of the hillock, I was quite certain that I was on the right road, a beaten track about three inches wide which was densely crowded with ants, some homeward bound, while others were making their way outwards evidently in search of provender.

I noticed too that up and down the tree trunks in close proximity to the nest, trains of ants were moving, always confining themselves to a space about three inches across, until they got amongst the branches, and then they scattered here and there in search of flies or insects of any description: and that their captures were plentiful, was plainly seen by the great number of victims which were being dragged down the trunk.

The day previous to my visit having been a very wet one, the upper part of the nest appeared quite sodden, and being curious to find how far into the nest the rain had penetrated, I turned over the material with my stick, and found that although the rain had been coming down for something like ten hours at a stretch it had not penetrated more than two inches, and in the chambers below that depth the pupæ, or ant-eggs as they are sometimes called, were snugly ensconced, "dry as a match-stick," as they say here in the north. The wood ants appear to be unerring weather prophets, for long before the appearance of rain they know of its coming, and carry their embryo children down out of harm's way. In fine, warm weather, the pupæ will be found close to the surface; and if one should lay them bare by removing the nest material, the first care of the adult ants is to seize them and carry them away into safety.

The sense of hearing in *F. rufa* was here again proved to me, for on clapping my hands loudly numbers of them swarmed from the nest, and creeping up the long grass stood in a defiant position as if expecting the approach of an enemy; although possibly they might feel as much scared as the inhabitants of a volcanic country, after the first shock of an earthquake.

Having given a brief and, perhaps, a weak description of a portion of the outside life of my favourites, I shall here leave my readers, promising to trouble them again, by the permission of our worthy Editor, with a few observations on the ants' mode of building, and their life inside their home.

Havelock House, Sunderland.

GOSSIP ON CURRENT TOPICS.

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

VANDAL NATURALISTS.—Collectors may be useful contributors to science, or they may be quite the contrary. In some cases the collecting mania is merely a modification of the morbid instinct of the miser, the greed of possessing and hoarding. When thus manifested and applied to botanical or zoological rarities, serious mischief is perpetrated. The true scientific botanist who comes upon the habitat of a rare plant and desires a specimen, takes the utmost pains to obtain such specimen in such a manner that shall do the smallest possible amount of mischief as regards the maintenance and future propagation of the plant in its own chosen abode. The collecting miser grabs every stalk and root he can reach, exulting in the destruction which will increase the rarity of his own specimens.

I was present at an annual conversazione of a North Country Field Club, where a very large collection of birds' eggs were exhibited by a collector who ardently expected much admiration; but the chairman, a true naturalist, treated both collection and collector with stern justice by publicly and severely reprimanding the self-convicted Vandal, who was known in the neighbourhood as a ruthless nest-robber and exterminator of rare birds. A genuine naturalist requiring a specimen for scientific purposes would take but one egg from the nest, and do this in such a manner as not to scare the parent birds, nor prevent them from hatching and rearing the rest.

These remarks are suggested by a report of Professor Hillhouse on behalf of the Conference of Corresponding Societies to the British Association, section D. Referring to the disappearance of Native plants from their local habitats in Scotland, he states the melancholy fact, that eighty-five flowers are "practically extinct," and especially notes that the white water-lily (*Nymphæa alba*) has been almost exterminated from the lochs about Dumfries; and that the name of the delinquent who committed the ravages has been brought before the local Natural History Society. By means of an appeal from the Society to the owners, the exterminator has been warned off in time.

Other cases of extermination are mentioned, inincluding those caused by the abuse of exchanging clubs, which offer strong temptations to ruthless botanical vandalism.

True and Spurious Technical Education.—In Mr. R. Bannister's first Cantor Lecture on our milk, butter, and cheese supply, recently delivered before the Society of Arts, the following facts are stated: Denmark, which twenty years ago exported bad butter of £420,000 annual value, last year exported excellent butter of the value of £2,600,000 which represents a sixfold increase. The improvement in quality (and consequent demand for quantity) has been mainly wrought by a judicious expenditure of a sum not exceeding £11,000 a year in providing the country with dairy schools, where the pupils are trained in the theory and practice of dairy work, and are taught to make butter and cheese of the best quality during all seasons of the year.

These facts are eloquent appeals for technical education, properly so called, which is something very different from that which is advocated by certain "professors and college men," who having added modern science to their classical attainments are condescendingly willing, in obedience to the law of demand and supply, to transfer a certain portion of their university culture to the neglected artizan.

Such repetition of college text-book science is very different from the technical education that has been supplied with such admirable results to the dairy farmers of Denmark, and equally different from that which is demanded by our artizans. It is different from the technical education that is so well supplied in this country to another and very important class—our medical students.

In medical schools, the technical professors are practical physicians and practical surgeons. What would become of a medical school in which these professors were mere bachelors or masters of arts, or bachelors or masters of science, or wranglers, or fellows, however distinguished, of their colleges, but without any practical experience in the actual treatment of the sick and injured. In such schools there are, of course, the "preliminary scientific" classes, and the preliminary scientific examinations in chemistry, botany, natural history &c., but this is not the technical education of the student, and does not bear that name. The technical education, properly so called, follows this.

A corresponding distinction is demanded in the education of artizans and men of commerce. Let the "professors and college men" do their part of the work, but let us have no pedantic assumption of its completeness or superiority. It is merely subordinate and comparatively easy. All they are capable of teaching is within reach of all; the difficulty of technical education comes after their work is done. It is the difficulty of finding men with practical technical knowledge, who can teach what they know on a scientific basis. Good work is being done in the less pretentious classes of the Polytechnic and other similar institutions, where theory and practice are firmly welded together; but, on the other side, we have some sad examples of what I am justified in designating as learned charlatanism, where mere college cram is offered for what it is not, and men devoid of technical knowledge are pretending to be technical teachers.

Besides the Danish dairy schools, I may refer to the horological universities of Switzerland, where highly skilled practical and scientific watchmakers are the leading professors, aided in subordinate capacity by ordinary "college men," who do the preliminary or introductory teaching. I emphatically repeat the word *subordinate*, knowing from long practical experience as a scientific teacher of artizans that, unless their preliminary scientific teaching is strictly subordinated to practical demands, it becomes worse than useless, it only disgusts those it pretends to teach, and drives them to the conclusion that pure science is dreamy, useless theorizing, that practical men should treat with contempt.

Electrical Superstitions.—The melancholy collapse of "The New York Electric Sugar Refining Company" is such a glaring *reductio ad absurdum* of the wild expectations of electric visionaries that it may do some good as a warning. "Shut your eyes and open your purses" was the cool demand of the promoters of this model company, and dupes were actually found so eager to do so that the 100-dollar shares were run up to 300, mostly in this country. The friend who was to have made the fortunes of these true believers refused to disclose his method, beyond telling them that he poured raw sugar into the top of his machine and electrified it somehow, when hocus pocus, presto, prestissimo! it ran out from the bottom fully refined. He told them that the machine was made and working; he supplied eye-witnesses who had seen it working; he had fully succeeded, was actually at work; all he required was that outside—especially this side—investors should share the enormous profit, and thereby relieve him of the burden of excessive riches.

The New York "Evening Sun" tells us that "just how many were interested in the scheme does not appear. They realized about 250,000 dollars." When "Mrs. Friend and all who had been connected with the company had disappeared," leaving word that they had "gone West," it was discovered that the "raw sugar" put into the top of the machine was "refined sugar chiefly in cubes," and that there was no electrical apparatus whatever.

I need not enter upon any further commercial particulars, as the above are quoted from a detailed account published in the "Times" of Jan. 5th, and will be well known before this is published, but I will improve the occasion by again pointing out the monstrous folly that so widely prevails, of regarding electricity as something more wonder-working, more mysterious than the other familiar energies of Nature, such as light, heat, or gravitation. It is far less potent than heat or light, far less mysterious and far less wonderful than gravitation.

The mystery of gravitation is absolute. No human being can form any approach to a thinkable idea of the nature of the link that binds our earth to the solar orb through a distance of nearly one hundred millions of miles, and which holds together the other and vastly greater orbs at distances a million and more times greater. We feel it operating perpetually on our own bodies, and yet can form no approximation to a rational idea of its mode of operation. Theories of an electric fluid or fluids, and of electric vibrations and undulations, have been attempted, and some are satisfied therewith; but the mystery of gravitation defies even the imaginative inventors of the universal all-pervading luminiferous "jelly."

THE LOW ANTARCTIC BAROMETER.—In a recent number of "Nature," Mr. Murphy asks, "Why in all the disquisitions on fluid equilibrium are the constant low barometric pressures in the Antarctic regions south of 60° neglected?" and he proceeds to explain them by the action of atmospheric currents.

It certainly is a very curious fact that, as a ship approaches the great icy Antarctic continent, the barometer behaves precisely as though it were sailing up hill by a very gradual incline, its mean height diminishing as the ship comes nearer and nearer to the precipice wall of ice which, so far as we know, presents all around an impenetrable barrier to the mountain mass which surrounds and possibly caps the southern pole of the earth.

I believe that the ship actually does sail up hill, and that for a very simple physical reason. As everybody knows, gravitation acts with a force varying inversely with the square of the distance between the mutually acting bodies. Such a mass of lofty mountain land and ice as that around the south pole must pull at the ocean outside and be pulled thereby, but the mountains cannot move towards the waters of the ocean, while they, like Mahomet, are free to go to the mountain. If they do so, the order of their going will demonstrably be such that their surface will form an inclined plane sloping upwards towards the great protuberance.

I am aware that certain mathematicians have estimated the amount of displacement of the centre of gravity of the earth due to such protuberant masses of land, and have assumed that the only result as regards ocean-level must be, that the ocean will arrange itself around this altered centre. This, although correct as regards the mean distribution of the ocean, is fallacious as applied locally, as in reference to the present question; it is fallacious because it only measures the force of gravitation of the given mass of land, at its mean distance from the mass of the ocean generally, *i.e.* from the centre of gravity of the whole ocean; but the oceanic matter immediately surrounding the Antarctic continent is at a shorter distance from this gravitating mass than is the general mass of the ocean, and as we are dealing with a mobile fluid, the scholastic formulæ concerning the movement of the whole mass of a rigid body with that of its centre of mass do not apply. If a body were resting on a delicate spring balance, and a great mass of lead were held just above it, the downward gravitation of the body would be sensibly diminished if the mass of lead weighed many tons, but the effect of the mass of lead upon the position of the centre of gravity of the earth would be immeasurably, I may say inconceivably, small.

If I am right in the above, the mean height of the barometer at the head of the Adriatic and near the northernmost shore of the Gulf of Genoa and the Riviera should be less than on the Egyptian boundary of the Mediterranean; it should also be lower on the shores of Peru than on those of Brazil, as the northern termination of the Mediterranean approaches the foot of the Alps, and at Peru the ocean is similarly near to the foot of the Andes, while at the Brazilian coast, as on that of Egypt, there is a great stretch of low land between the sea and the inland mountain masses. The barometer should fall as we sail towards the northern Mediterranean shores, and as we approach from the west to the eastern coast of South America. An *experimentum crucis* may thus be applied to this question.

GOSSIP ABOUT FORAMINIFERA.

PART II.

By EDWARD H. ROBERTSON.

STILL another group, the Helicostegidæ, presents us with some of the most exquisitely beautiful forms ever presented in shells. Commencing by a small central chamber the subsequent chambers are arranged in a spiral form, each cell added being larger than that preceding it, so as to give the entire shell the aspect of an Ammonite, or other spiral shell.

This group consists of the two families, Nauti-

Fig. 20.—*Peneroplis.*

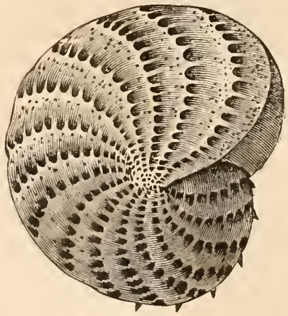

Fig. 21.—*Polystomella crispa* (after Carpenter).

loidæ and Turbonoidæ—the first including those in which the successive whorls all lie in the same plane, so that the shell is equilateral, like the Nautili and Ammonites—whilst the second contains those in which the spiral passes obliquely round an axis, so that the shell becomes "inequilateral," like that of a snail. Examples of these two methods of growth are well shown in Figs. 21 and 23.

It is in these these two families that we find the Foraminifera so closely resembling in their exterior aspect the beautiful chambered shells of the Nautilus, the Argonaut, and the fossil Ammonite, that little wonder that the earlier naturalists actually classed them together, whereas, indeed, they are as widely separated as are the shrubs and flowers of the vegetable kingdom from the humble nostoc. The inhabitants of the former—creatures highly organised—dwell only in the last-formed and largest chamber, united with those previously inhabited by a tube or siphon — whereas the Foraminifera occupies every chamber, communication between each being afforded

Fig. 22.—Portion of a slide of Foraminifera, from Sponge of Commerce.

by the perforations (foramina) in the septa. Figs. 23 and 24 exhibit characteristic specimens of this group.

Then, again, we have a group in which the segments are added in concentric rings, each surrounding its predecessors. As an example may be mentioned the Orbitolites.

Some of these minute shells are opaque, or some opaque and homogeneous, some are arenaceous, *i.e.* composed of particles of sand cemented by shell material; others again are exquisitely hyaline, *i.e.* glass-like, and tubuliferous.

The minute delicacy of structure frequently presented in these beautiful shells is well seen in the Operculina, each chamber being separated from its neighbours by double walls containing tubes, which send off ramifications of smaller, which form a network for circulation of fluid. The margin of the shell is formed by a tube or siphon, which is the medium of communication between the chambers.

The sieve-like structure frequently presented by the external shell is well seen in the beautiful Rosalina (Fig. 23), and in a most exquisite form I rarely meet with in Sponge sand (Fig. 24). This latter is the most beautiful that I have seen, the steel-blue tint not impairing its transparency, and the margin of each of the foramina appearing golden, even when viewed under a tolerably high power.

Notwithstanding the simplicity of their structure—if structure it can be called—these creatures nevertheless possess some capacity of voluntary movement.

Place a living one in a vessel of water and examine it with a hand magnifier. See how the tiny thing emits, through the minute orifices in its habitation, sarcode threads of wondrous tenuity, which adhere to the sides of the vessel and seem to feel their way. Is it seeming only? Now and again these threads, or pseudopodia, come into contact, and, lo! as one thread of liquid glue would coalesce with another, so these life-endowed jelly threads immediately coalesce, sometimes forming lakelets of sarcode; the threads behind are gradually withdrawn, and by means of the foremost the creature slowly—painfully slow, so it appears to us, we who so often erroneously associate rapidity of motion with joy, and slowness with pain—moves forward, and so the process is again and again repeated. Marvel of marvels in this world of wonders, that a globule of jelly, destitute of any external integument, should thus put forth such attenuated filaments, the atoms of which not only cohere, but serve the double office of organs of locomotion and of cables mooring it to its anchorage! Yet so it is; and the factor in this wonder is that mystery of mysteries—that principle which we call life, the secret of which we are ever striving to penetrate, but which we, living in an age of electricity and steam, seem as far off from doing as were the sages who a hundred generations agone strove to fathom its profound depths.

Unendowed with the complex organisations of animals higher in the scale than themselves, these tiny things of beauty yet perform the varied functions of life efficiently, exercising a most important influence in Nature's economy.

When the naturalist contemplates the labours of

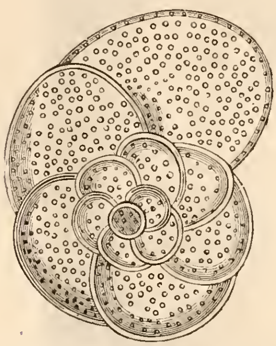

Fig 23.—Discorbina globularis (*Rosalina varians*, Schultze), after Carpenter.

these inconspicuous organisms, he is overwhelmed with a feeling of wonder that, in the far past, they should have contributed more than any other animated creature to the formation of the solid crust of the earth. In deep abysses of the ocean they still constitute almost the only material of its oozy bed, and possibly—nay, may it not be said probably?—they are yet building up, beneath the waters, continents for the habitation of future generations.

Whole ranges of mountains in various parts of the world, are composed of these tiny creatures, and vast deposits of them, spreading in the aggregate over many thousands of square miles, have been traced in Hindostan, Egypt, the Holy Land, and Arabia. These minute organisms constitute the mass of that pure white substance which has given—so it is said—its name of Albion (Alba, white) to Britain's happy land; and how inconceivably vast these hosts, when it is remembered that this formation alone once extended in a north-westerly and south-easterly direction from Ireland to the Crimea—a distance of upwards of 1100 miles; its breadth from the south of Sweden to the south of Bordeaux being (allowing for breaks caused by denudation) about 840 miles; its thickness is this country averaging from 600 to 800 feet.

Imagine, if you can, reader, the myriads whose remains compose a single cubic foot of chalk, then endeavour to form some conception of the myriads of myriads that compose 800 cubic feet—and then—But there the thought is overwhelming, "in midway flight even imagination tires."

Those who desire to examine and preserve these beautiful objects need experience no difficulty in obtaining them, as they abound in the waters of the ocean in every part of the globe, existing in the greatest profusion in the seas of the warmest regions of the earth. They may be found in great abundance on the English coast, in the ooze of oyster beds, in

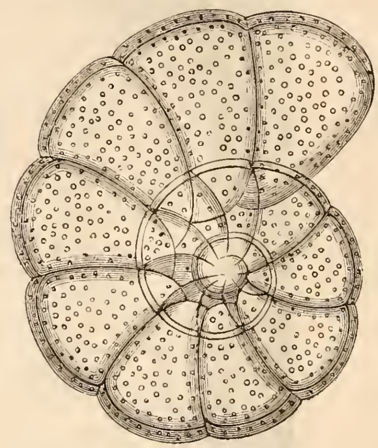

Fig. 24.—Beautiful specimen, probably a Rotalia, viewed as a transparent object (× 35).

the roots of the Laminaria, and on the zoophyte-clothed rocks, and frequently occur in vast numbers in the sand of the sea shore. I have sometimes collected myriads of Miliola from the hollows of ripple-marked sand in the neighbourhood of Margate—and these, with one or two of the nautiloid forms, are extremely abundant at Ventor, I.W., and other places, occurring mostly in the sand found about the roots of Laminaria. Although numerically abundant, the variety of forms found on the English coast is not great, and the microscopist will do well to search diligently the surface of uncleaned foreign shells and seaweed. But his very mine of foraminiferous wealth exists in the sand which occurs in the sponge of commerce; a single pound of this will yield him vast numbers of the most beautiful forms. They may be separated from the sand by repeated washings, but it is only by the exercise of almost infinite patience that they can be entirely freed from it and particles of foreign matter. This once accomplished they may be passed through fine meshed sieves of wire or muslin, so that the large may be separated from the smaller kinds. Before sifting, however (indeed, before I have entirely freed them from the sand, &c.), I boil them for some few minutes in water to which has been added a small quantity of *liquor potassæ*—say a tablespoonful in a quart of water—if too strong it will disintegrate the shells. Allowing time for the subsidence of the minutest forms, I carefully pour off the discoloured water, and add a fresh portion, repeating the process until the water comes off perfectly clear, when the residue may be thoroughly dried in an oven.

A little of this white powder at a time may then be thrown into a glass vessel of water, the lighter forms of Foraminifera will float, and may be collected with a feather, the bulk of the material will have subsided, and, after pouring off the water, it must again be dried, and the process again and again repeated, until none but the heaviest forms sink with the sand; these also may be gathered by stirring the contents of the vessel, and after allowing the solid particles to subside pouring off the water without disturbing the sediment, which should be gently skimmed, the skimmings set aside, and this process, also, again and again repeated, until foraminifera almost entirely free from foreign matter are ultimately obtained. The whole process is a most tedious one, but, if properly performed, the result will be in every way satisfactory. I recently prepared about thirty pounds of this "sponge sand," obtaining as the fruit of my patient labour about—"Two or three pounds of Foraminifera!" perhaps some eager microscopist will exclaim. Nay, not so; but about a piled-up teaspoonful of exquisite shells, the gathering consisting of a very large proportion of all the known forms. Fig. 22 exhibits a small portion of a slide of medium sized shells, viewed as transparent objects with a two-inch objective. Higher powers, of course, may be employed with advantage.

After mounting some hundred or so slides for exchange, I was still able to supply my micro-friends with unmounted material.

Although a series of slides would exhibit many of the rarest forms, no single mount will do so, even though it may contain many hundreds, or even thousands, as mine do. I therefore keep in my collection not less than a score of slides, some exhibiting rare forms that do not occur in others.

When preserved by the microscopist for examination as beautiful objects, I consider that no method of mounting surpasses that of immersion in Canada balsam, since, if properly prepared, the structure of the shell, the foramina, the septa or divisions of the chambers, are all made distinctly visible, and they can still be viewed as opaque objects if the light be concentrated upon them, when they present an exquisitely opalescent appearance. Deep cells containing a quantity of the loose material may also be added to the cabinet.

For scientific examination it will be necessary to view them under every possible condition and mode of illumination and preparation, in order to arrive at a due conception of their form, and the disposition of the openings; and a student will, doubtless, find it necessary to isolate the various forms for this purpose—a tedious process, but one that will well reward his patience.

Great care is requisite in preparing these tiny shells for their final "mount," since the several chambers often most obstinately, for a length of time, resist every attempt to dislodge the included air. Most persons will consider air bubbles a great disfigurement, and the preparer should invariably expel the whole of them before offering his duplicates for exchange.

Once mounted, I class them according to their size, usually numbering from 1 to 6. No. 1 contains the largest forms, No. 6 the smallest.

The fossil forms from the chalk may be obtained by repeated washings, and I venture to think that the method suggested by myself in SCIENCE-GOSSIP, in February, 1867, will yield the microscopist as fair a result as any with which I am acquainted.

Davies on Mounting Micro-objects describes other methods, which some may prefer.

These shells commonly occur in the flints of the chalk formation, and those curious bodies the Coscinopora, once believed to be small sponges, are now classed by Dr. Carpenter amongst the Foraminifera. Polished sections of flint often exhibit very beautiful forms. The figures which illustrate this paper will convey a far better notion of the varied forms of these beautiful organisms than any written description would do.

NOTES ON NEW BOOKS.

FOSSILS OF THE BRITISH ISLANDS Stratigraphically and Zoologically Arranged, by Robert Etheridge, F.R.S., &c. (Oxford: The Clarendon Press). Many years ago, the late Professor Morris brought out a "Catalogue of British Fossils," which proved of great service to geologists. But the present work is based on a much more extensive scale. The volume before us deals only with the fossils of the Palæozoic formations. Nevertheless, it runs to 468 pp. quarto of closely-printed matter. It is indeed a gigantic labour, and one which no other man than Mr. Etheridge would have found either the knowledge or the patience to have given to it. In his long and useful position as Palæontologist to the Geological Survey, he doubtless had opportunities for dealing with a work of the present description possessed by no other man. Some idea of the labour involved may be gathered from the fact, that it has been in hand the last twenty-four years. 1,588 genera, and 6,200 species of fossils are described, ranging from the Cambrian to the Permian formation, and references are made to all the works in which they have been figured. The work is beautifully printed, as all the Clarendon Press works are; and it is a high credit to the delegates of the Oxford University Press that their liberality has enabled a valuable work like the present to be given to the scientific world.

The Eulogy of Richard Jefferies, by Walter Besant (London: Chatto & Windus). This excellently-printed and handsomely-got-up book is as idyllic and dramatic as any of the world-famed novels of which Mr. Besant is the author. Richard Jefferies was unknown to fame a few years ago. Then suddenly it was evident a new star had arisen above the horizon. Articles appeared, and even books, such as "Wild Life in a Southern County," which displayed natural history knowledge of large range, observation almost photographic in its accuracy, a sympathetic love for the objects he described, not even excelled by Gilbert White, and a power of description more than equal to that of Thoreau or of John Burrowes, the famous author of "Wake Robin," &c. Indeed, Richard Jefferies' books have added a new and additionally rich element to our already surpassingly rich English literature. Poor Richard Jefferies' life was one both of suffering and poverty; it was only wealthy in its deep and reverential love of nature. He attempted novel writing, failed in his plots and characters, although he succeeded in their realistic natural settings. It is as a natural-history writer and observer he will be longest and best known. Besant's life of him is a most charming volume; for although Besant never knew Jefferies personally, he had the keenest interest in and sympathy for his writings.

The Building of the British Isles, by A. J. Jukes-Browne (London: George Bell & Sons). It is now a fact well known to all geologists that continents, and even islands like our own, have had a geographical evolution. You can begin with the oldest, and gradually proceed to the newest formations. Mr. Jukes-Browne has already distinguished himself in geological literature by his well-known books on "Physical Geology," and "Historical Geology;" and now he meets the wants of students in another direction, in the admirable volume before us, wherein he deals with the physical conditions under which our islands were formed. This volume is, in short, a continuous series of geographical restorations, commencing with the Cambrian period, and extending to the present. These restorations are assisted by fifteen plates, or maps, representing the areas supposed to have been covered by sea during each geological period. The book is well written, and will sustain Mr. Jukes-Browne's reputation as a geological literary authority.

On the Senses, Instincts, and Intelligences of Animals, by Sir John Lubbock, Bart., F.R.S. (London: Kegan Paul & Co.). This is the sixty-fifth volume of the now famous "International Scientific Series." It deals with one of the most fascinating departments of modern physiological and psychological research and observation. The hard and fast lines between the two have recently been toned down into a kind of shadowy borderland. It hardly need be said that in the present work Sir John Lubbock dwells chiefly on his beloved insects; but he by no means confines himself to the Invertebrata. His book is a perfect cyclopædia for the general and even scientific reader, of all that is known on the subject up to date. We need hardly say that it is written with the lucidity and naturalness characteristic of all Sir John's popular writings. A list of 118 specially drawn illustrations help to make the text clear wherever necessary, and students will find the bibliography of works referred to in these pages a great help, as references to various authorities on the different subjects herein discussed.

The Folk-Lore of Plants, by T. F. Thistelton Dyer (London: Chatto & Windus). The author is already well and favourably known as an authority upon the increasingly interesting subject of Folk-lore. The old-world sayings and beliefs regarding plants are, perhaps, more voluminous than those concerning any other group of natural objects. Consequently within the last few years several works have appeared on the fascinating subject, amongst which the principal are those of the Rev. Hilderic-Friend and Mr. Richard Folkard. When we remember how the supposed virtues of plants have been associated not only with planetary influence, but also with medicine and witchcraft, as well as with hypothetical protection from diabolical influences, it cannot be wondered at that most of our common wild plants are linked with the hitherto unwritten history of the fears, hopes, thoughts, and beliefs of the unlettered masses of the people. Mr. Dyer's book is pre-eminently readable, and in its variety of treatment he covers a larger ground than any of his fellow-writers on the subject. This will be seen by the following headings of the chapters:—"Plant Life," "Primitive and Savage Notions respecting Plants," "Plant Worship," "Lightning Plants," "Plants in Witchcraft," "Plants in Demonology," "Plants in Fairy-Lore," "Love Charms," "Dream Plants," "Plants and the Weather," "Plant Proverbs," "Plants and their Ceremonial use," "Plant Names," "Plant Language," "Fabulous Plants," "Doctrine of Signatures," "Plants and the Calendar," "Sacred Plants," "Plant Superstitions," "Plants in Folk Medicine," "Plants and their Legendary History," "Mystic Plants."

Star Atlas, with Explanatory Texts, by Hermann J. Klein; translated and adapted for English readers by Edmund McClure, M.A. (London: S.P.C.K.). The increasing interest in astronomical observation is best shown by the establishment of provincial astronomical societies, of which that at Liverpool is a distinguished example. This is largely due to the abundant high class literature on the subject, of which the labours of the late Richard Proctor form no small element. His Star Maps have long been in use by amateur astronomers, which latter class has been largely called into existence by means of the highly-finished and low-priced telescopes turned out by John Browning and others. The "Star Atlas" before us contains eighteen maps, printed by E. A. Funke, of Leipsic. They are exquisite examples of star-mapping and star-grouping. The young astronomer possessed of a telescope, will find this atlas of the utmost service. The Rev. E. McClure's translation is exceedingly lucid and interesting.

Planetary and Stellar Studies, by John Ellard Gore (London: Roper & Drowley). A well-printed and attractively-got-up little volume, containing papers which the author has contributed to various periodicals, all of which, however, have been re-written and brought up to date, in addition to six chapters which have not appeared in print before. The illustrations are unusually good, and altogether we commend this work to the notice of all our readers interested in astronomy.

The Invisible Powers of Nature, by E. M. Calliard (London: John Murray). Perhaps there is no scientific subject more repellent to the popular mind than the study of physics; in spite of the education in the subject by the science classes under South Kensington. Nevertheless, there are few departments of research which present such fascinating or practical results. The author's title is an excellent one, and he works it out admirably, for it is the "invisible powers" of nature which affect us more than the "visible." So we have chapters on gravitation, molecular attraction, the properties of gases, liquids, and solids, heat, light, colour, sound, electricity, and magnetism. The writer tells us his book is intended for readers who love to hear of wonderful things.

Entomology for Beginners, by Dr. A. S. Packard (New York: Henry Holt & Co.). Dr. Packard is well known throughout the English-speaking countries of the world as one of the best of living economic entomologists, and this book cannot fail to add to his fame as a popular writer on this important subject. It is illustrated by nearly 300 excellent woodcuts, and the author tells us he intended it "for the use of young folks, fruit-growers, farmers, and gardeners." The work gives a full description of the structures of insects, their growth and metamorphosis, a synopsis of their classification, and of insect architecture. Then we have a useful chapter on insects injurious and beneficial to agriculture; and a lengthy but not less useful one, giving directions to all sorts of beginners for collecting, preserving, and rearing insects. Two other sections will be useful to microscopists and biologists generally, for they deal with the various methods of dissecting insects as well as mounting them whole and cutting sections of them for microscopic examination. Mention should also be made of the bibliography of the subject, which is one of the fullest we have yet come across. To complete the excellence of this admirable manual, there is a lengthy glossary, and a copious index.

The Bacon-Shakspeare Question, by C. Stopes (London: T. G. Johnson). The "fad" of Donelly's is over. The "cryptogram" went up like a rocket, and came down like the stick. Many Shakspearean scholars thought it beneath them to answer the man; but the authoress of this book very properly imagined that silence might be construed into consent. The consequence is a most valuable contribution to Shakspearean literature, a useful and ready manual to lovers of Shakspeare who have not time to answer cavillers, and a valuable help to the student of English literature. We cordially commend the work.

Land and Freshwater Shells, by J. W. Williams, J. W. Taylor, and W. Denison Roebuck (London: Swan Sonnenschein & Co.). This is one of the shilling volumes of the "Young Collector Series," and the names of the authors are a guarantee for its conchological accuracy and value. The illustrations (thirty-four in number) and descriptions are excellent. The "census" of the authenticated distribution of these mollusca at the end of the volume, will be found useful to others than "Young Collectors."

A Classified Index of Mr. G. W. Silver's Collection of New Zealand Birds, by Sir Walter L. Buller (London: E. A. Petherick). This very handsomely-got-up and well-printed volume, with descriptive notes of the New Zealand birds by the one ornithologist who has best and longest studied them — Sir W. L. Buller — is a useful contribution to geographical ornithology. The excellent woodcuts are mainly borrowed from Sir Walter's "Birds of New Zealand." Many of our readers will remember the birds described in this "Index," for they were exhibited at the "Colinderies," in the New Zealand Court in 1886.

A Class-Book of Elementary Chemistry, by W. W. Fisher, M.A. (Oxford: Clarendon Press). Altogether a superior manual, as one would expect from its publishing source. It exhibits an unusual teaching power, and a simplicity of classification rarely seen in elementary works on this important subject. Chemistry is now very properly becoming a part of regular school work, and we can recommend no better manual to the higher schools than this.

Truth for its own Sake: The Story of Charles Darwin (London: Swan Sonnenschein & Co.). This charming little book is written by Mr. W. Mawer, F.G.S., for "young people;" and the latter could not have a simpler or more interesting description of the great man than Mr. Mawer has given them.

Primer of Micro-Petrology, by W. Mawer (London: Office of "Life-Lore"). We are frequently asked by beginners to recommend them an elementary manual on this important and fascinating subject. Now we are able to do so by noting the cheap, well-written, and well-illustrated little book above-named.

Electric Bells and all about Them, by S. R. Bottone (London: Whittaker & Co.). The author of this useful little work is well known to all practical electricians; and those who desire to know the theory and practice of electric bells (and their number must be legion, considering the immense quantity of such bells in use) cannot do better than procure and read this book.

We are pleased to see that the following useful books (which were duly noticed in our columns when they appeared) have gained public approval by the demand for extra editions—*Elements of Mineralogy*, by F. Rutley (London: Murby). Third edition. *Nature's Fairy-Land*, by H. Worsley-Benison (London: Eliot Stock). Second edition.

The Playtime Naturalist, by Dr. J. E. Taylor, F.L.S., &c., editor of SCIENCE-GOSSIP (London: Chatto & Windus). Our relation with regard to this book does not allow of any comment upon it, except to say that it is well bound and printed, that the 366 illustrations come out very well, and that the price is 5*s*. Perhaps the editor of SCIENCE-GOSSIP would not mind the author of "The Playtime Naturalist" quoting the following from the preface, as showing the scope of the work:—"The writer has a liking for intelligent English lads, just as some people have for blue china and etchings. He even ventures to think the former are more interesting objects. And, as the writer was once a boy himself, and vividly remembers the never-to-be-forgotten rambles and observations of the objects surrounding us in the country; and, moreover, as he treasures up such reminiscences as the most pleasant and innocent of an active man's life, he thought he could not do better than enlist this younger generation in the same loves and pleasures. He has endeavoured to do his best for his human hobbies, that their lives may be richer and sweeter and more manly, for what he has introduced them to in the following pages."

OUR SCIENTIFIC DIRECTORY.

[The Editor will be obliged, if, for the benefit of his numerous readers, secretaries of scientific societies will send notices like the following, also place and time of meeting.]

BRISTOL Microscopical Society: Hon. Secretary, H. A. Francis.

Chichester and West Sussex Natural History and Microscopical Society: President, J. Anderson, jun.; Hon. Secretaries, A. Lloyd, F.C.S., F.E.S., Freeman W. Hunt.

City of London College Science Society: President, Sir John Lubbock, Bart., M.P., F.R.S., etc.; Hon. Secretaries, Mr. W. L. Fulcher, Mr. A. C. Young, F.C.S.

Geologists' Association: President, F. W. Rudler, F.G.S. (Hon. Sec. Anth. Inst.); Secretaries, John Fullerton, M.D., F.G.S., B. B. Woodward, F.G.S., F.R.M.S.

Hackney Microscopical and Natural History Society: President, M. C. Cooke, M.A., LL.D., A.L.S.; Hon. Secretaries, Collis Willmott, F.R.M.S., J. T. Powell.

Harrogate and District Naturalist and Scientific Society: President, John Naughton; Hon. Secretary, F. R. Fitzgerald.

Hertfordshire Natural History Society and Field Club: President, F. Maule Campbell, F.L.S., F.Z.S., F.R.M.S., F.E.S.; Hon. Secretaries, F. G. Lloyd, C. E. Shelly, B.A., M.B.

Leeds Geological Association: President, C. D. Hardcastle; Hon. Secretary, Samuel A. Adamson, F.G.S.

Liverpool Geological Society: President, Henry C. Beasley; Hon. Secretary, William Hewitt, B.Sc.

Penzance Natural History and Antiquarian Society: President, Thomas Cornish, Esq.; Secretary, George Fox Tregelles, Esq.

Wolverhampton Literary and Scientific Society: President, The Ven. F. W. Farrar, D.D. (Archdeacon of Westminster); Hon. Secretaries, Chas. R. Smith, Horace Percy Smith.

SCIENCE-GOSSIP.

MR. MATTIEU WILLIAMS has an interesting paper in "Scientific News" on the origin of petroleum and anthracite. He shows how, by slowly and moderately heating certain kinds of coal in an iron or brick retort, we shall obtain real petroleum and a porous coke which, on the application of pressure, becomes true anthracite. This, he shows, is the way in which it is formed in the coal-beds. Above and below the coal-seams are porous strata, through which the petroleum percolates and eventually rises to the surface like a water-spring. This accounts for its occurrence in Silurian, Devonian, and other non-coal-bearing regions.

DURING November and December, Dr. J. E. Taylor, Editor of SCIENCE-GOSSIP, delivered popular extemporaneous lectures (illustrated both with diagrams and lime-light views) on "Carnivorous Plants," "The Great Ice Age," "The Natural History of Fish," "The Natural History of the Amphibia and Reptiles," "Earthquakes and Volcanoes," and a "Naturalist's Holiday in Australia," to large audiences at Beccles, Hadleigh, the

Museum at Ipswich, the Midland Institutes Union at Birmingham, and the Literary and Philosophical Societies of York, Hull, and Wolverhampton.

Mr. G. H. Morton, jun., read a paper on "The Agreement of Colour Theories with Practical Experience," before the Art Congress, Liverpool. He dwells on the difference between the three primary colours of the artist and those of the physicist. Those of the former are the pigments red, yellow, and blue, while those of the latter are the sensations—red, green, and violet. The artist's red is of a violet hue, whilst the physicist's is a yellow-red, or orange. One set contains the mean between two colours of the other set; thus the violet of the physicist's set is obtained by mixing the red and blue of the artist's set, and the artist's blue by mixing together the physicist's red and green. The hue of a primary pigment is that one which will mix with the greatest number of colours and still retain its brightness. As a rule the hue of each primary pigment tends towards blue and away from red. This is explained by the vibratory theory of light. The primary blue pigment has more of a green than a violet hue. All colours are sensations caused by the action of light on the retina of the eye. Each of the three sets of nerves when excited, produces a colour, thus there is in reality no colour outside ourselves, and a pigment is not really a colour, but an object which causes the sensation of colour. From this we see that the physicist's are the true primary colours, viz. orange, green, and violet.

The Rev. Dr. Hind, rector of Honington, assisted by Professor Churchill Babington, D.D., F.L.S., rector of Cockfield, is about to bring out "The Flora of Suffolk," a Topographical enumeration of the plants of the county, showing the results of former observations and of the most recent researches. The work will contain an introductory chapter on the geology, climate, and meteorology of Suffolk, by Wheelton Hind, M.D., F.R.C.S., and will be published by Gurney and Jackson, successors to Van Voorst, Paternoster Row.

Mr. C. J. Watkins, King's Mill House, Painswick, Gloucestershire, sends us a list of selected scales of Lepidoptera, &c., unmounted, in packets. Each packet contains a named portion of wing, sufficient to mount two or three good slides of detached scales. There is a good variety, and the price is low.

We have received from Messrs. J. Wiggin and Son, Ipswich, a "Youth's Half-Crown Chemical Cabinet." Its contents are both varied and interesting, and it is without doubt the cheapest set of Elementary Chemical Apparatus we have seen.

Messrs. Ewart and Son, 64 Euston Road, London, N.W., have, in addition to their well-known Lightning Geyser for heating water for a bath, &c., brought out a smaller one (No. 5) "for the many occasions when a small quantity of boiling water is required." It is made of copper throughout, and is carefully tinned next the water. It produces boiling water at the rate of a pint a minute, and is therefore useful for dentists' operating rooms, bedrooms, kitchens, &c.

Mr. B. Piffard, of Hemel Hempstead, writes to say that the fossil from the chalk referred to in our Geol. column last month as a Cone of Taxus, turns out on further examination to be a coprolite.

The Huddersfield School Board have started a Natural History Society. The chairman of the School Board, J. W. Robson, Esq., is president. The rules are a model of what such Societies should be. A comprehensive and attractive programme consisting of Lantern Lectures, and Rambles, Pic-Nics, and Flower-Shows, has been drawn up. We wish the Board Schools everywhere would adopt this new departure, and we congratulate the Huddersfield School Board on setting so good an example.

At the last meeting of the Geologists' Association the following papers were read: "On some Bagshot Pebble Beds and Pebble Gravel," by Horace W. Moncton and R. S. Herries; "On the Palæontology of Sturgeons," by A. Smith Woodward.

Parts 6 and 7 of the "Illustrated Manual of British Birds," by Howard Saunders (and published by Gurney and Jackson), are to hand. They fully maintain the high reputation for artistic merit and good letter-press, gained by the preceding numbers.

We have received Mr. Wm. Wesley's comprehensive Natural History catalogue of books relating chiefly to Microscopic Zoology, Entomology, and Conchology.

MICROSCOPY.

Microscope Slides.—We have received two most interesting slides from Mr. E. Hinton, 12, Varley Road, Upper Holloway, N. The first is a specimen of *Hydra viridis*, exquisitely clean, with the natural colour preserved, and the tentacles fully extended; it is intended to be used with the Paraboloid. The second is the Medusiform gonozooid of *Obelia geniculata*, one of the Hydroids. It has been killed in sea-water, and the delicate tentacles (of which there is an immense number) are fully exserted as in life, the manubrium is also well shown. The preparation is most interesting, and, without doubt, many microscopists would be glad to see the phenomenon of the Medusa life of the Hydroid, as it cannot often be obtained.

The Journal of the Royal Microscopical Society, besides containing its Transactions and Proceedings and a summary of current research in zoology, botany, and microscopy, has "A Revision of the Genus *Auliscus*, Ehrb., and some Allied Genera," by John Rattray; and also a "Note on the Large Size of the Spicules of *Acis orientalis*," by F. Jeffrey Bell.

CELLOIDIN.—Some reader (I forgot the name), three months ago asked for information about Celloidin. The following is from the "Microtomist's Vade Mecum," by A. B. Lee:—Celloidin is a preparation of pure pyroxylin, patented for Germany and England, under the name of "Schering's Celloidin." It is manufactured by the Chemische Fabrik auf Actien (vorm. E. Schering), Berlin, N. Fenstrasse, 11, 12. It may be obtained through the post by writing to Schering's Grüne Apotheke, Wittick and Benkendorf, Berlin, N. Chaussée-Strasse, No. 19. "The tablets cost three marks (three shillings) each. A single tablet would, I think, suffice for imbedding many hundreds of embryos." If the above is not what you want, write again, and I will give any information in my power.

I SHOULD be much obliged if any one would tell me how to prepare a coffee-bean for section, cutting in a Rivet-Leyser microtome. Dr. Marsh says to soak them in water till soft, but I found that they begun to germinate long before they were soft enough for section-cutting. Can any one tell me the price of the Cambridge Rocking Microtome, where it is to be got, and whether it works well, also the price of the Thoma Microtome?—*M. J.*

ENOCK'S ENTOMOLOGICAL SLIDES.—We have received two most useful and instructive preparations by W. F. Enock, illustrating the "life-history" of the Hessian Fly (*Cecidomyia destructor*). The eggs are shown in silk on the leaf of barley, and the larvæ in the skin. We may add that Mr. Enock has just presented to the British Museum, South Kensington, nineteen specimens (mounted dry) illustrative of the various stages and appearances of infested barley and wheat, which are placed in the new gallery devoted to economic entomology.

MICROSCOPICAL SOCIETY OF CALCUTTA.—This flourishing society has issued "Keys," for the use of members, to the Desmids, Diatoms, Fresh-water Algæ, and some Genera of Infusoria. These "keys" are all printed on one sheet, and at the bottom are the initials W. J. S.

ZOOLOGY.

ECDYSIS.—I take this opportunity of thanking Mr. James Harvey for so kindly affording the information contained in his paper on "The Ecdysis of Insects," which appears in the October number of SCIENCE-GOSSIP received by last mail. Mr. Harvey's paper serves a double purpose: it places on record a practical drawing and note of his observations on *Pediculus capitis*, and it enables me to associate his observations, and mine (on *Phthirius inguinalis*) with Mr. S. J. M'Intire's on a "Spider's Foot," which I have lately found recorded in SCIENCE-GOSSIP, Vol. V. (1869), p. 136.—*W. J. Simmons, Calcutta.*

THE BRITISH MOLLUSCA.—Having recently examined a copy of the "Shell-Collectors' Handbook," by J. W. Williams, I may perhaps be permitted to offer a few remarks concerning the descriptions given of certain varieties therein, for the benefit of those who have the book. *Limnæa stagnalis*, var. *elegantula* (p. 78), to the description given of this may be added: "Shell much smaller than type, animal tinged with orange." The variety figured on p. 79 (Fig. 9), appears to have no name, but it may be called var. *compressa*, a name I gave it in MS. long ago. *Arion ater*, several described varieties might be added to the list given, and also var. *fasciata*, v. nov., a variety with bands resembling *A. subfuscus*, which I described (but did not name) in the "Zoologist," from Ireland some time ago. *Limax agrestis*, some varieties might be added, including var. *grisea*, v. nov., entirely dark greyish, which I found in Lancashire and recorded in "Naturalist," 1888, p. 55. *Limax arborum*, var. "*dicipiens*" (p. 92), should be *decipiens*. *Helix aspersa* var. *semifusca* (p. 108), for "third whorl," read "third band." The dark variety of the animal *H. aspersa*, which I called *nigrescens*, may be changed to *nigricans*, because there is already a var. *nigrescens* of the shell. *Helix hortensis*, var. *roseozonata* (p. 111), the description should be: "Shell pale or whitish, with rose-coloured bands." The description given on p. 111 belongs to var. *rufozonata*. It is probably best to keep the varietal name *albina* for the white shells of *H. hortensis*, and use *subalbida* for those which are very pale yellow, almost white.—*T. D. A. Cockerell, West Cliff, Colorado.*

LOVE-DARTS IN SNAILS.—I should be glad if Dr. J. W. Williams, or any of your correspondents, will inform me whether the dart or *spiculum amoris* is present in Helix throughout the year, or only in the breeding season. I ask this because I have lately been experimenting on hybernating specimens of *H. aspersa*, and have failed in every case to find anything approaching "a sharp calcareous" dart as Morgan describes it.—*C. A. W.*

TROUT CULTURE.—The Howietoun Fishery in issuing the price list for season 1888–89, records one of the coldest summers experienced since the commencement of the Fishery. Yearlings are fully three weeks later than usual. The rearing season, however, has been exceptionally successful, and fully one hundred and fifty thousand yearlings and twenty-five thousand two-year-olds are ready for delivery. A salmon hatched from ova obtained from the Forth District Board in December, 1880, and reared in the ponds, having spawned three seasons, was found in the first week of November this year to be clean. It weighed just under three pounds, was very silvery, with about thirty jet-black starlike spots. The flesh cut pink, and the flavour was that of a fish a week in fresh water. This salmon had been fed exclusively on clams (*pecten*), and was a fair specimen of those still alive at Howietoun of the same spawning. The smolts and grilse which have been bred from these fish are growing more rapidly than their parents, and we hope to show that although the first generation of artificially land-locked salmon are usually dwarfed, yet their progeny may attain to the size of Loch Leven trout—viz., 6 to 10 lbs. weight. The American land-locked salmon (*S. sebago*) have not yet spawned, but a few of the rainbow trout (*S. irideus*) spawned in April, and the fry are thriving; the largest irideus weighed, when three years old, between three and four pounds. The crosses between salmon and trout, and between trout and salmon, are growing at the average rate of Loch Leven trout at Howietoun. The experiments in inter-breeding these crosses will be continued this season.—*Thomas Winder*, 81 *Watson Road*, *Sheffield*.

Sinistral var. of Littorina rudis.—It may be interesting to record, that I found two young reversed specimens of *Littorina rudis* the other day, whilst examining some drift from the Weymouth Backwater. They are very immature and of course only dead shells. I fancy that there is a large specimen of this monstrosity in the Liverpool public Museum from the Gaskoin cabinet.—*B. Tomlin.*

BOTANY.

The Sunflower.—Permit me to add to Mr. W. Lett's remarks on the Sunflower, that the popular notion as to the movement of the flowers has been exploded in Dr. Vine's Vegetable Physiology, but in that work it is stated that sunflowers have a fixed light position which is towards the S.E., if the situation is an open one. In my garden the aspect is open on all sides except the west, and there are two groups of sunflowers. In one I counted ninety heads, of which thirty-eight faced the S.E., and in the other, twenty-seven heads, of which eleven turned to the S.E. In the two groups eight flowers turned to the N.W., and the others were at intermediate angles between that point and the S.E. A closer examination showed that at least one hundred of S.E. heads were the larger terminal ones which first open, and that without exception the large terminal heads were turned to the S.E. I therefore came to the conclusion, that the fixed light position only applies to the terminal heads. It is well known that light from the S.E. is most active in producing heliotropism. *Sonchus arvensis* is an example of several plants in which the flowers bend to the sun at dawn, and following it with at first an increasing and then a decreasing rapidity until the S.E. is reached, when the more intense light checks growth. In the evening, when the light fails, the peduncles straighten themselves by negative geotropism, and are ready to repeat the operation next morning. The peduncles of sunflowers are less susceptible to changes of light, as the permanent stage of growth sets in earlier than in plants where the peduncle continues elongating. The sunflower behaves similarly to, though not quite the same as the flowers of *Œgopodium podagraria*, *Anthriscus vulgaris*, *Milium*, *Achillea millefolium*, and the ox-eye daisy, in which the fixed light position is upright in an open situation, and lateral, where the plants grow under a wall or in a hedge.—*J. Hamson*, *Bedford.*

Abnormal Growth of Plantago Maritima.—Is it not unusual to find the small bracts of this plant developed to a length of two or more inches? A considerable number of examples I have met with at Hermitage, Emsworth, had all the flowers on the spike subtended by monstrous bracts, taking the form of leaves. Indeed, in some instances, all the floral organs seemed to have assumed that appearance. Has any one observed a similar instance?—*F. H. Arnold.*

Alchemilla Vulgaris.—In the "Student's Flora," 1878, Sir J. D. Hooker, in describing this plant, says: "Moist pastures and streams, except in the S. E. of England." In May, 1886, I found a patch of *A. vulgaris* by a country roadside, not far from Maidstone. *A. arvensis* was also growing near. Is *A. vulgaris* rare in the south-east?—*Henry Lamb*, *Maidstone.*

Sonchus palustris.—This summer I found the marsh sow-thistle growing abundantly in this district. Many of the plants were about 7 feet in height, with stems about an inch and a half in diameter.—*Henry Lamb*, *Maidstone.*

GEOLOGY, &c.

Supposed Cones in the Chalk.—Since sending my note about the cones in chalk, Mr. Etheridge, in consultation with Mr. Carruthers, has changed his mind, and says they are coprolites. One thing is certain, that they resemble cones exactly, which coprolites have never done. There are also coprolites more resembling the ordinary form found with them.—*B. Piffard.*

Society of Amateur Geologists.—We are pleased to observe the steady progress of this Society, which has now entered on its fifth year. Abstracts of the following papers read before the Society during the past year have been issued: "The Metallic Ores of Cornwall," by W. Semmons (Presidential Address); "Geological Age of Mountains," by J. Logan Lobley, F.G.S.; "Lizard District," by A. H. Williams; "Some Older Volcanic

Areas of Britain," by Grenville A. J. Cole. F.G.S.; "Water Supply of the Metropolis," by G. F. Harris, F.G.S. "Work of Prehistoric Artizans," by W. J. L. Abbott; "Geology of the Isle of Purbeck," by Professor G. S. Boulger, F.L.S. F.G.S.; "Silver Ore Deposits of New South Wales," by W. Clunies Ross, B.Sc., and "Some Notes on a Chalk Section at Grays," by J. T. Day. The report for the past year shows that there have been excursions to the Museum of Practical Geology; to Erith and Crayford; to Hampstead; to Caterham and Tilburstow Hill; and to Ealing. The Meetings are held in the City (10 Arthur Street West, London Bridge). Professor Boulger, F.L.S., F.G.S., is the new President.

GAULT FOSSILS.—I have observed the inquiry of J. H. A. Verinder, "How to preserve Gault Fossils," and the reply of Mr. W. E. Windus. I have had no experience of "Picture Mastic Varnish," but should think it too thick a varnish for the purpose, and with some specimens would be very difficult to apply. I have some Ammonites, Scaphites, and other fossils characteristic of this formation, which I obtained some years ago at Folkestone. I at once carefully washed and dried them, and then gave them a covering of "Gum Acacia" dissolved in water. No signs of crumbling or disintegration can be seen; and the beautiful natural colours are as bright and iridescent as when I took them from the Folkestone Cliffs. I have been accustomed to treat Fossil ferns from the coal measures in this way, and I have specimens of Lycopodium, Lepidodendron, Pecopteris, &c.; which reveal all the details of structure, with the sharpness of outline and beauty of appearance, which can be obtained (as far as I know) by no other process. Indeed the general plan in Museums and private collections, is to let them alone; with the result, that the ferns crumble away, and the specimen is rendered of little practical use or value. Whereas, one application of Gum Acacia will set the ferns, and unless they are exposed to strong sunlight, or undue heat, they will retain all their beauty, and show up rich and black against the Shale or sandstone, and require no further attention for many years.—*T. S. King, F.G.S.*

NOTES AND QUERIES.

THE MILD WEATHER BEFORE CHRISTMAS.—Through the mildness of the weather that we have been favoured with this winter, there are many records of plants flowering, birds nesting, and other works of nature which otherwise only occur during the summer months. Norfolk has been no exception to this rule, for a gentleman in Norwich had, during December, a good supply of peas growing in his garden, and they no doubt formed a relishing addition to his winter fare. Another writes to a local paper, stating that he had strawberries for his Christmas tea of which he plucked a quantity that morning, whilst another (also in a letter to a local paper) confidently asserts that he heard the notes of a cuckoo. At Yarmouth, a partridge's nest was found on Sunday, December 29th, amongst some furze bushes, containing fourteen eggs; whilst roses, chrysanthemums, daisies, pansies, wild and garden primroses, and many other plants were in full bloom in open gardens and the surrounding districts.—*J. B. Beckett, Trinity Place, Friars Lane, Great Yarmouth.*

THE MILDNESS OF THE SEASON.—December 6th is quite phenomenal: primroses are in bloom in the lanes between this and Caerphilly. Thrushes and robins vie with each other in song. To-day I heard the note of the blackbird, and the merry twitter of finches made the air alive with sounds familiar to early spring months instead of the dark side of Christmas.—*W. H. Harris, Cardiff.*

THE WARM WEATHER.—No doubt notes of unseasonable flowers in bloom have reached you, but the following may be worth recording. A nosegay brought me yesterday contained: winter coltsfoot, yellow jasmine, orange marigold, greater leopard's bane, white musk mallow, white double fever-few, crane's-bill (Herb Robert), lesser alkanet (*A. officinalis*), fronds of male shield fern. Altogether, a curious mixture of flowers of different seasons.—*M. E. Pope.*

LONGEVITY IN A BEETLE.—*Occidit Idus Novembres Calosoma Sycophanta, exsequias ite frequenter coleoptera*, captured in a leaf-strewn oak copse behind the Marienburg at Treves at the end of June or beginning of July last, he has kept company with me for the space of four months, and had doubtless seen happy hours among the fallen leaves before we met. This is a green old age in insect-life which numbers its days at a fortnight. While he lived I fed him on raw meat and earthworms; he went with me up to town, where his last repast was a gigantic worm from the neighbourhood of the Regent's-park Canal, that stretched to half a foot or more; he tackled it finely, although he had long been feeble and ailing. He was a great favourite with our girl Mary at Ramsgate, on account of his shiny coat, otherwise his manners were objectionable. Of him it may be said that death has not tarnished his comeliness. The beautiful beetle has ceased to live.—*A. H. Swinton, Gery Street, Bedford.*

A SINGULAR FEATURE IN AN EXPLOSIVE MIXTURE.—The house in which I write has been the scene of a gas explosion that has scorched or cracked the cornices, blown out panes of glass, and committed direct personal injury by the ignition of hair. I was asleep at the time in a room on the top flat, with my door shut. My top pane of glass went smash, and directly beneath on the washhand-stand there remains a white blur as if a bombshell flung at it had there burst. These explosions around the lines of least resistance, and the solitary explosion in my room, so remote from the centre of disturbance, are both curious and remarkable as illustrating a law of nature. The accident is attributed to the opening of a window in a room where a light had been lit, and in which a gas escape had taken place owing to the lowering of a gaselier found to be defective.—*A. H. Swinton.*

A FLEA'S LIFE, &c.—We should be glad if some of your readers would kindly give us information on the following points. What are the phases of a flea's life? Does the flea pass through the different stages of larva, pupa and imago, or is the perfect insect hatched from an egg? Are white moles common? Two have been found in this part at an interval of some months, and at places a mile or so away from each other. Are apple-trees often observed to blossom twice in the same year? We gathered several flowers on September 19th, 1888, off two trees both loaded with ripening fruit.—*N. P. Chrzastow, Poland.*

[P.S.—See the paper on the "Development of a Flea's Egg" (with copious illustrations), in November No. of SCIENCE-GOSSIP, 1885.—ED. S.-G.]

THE "WANDERING JEW."—Can any of your Canadian readers give the botanical name of the creeping plant known locally as "Wandering Jew"? It is found in the North-West Provinces, particularly, I believe, in Manitoba.—*John Christie.*

WILD FLOWERS AT CHRISTMAS.—During a walk from Burton to Tutbury, on Saturday Dec. 22nd, I found the following plants in flower:—*Stellaria media, Capsella Bursa-pastoris, Geranium molle, Geum urbanum, Anthriscus sylvestris, Bellis perennis, Matricaria inodorum, Senecio vulgaris, Taraxacum officinale, Veronica Buxbaumii, Lamium album.* I also found *Saxifraga tridactylites, Conium maculatum*, and rose bushes with spring leaves.—*Jno. E. Nowers, Burton.*

ON Christmas Day I found the following plants in flower near Burton:—*Ranunculus repens, Lychnis alba, Geranium molle, Geum urbanum, Anthriscus sylvestris, Bellis perennis, Senecio vulgaris, Crepis virens, Sonchus asper, Lamium purpureum, Lamium album, Veronica Buxbaumii.* The honeysuckle was in leaf, in several places by the roadside.—*Jno. E. Nowers, Burton.*

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.

LOST, or arrested in transit, the botanical circulating magazine, "Sachsiana." Any member having it in his possession will please forward it to J. Hamson, Bedford.

B. B. LE T.—We have looked through all the late Frank Buckland's works, but cannot find any account of the "Beavers of Bute." Perhaps it appeared in "Land and Water," or some of our correspondents may be able to inform you.

A. VERINDER.—We have not heard who is editing the new edition of "Carpenter on the Microscope." The coloured plate of Foraminifera appeared in the September number of SCIENCE-GOSSIP vol. for 1885.

W. J. L.—The desirability of publishing another "General Classified Index" to the vols. of SCIENCE-GOSSIP is under consideration for the end of the present year, when we shall have completed the 25th vol., and hope to celebrate our "Silver Wedding!"

A. MAYFIELD.—*Lastrea multiflora* does not exist as a British species of fern. We believe it was a name given to a variety by Newman, but which does not appear to have been generally adopted.

J. C.—The fossil is *Ammonites catenatus.* The fragment of stone is a partially metamorphosed volcanic ash.

B. D. P.—Your second paper shall appear in due course.

W. H. THRUSH.—A Queen Elizabeth's shilling varies in value from two to five shillings, and a sixpence from one to two shillings, according to condition.

A. G. HAMMOND.—Is your account of the Fossil Hunt illustrated? Send it on.

A. B.—The eggs reached us in a very shrivelled and dried-up condition. They appear to be those of the common Earthworm.

MARY E.—You had best apply to the secretary of the Entomological Society for information about Miss Ormerod's paper on Preserving fruit from Caterpillars.

EXCHANGES.

OFFERED, Fossil shells from the Paris basin, in exchange for British or other fossils, recent exotic shells, or prehistoric implements.—Monsieur Bonnet, 9 Rue de Mazagran, Paris.

RARE Australian, New Zealand, and other foreign shells, mostly land and freshwater, or large examples of *U. pictorum*, for any of the following: *Vertigo Lilljeborgi, V. tumida, V. alpestris, V. pusilla, Succinea Pfeifferi, Sph. lacustris*, var. *Rickholtii, Pisid. nitidum*, var. *splendens, L. peregra*, vars. *picta, nitida, succinæformis*, and *stagnaliformis, L. auricularia*, vars. *monardi* and *magna, L. stagnalis*, vars. *variegata* and *roseolabiata, Z. fulvus*, var. *viridula, H. aspersa*, var. *virescens, H. rupestris*, var. *viridescenti-alba, Cl. laminata*, var. *albida, Coch. tridens*, var. *crystallina, Coch. lubrica*, vars. *hyalina* and *viridula.*—W. A. Gain, Tuxford, Newark.

THIRTY or forty histological specimens of normal tissues, all different, in exchange for low powers (2, 3, or 4 inch, universal screw) or sub-stage condenser, 1½ in. diameter.—J. Herbert Frederick, Kornthal, Sidcup.

WANTED, Coddington lens, and few preserved snakes, lizards, etc. Can offer choice micro slides, parasites, diatoms, anatomical, botanical, etc.—Suter, 5 Highweek Road, Tottenham.

DUPLICATE diatom micro slides in exchange for others. Lists exchanged.—E. A. Hutton, Mottram, Manchester.

WANTED, offers of good named British or foreign marine shells, Forbes' "British Starfishes," or Gosse's "Actinologia Britannica," for the following: SCIENCE-GOSSIP, half-calf. 1873–4, 1875–6, 1878–9; "The Microscope," fifth edition, by Carpenter; "Comparative Anatomy of Vertebrates," by Owen; "Manual of Botany," fifth edition, by Balfour. Condition, nearly new.—Write first to H. C. Chadwick, Beech Road, Chorlton-cum-Hardy, Manchester.

THIRTY-SIX varieties downs of British birds, including sand-grouse, offered in exchange for two well-mounted slides, or other unmounted micro material.—W. Sim, Gourdas, Fyvie, N.B.

FOR exchange, *A. cygnea, D. polymorpha, P. contecta, P. albus, corneus*, and *spirorbis, L. peregra, L. nitidus, H. nemoralis, hortensis*, and *arbustorum, B. obscurus, Coch. tridens*, &c. Wanted, *P. contortus, P. vortex, H. virgata, Cantiana, caperata, ericetorum, Cl. biplicata*, and many others.—Thomas Smith, Park Hill Cottages, near Burnley, Lancashire.

WANTED, good works, with plates, on the Continental eocene and miocene formations. Offered, large selections of exotic shells, British fossils, minerals, scientific and philosophical works, or state requirements.—J. E. Linter, Arragon Close, Twickenham.

WANTED immediately, larva, pupa and imago of privet hawk moth, in good preservation; will give in exchange Dawson's "Chain of Life" (new).—Sphinx Ligustri, 80 Clifton Street, Lytham.

DUPLICATES. — Cardamines, sylvanus, pamphilus, alexis, urticæ, Jacobæ, caja, auriflua, ulmata, dispar, fulvata, chi, and mensuraria. Desiderata numerous. — F. Emsley, 98 West Street, Leeds.

OFFERED, spherulite and pitchstone from Arran, white dolerite and volcanic bombs, Ayrshire. Wanted, fossils.—I. Smith, Monkredding, Kilwinning.

WANTED, to correspond with collectors with the view of exchanging the rarer kinds of rissoas, and other rare shells. Desiderata very numerous, including mangelias and odostomias. Lists sent.—A. J. R. Sclater, M.C.S., 23 Bank Street, Teignmouth.

OFFERED in exchange, the following micro objects: star-shaped *Placentula asterisans*, striated *Orbulites striata*, wrinkled *Polystomella crispa, Nummulites complanatus*, rare and fine spines of echinus, minute corals and shells, very small and perfect, and rare sorts. Wanted, *Pecten glaber, V. sulcata* (from the Adriatic Sea), also *Pecten niveus, Trochus granulatus, Anomia striata, Pecten tigrinus, Scalaria turtoniæ, Ianthina exigua, I. rotundata*, and *Emarginula fissura.*—A. J. R. Sclater, M.C.S., 23 Bank Street, Teignmouth.

DUPLICATES.—*Sph. rivicola, U. margaritifer, D. polymorpha, P. contecta, V. piscinalis* and *cristata, Pl. albus, glaber, dilatatus, spirorbis* and *contortus, L. truncatula, palustris* and *glabra, Z. glaber, nitidus* and *purus, H. sericea, arbustorum* and *hispida, Pupa secale, Coch. tridens*, &c. &c. Wanted, *H. lamellata* and *pygmæa*; no other species wanted.—F. C. Long, 8 Cog Lane, Burnley, Lancs.

AN injecting syringe and Parke's micro lamp, in exchange for portable microscope, or offers. Also two first parts of Saville Kent's "Infusoria."—I. S. Williams, Livingstone Villa, Iffley Road, Oxford.

OFFERED, the "Conchologist's Text-book" (Macgillivray), "Entomologist's Text-book," with coloured plates (Westwood), "Half-hours with the Microscope" (Tuffin West), twenty odd numbers of the "Entomologist," previous to 1870, "Insect Hunters" (Newman). Wanted, Rimmer's "Land and Fresh-water Shells," side-blown eggs, shells, &c.—Thos. H. Hedworth, Dunston, Gateshead.

SHEEP flukes (unmounted) in exchange for other interesting object.—I. S. Williams, Livingstone Villa, Iffley Road, Oxford.

WANTED, English regal or Colonial copper coins, 17th or 18th century tokens, also war or other medals, in exchange for named English shells or fossils.—F. Stanley, Margate.

WANTED, the two last volumes, or any odd numbers from 166, of C. E. Sowerby's small edition of "English Botany," containing plants of Great Britain. Good exchange.—Mrs. Bishop, The Platts, Watford.

DUPLICATES.—Io, *S. ligustri*, *ligniperda*, *tipuliformis*, *sambucata*, *tiliaria*, *rhomboidaria*, *phragmitis*, *lithoxylea*, *chrysitis*, *iota*, *lariciana*, and *occultana*. Desiderata, pupæ of *A. sinuata*, and offers.—George Balding, Ruby Street, Wisbech.

WANTED, Vol. II. of SCIENCE-GOSSIP, bound or in numbers, the latter preferred; mounted micro slides for polarizer, offered in exchange, or offers.—W. Wise, Chemist, Lancashire.

WANTED, dragonflies, crickets, grasshoppers, locusts, earwigs and cockroaches. Offered, lepidoptera, shells, echinoderms, algæ, &c.—W. Harcourt Bath, Ladywood, Birmingham.

To beginners.—I have about 100 duplicates of British butterflies, which I will distribute among the first half-dozen readers of SCIENCE-GOSSIP who will forward box and return postage before Feb. 15.—W. Harcourt Bath, Ladywood, Birmingham.

TWELVE specimens of *V. urticæ*, in papers, will be posted to any juvenile reader of SCIENCE-GOSSIP who will forward a stamped directed envelope.—W. Harcourt Bath, Ladywood, Birmingham.

QUANTITY of minerals, &c., in exchange for volcanic, gem, or auriferous sand for micro slides; also red crag fossils in exchange for common silurian ones.—A. G. H., 10 St. John's Hill, New Wandsworth, S.W.

SHALL be glad to exchange any of the following for clutches of many other species: clutches of American robin, sedge warbler, gold crest, great tit, jackdaw and magpie, reed bunting, tree and meadow pipit, skylark, nightjar, golden-winged woodpecker, moor hen and coot, lapwing, ringed plover, curlew, snipe, common and Arctic terns, sooty and Rüppell's terns, kittiwake, common L. B. B. and G. B. B. gulls, great skua, little grebe, mute swan, and eggs of sheldrake, pheasant, partridge, hen harrier, Dartford warbler, water rail, dunlin, puffin, guillemot, ringed guillemot, razor bill, whimbrel, and stormy petrel.—Capt. Young, R.N., Rodwell, Weymouth.

WANTED, microscopic or stereoscopic slides, in exchange for magic lantern, 2-in. condenser, with thirty slides.—H. Ebbage, 344 Caledonian Road, London.

WANTED, stereoscope and slides; exchange microscope and slides.—H. Ebbage, 344 Caledonian Road, London.

FOR exchange, a collection of 400 micro slides (many professionally mounted), also pine cabinet to hold 288 slides. Wanted, Shaw's "Eclipse" photo apparatus, or other good detective camera, ¼-plate size, must be in good order.—W. A. Hyslop, 22 Palmerston Place, Edinburgh.

SCIENCE-GOSSIP for Feb. 1885 (No. 242) wanted, to make up volume. Will pay 1*s.* for clean and complete copy, or send Möller's test-slide (*Grammatophora subtilissima*), dry, in exchange.—M. Hafen, Ditton, Widnes, Lancs.

DUPLICATES.—*H. sericea*, *H. lapicida*, *H. pulchella*, *H. arbustorum*, *V. alpestris*, and many others. Wanted, British land, freshwater and marine shells.—A. Hartley, 8 Cavendish Road, Idle, near Bradford, Yorkshire.

WANTED, "Quarterly Journal Geo. Society," part containing paper on the "Thanet Sand," Prestwich, 1852; also part containing paper on "The Woolwich and Reading Beds," Prestwich, 1854.—Geo. E. East, jun., 10 Basinghall Street, London, E.C.

WANTED, whole insects in spirit, British or foreign, also zoophytes; all must be correctly named. Well-mounted micro objects or micro material offered in exchange. A well-preserved scorpion (recent), in first-rate condition; open to any offer in any of the above, or other unmounted objects. List to—R. M., 24 Park Road, Clapham, London, S.W.

OFFERED, L. C., 8th ed.: 5*b*, 9, 58, 66*b*, 100, 119, 126, 127, 175, 178, 189, 197, 199, 207, 222, 234*c*, 249*c*, 251, 253, 256, 300, 357, 394*a*, 439, 509*b* 514*d*, 514*e*, 514*f*, 514*g*, 514*i*, 514*l*, 514*n*, 514*p*, 515*b*, 526, 532*a*, 532*b*, 575*b*, 585, 601, 649, 650, 662, 712, 788, 795, 904, 917, 928*b*, 974, 995*b*, 1267, 1326, 1412, 1417, 1418, 1558, 1563, 1579, 1590, 1591, 1592, &c. &c. Lists requested.—F. C. King, Bank Villa, Fulwood, Preston.

FOR exchange, first-class clutches of eggs from Asia Minor and North America, such as Egyptian vulture, osprey, bald eagle, kites, buzzards, hen and Montajus' harriers, lesser kestrel, hobby, mottled owl, rolleri, bee-eater, Barbary and red-legged partridges, Andalusian quails, com. quails, bustards, pratincoles, sooty and noddy terns, and others. Send lists of duplicates to—W. Raine, Walton Street, Toronto, Canada.

WANTED in clutches, eggs of white-tailed eagle, peregrine falcon, kestrel, long-eared owl, short-eared owl, dipper, redwing, gold crest, meadow pipit, skylark, cuckoo, golden plover, curlew, heron, kittiwake, oystercatcher, com. gull, stormy petrel, spoonbill, raven, red grouse, wood and purple sandpipers, swan, ducks, and many others. Offered, several clutches of osprey, Pallas' sand-grouse, Bartram's sandpiper, Egyptian vultures, and over fifty other species collected in North America and Asia Minor.—W. Raine, Walton Street, Toronto.

SCIENCE-GOSSIP for 1865–68 (bound); 1875 (unbound); and Nos. 121, 177, 179: "Knowledge," parts 1–14; "Natural History Review," 1865. Wanted, "Entomologists," parts,—Aug., 1881, Oct.–Dec., 1881, Jan.–June, 1879: SCIENCE-GOSSIP, 1871; Lepidoptera, or micro material.—C. S. Bouttell, 7 Irene Road, Fulham.

WANTED, standard works on zoology, comparative anatomy, microscopy (especially histology), &c.—Apply, stating requirements, to F. R. Rowley, 60 Lower Hastings Street, Southfields, Leicester. Unaccepted offers not answered.

WILL exchange a collection of about 100 species of British birds' eggs, for botanical or microscopical books.—J. E. Nowers, 71 Branstone Road, Burton-on-Trent.

FOR exchange, SCIENCE-GOSSIP, vols. 1865, 1866, 1867, 1868, 1869, and 1874, 1875, 1876, 1877 (unbound), also 1870 (bound).—J. G., 26 Gt. Chatham Street West, Manchester.

WANTED, *Ped. cap.*, *vestimenti*, and *pubis*, and other parasites, in exchange for micro slides, or offers.—Fred Lee Carter, Gosforth, Newcastle-on-Tyne.

SMALL duplicate collection of British land, freshwater, and marine shells, forty species, named, in exchange for micro slides, turntable, or offers.—J. B. Beckett, Trinity Place, Friar's Lane, Gt. Yarmouth.

A QUANTITY of good micro slides in exchange for books, other slides, or offers.—A. Draper, Cemetery Road, Sheffield.

BRITISH and Foreign algæ offered in exchange for others, Tasmanian, Australian, and S. American species especially desired.—E. M. Holmes, Bradbourne Dene, Sevenoaks, Kent.

MARINE algæ, collected in Shetland and North Ireland, wanted in exchange for rare southern species.—E. M. Holmes, Bradbourne Dene, Sevenoaks.

WHAT offers for sea anemones and other specimens for sea-water aquarium? Wanted, SCIENCE-GOSSIP numbers for November and December, 1881, also for years 1882 and 1883.—Walter Hollebon, Newark House, Langney Road, Eastbourne.

WANTED, last edition of Hobkirk's "Synopsis of Mosses," in exchange dried plants, mosses, birds (stuffed) or eggs.—J. A. Wheldon, High Ousegate, York.

WANTED, good specimens of most of the British Grasses, in exchange for Botanical, or Pathological micro-slides (the diagnosis of the Pathological guaranteed).—B. Piffard, Hill House, Hemel Hempsted, Herts.

WANTED, British stone implements in exchange for slides as above.—B Piffard, Hill House, Hemel Hempsted, Herts.

BOOKS, ETC., RECEIVED.

"Evidences of the Antiquity of Man in Eastern North America," by Chas. C. Abbot."—"The Antiquary."—"The Bookworm."—"Proceedings of Society of Amateur Geologists."—"Evidences of the Antiquity of Man in Leicestershire," by Montague Browne, F. Z. S.—"Official Year Book of the Scientific and Learned Societies of Great Britain and Ireland for 1887."—"Mineral Resources of the United States."—"Geological History of Lake Lahouton," by J. C. Russell (Washington). "Pneumatics," by C. Tomlinson, 4th ed. (London: Crosby Lockwood & Co.).—"Book Chat."—"The Century Magazine."—"The Amateur Photographer."—"The Garner."—"The Naturalist."—"Cassell's Technical Educator." "The Botanical Gazette."—"Belgravia."—"The Gentleman's Magazine."—"American Monthly Microscopical Journal."—"The Essex Naturalist."—"Wesley Naturalist,"—"Journal of Conchology."—"The Midland Naturalist."—"Research in Life-Lore."—"Feuilles des Jeunes Naturalistes."—"The American Naturalist."—"Journal of Microscopy and Nat. Science."—"Canadian Entomologist."—"*Ottawa Naturalist*."—"Victoria Naturalist."—"The Microscope."—Journal f Royal Society of New South Wales, &c. &c.

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

LUNAR INFLUENCES.

By A. W. BUCKLAND,

Author of "The World Beyond the Esterelles," &c. &c., Member of the Anthropological Institute, and Hon. Member of the Bath Lit. and Phil. Association.

THE following paragraph from a contemporary, has to do with certain lunar phenomena very little studied or understood, even by astronomers; but which can hardly be ignored, in face of the persistent testimony of practical agriculturists in climates differing from our own:

"The influence of the moon upon vegetation is an interesting problem awaiting solution. A recent writer upon the subject mentions that woodcutters in Cape Colony and in India insist that timber is full of sap, and unfit to be cut at full moon. Another observation of lunar influence in Cape Colony is the rapid spoiling of meats and other provisions when exposed to moonlight, though this may be due to the fact that the light serves as a guide to insects."*

Before treating of these influences, which we believe to be worthy of scientific enquiry and investigation, we will just glance at the numerous superstitions still lingering among us in connection with the lesser light which rules the night, and see whether we can discover a few grains of reason in the apparent absurdities.

When you first see the new moon you must courtesy, and turn your money for luck. It is unlucky to see the new moon through the window, or over your left shoulder.

> "If the new moon you see
> Neither through glass nor tree,
> It shall be a lucky moon to thee."

A Saturday moon is always unlucky, for the weather will be bad during the ensuing month; but to see the old moon in the lap of the new betokens fine weather. If the crescent moon lies on her back she holds the water in her lap; but, if the horns are upright, the water will be poured out, and it will be a wet month. You should cut your hair in a waxing, and your nails in a waning moon. Herbs should be gathered when the moon is full, and you must kill your pig when the moon is waxing, or the meat will shrink in cooking.

These are the principal superstitions relating to the moon, and they seem to fall naturally into three parts: the first of which may be traced to moon-worship, the second to the influence of the moon on the weather, and the third to the effect of moonlight upon plants and animals.

The worship of the moon is probably as ancient as that of the sun. In most countries the sun held the first place, the moon being regarded as his consort; but in some ancient religions the moon was regarded as the chief divinity, and was the male element, the sun becoming female. This metamorphosis is still to be traced in many languages, as in the German, but, either as brother and sister, or husband and wife, the sun and the moon have held sway over mortals from the earliest times to the present day.

If we look to the attributes assigned to lunar deities, we shall find they are almost always associated with the chase; thus the attributes of Artemis, the moon goddess of the Greeks, and of Diana, her representative among the Romans, are the bow and quiver, arrows or a spear, stags and dogs. We may, therefore, conclude that moon-worship originated among hunters, and that the horned divinities met with so frequently in ancient sculptures have some connection with the moon, the horns representing the cusps of the crescent moon.

We find Assyrian and Egyptian goddesses thus adorned, and it would seem from various notices in the Bible, that the Hebrews were given to the use of "Round tires like the moon" (Isaiah iii. 18) as

* "Wit and Wisdom," Jan. 1889.

head ornaments. It seems probable that these round tires may have resembled those golden ornaments found in Ireland and in ancient Etruria, and called *lunulæ*. It is certain that the Hebrews, like most Eastern nations, thought much more of the influence of the moon than we do in our colder clime. The new moon was ushered in by the blowing of the silver trumpets and by special sacrifices.

But we search in vain in Eastern lands for any notices of superstitions connecting the moon with the weather, for it is only in a variable climate like our own that the weather is watched with solicitude, and it is by no means clear, notwithstanding the dictum of astronomers and philosophers, that in our sea-girt island the moon is wholly devoid of influence upon the weather; for, when we consider that she regulates the tides, and that, at least on the sea-coast, the extremes of the tides certainly bring about atmospheric changes, these changes may truthfully be assigned to the primary cause, that is the moon. The extent of the change would, however, naturally depend greatly upon the direction of the wind and the degree of humidity of the atmosphere at the time, but we believe there is enough influence traceable to the moon to justify to some extent the weather prophecies of our ancestors.

When, however, we turn to the influence of the moon upon plants and animals, we find the minimum effects in our cold, variable climate, and the maximum in hot countries under clear skies. Yet even here, perhaps, the moon may have more effect upon the growth of plants than we are willing to recognise; and, as regards animal life, every keeper and attendant at a lunatic asylum knows how much the unhappy inmates are excited at full moon, and the howlings of dogs on moonlight nights show that they too are affected in some way. It is, therefore, possible that there may be some truth in the old wives' notion, that pigs should be killed when the moon is waxing. As regards the growth of hair, we cannot speak positively, but we have often noticed that the nails grow more rapidly when cut during the waxing period of the moon. These things are not superstitions, but may be proved or disproved by experiment, and it would seem to be worth while to test experimentally those lunar influences which modern philosophy is too ready to reject, simply because they were old-world beliefs.

In the blessing accorded to the tribe of Joseph, through the mouth of Moses, we find especial mention of "The precious things put forth by the moon" (Deut. xxxiii. 14), and certainly, in hot countries, it is well known that vegetation is largely dependent upon the moon. We have been told by planters in the West Indies that the growth of the sugar-cane during moonlight nights is twice as great as when there is no moon, as may be proved by the distance between the knots or divisions. The Chinese attach great importance to the influence of the moon, so timing the sowing of the seed as to ensure the greatest amount of moonlight for the springing corn.

The appellation of "moon-struck" is, amongst us, a term of ridicule, but in hot countries it is a reality, and no one would think of sleeping unsheltered under the influence of the light of the full moon. A curious effect of the influence of the moon on animal matter is well known at the Cape of Good Hope. A favourite food among the colonists is a fish called *snoek* (*Thyrsites Atun*). This is not generally eaten fresh, but is cured in a particular way by the Malays. Now if this curing takes place during the time when the moon is at the full, and the light of the moon is allowed to fall upon it when drying, all who partake of the fish thus cured, are seized with a swelling of the face, not particularly painful, but very disagreeable and disfiguring, and the unhappy snoek-eaters wander about like so many grown children afflicted with mumps.

From these few instances it will be seen that the influence of the moon is not altogether mythical, and further research may show that our ancestors were justified in attributing to the silver planet a share in controlling the forces of nature greater than will be admitted by modern philosophers; and that, even in changes of weather, it is at least possible that the moon may have some influence, although only at new and full moons, when the tides are highest. That the weather should be affected by an eclipse, as many suppose, can scarcely be imagined, since an eclipse is only a passing shadow, and when we come to the absurdities of courtesying and turning money at new moon for luck, we see only the lingering survival of old customs and beliefs which, even in this century of enlightenment, cannot be wholly eradicated; for in every human heart there still seems to be some little dark corner given up to superstition, and probably even now, as related by Aubrey (1678), some of our English country women may be found to sit astride on a gate or stile the first evening the new moon appears, saying, "A fine moon, God bless her!"

A PEEP AT THE ROMAN WALL.

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

THE quiet little town of Haltwhistle, on the Newcastle and Carlisle Railway, is a capital point from which to start for a peep at this interesting relic of former times. It is curious to notice how peaceful everything now is, where, centuries ago, all was life and bustle. It is fascinating to try and recall the appearance of the skilled masons trimming the blocks of whinstone and placing them in position along the crest of the hills, or in the secluded valleys along which the wall was built, and when we see how sharply the stones were faced, and then visit the quarry in which the very same stone is blasted and squared to-day for paving our cities, we wonder at the little progress which has been made in this branch of labour during the centuries that have gone into the historic past.

If we leave Haltwhistle on a bright, crisp morning, full of vigour and ready for an exciting tramp, a very pleasant day lies before us. After a brief glance at the town—which is not so interesting as some others in the neighbourhood, either historically or artistically—we strike away to the north-west, and after a brisk walk, come to valleys, ravines, streams, quarries, and mines of exceptional attractiveness for the student of natural history. In the streams and pools, the fresh-water plants and shells abound, and not a few are far from common. While every bank, nook, and cranny is bedecked with moss, and lichen, and fern, the quarries present many features of interest. Coal, clay, sandstone, are all in close proximity, and each invites our attention. Worm-tracks, striking ripple-marks and rain-drops abound in the latter, which varies greatly in texture and colour, and often contains a good deal of mica and other minerals. The streams too, especially where unpolluted by mining operations, prove attractive to geologist as well as botanist, for they have many a story to tell of obstacles presented to their course, and conquests won over boulders of many kinds, which now repose in the rugged water-course like subdued and vanquished heroes.

Such wayside studies as these beguile the time and make it pass all too quickly, and we find by our watches that it is necessary to hasten on. We therefore strike for a farm-house and hamlet known as Wall-town, and having reached the heights to the north, find ourselves on the very ridge along which the wall was constructed. Like the Great Wall of China, this lesser structure ran up and down, in and out, following the course of stream and cliff which aided the work of defence. Here we find ourselves actually on the wall itself, and now for miles in either direction we can trace its rise and fall (in more senses than one), and study many points in connection with its history. We soon observe that the line of hills which run along from west to east are of an eruptive formation, the rocks standing out here and there in such a way that when a small portion is dislodged with the geological hammer, its green tint and volcanic origin may be seen at a glance. This is the stone, here always known as "whinstone," when *in situ;* "cobbles," when found in river bed or amongst gravel, and generally known as "basalt" elsewhere. This is the stone which the Roman workmen quarried with such patience and skill for the construction of the wall throughout this part of the district. Here and there we find sandstone blocks intermingled, and the rubble which fills up the middle portion is perhaps as often of sandstone as of basaltic origin, but, as a whole, thousands upon thousands of whinstone blocks, all square-cut and beautifully laid, form the northern and principal face of this historic pile. We take the westerly direction for convenience, and because there are two special points of interest to study, and wend our way along the top of the wall, or by its side, now admiring the pretty patches of Lecidea covering the more exposed rocks and stones of basalt, now culling a pretty fern or fruiting moss, and anon fishing out a banded Helix or other thing of beauty, till at last we alight on one of the stone turrets or watch towers, which stood about three hundred yards apart, and thus enabled the sentinel to keep up communication all along the wall. These towers are twelve feet square, and as several of them have been cleaned out, they have told their own story of the past. At Greenhead we shall have an opportunity of seeing one of these in the process of being opened, but let us first step aside for a moment to ascertain whence comes the chink, chink, which we hear. Yonder, some hundred feet below us there are workmen busy with pick, and shovel, and hammer. They are quarrying whinstone, and the ridge along which we are walking is gradually receding before them. We look at the top of the works, and are amazed at the way in which the basalt has been weathered, then carefully descend into the workings beneath. What a splendid sight! That bold face of bluish-green rock has a wonderful tale to tell. It was once a super-heated mass which could not contain itself within the narrow bounds imposed by cold, unbending rocks, and with one mighty effort tore asunder the chains which bound it and poured out its fury on the quivering earth-crust to cool in due course and set into this solid mass! Here, guided by an intelligent Welsh quarryman, we see the very sandstone over which the lava flowed, and it is curious to observe how both the sandstone and basalt have been affected by the action. The stone quarried here varies in texture at different heights, from which we infer that the coarser, denser particles by their specific gravity subsided to the bottom while the mass was still mobile and liquid, the finer particles floating nearest the surface. We have never visited a quarry which produced upon us a profounder impression than this one has done. And now for a run to Carvoran which is nigh at hand, and we shall see the quarter-mile turret which has just been opened. It stands off the main road—the Maiden Way, perhaps, of the Romans—and is near a farm-house. Among the "finds" there are sundry pieces of pottery, some iron articles, bones of different kinds, the jaw of a carnivorous brute, whose teeth have been greatly worn down by the constant crushing of bones, and sundry pieces of horn which have evidently been employed in various ways. We are now within a short distance of Greenhead Station, whence we can take train to Carlisle or Newcastle or if we prefer, can run on to the pretty resort at Gilsland and after a night's rest, a drink at the Spa, and sundry pilgrimages, find our way to Birdoswald where one of the most complete stations on the

Roman Wall may be seen. We have had but a peep, and that peep has made us anxious to see more. If we cannot satisfy our desires we may procure the veteran Dr. Bruce's work on this subject and study it at our leisure. Now let us away for a wash and a cup of tea to refresh us after our ramble.

A CHAPTER ON DEGENERATION.

THERE are certain animals which, beginning life well, gradually lose their characters, become parasitic, or attached to some object, their senses become aborted, their limbs useless, and only the functions of digestion and reproduction are performed with their primary vigour.

Green-house plants are often troubled with a little pest called the Scale. It is found as a small brown or yellow scale on the leaves and stems of plants; sometimes in great quantities, and, as it spreads quickly, frequently causes considerable damage. If an old brown scale be lifted from the surface of the plant, minute red bodies, just visible to the unaided eye, are found underneath it. These are the young, while the scale which protects them is a degenerated female insect which lives upon the sap of the plant, and reproduces its young in this manner. The scale insect, then, is a good example of degeneration.

The mealy bug, which attacks green-house plants in the same manner, is closely related to the scale, although it does not undergo so complete a degeneration. It is about the same size (about one-sixth of an inch), and has very much the same manner of life. It is round in shape, of a reddish colour, and covered all over with a white mealy substance. Its body is divided into segments, each segment bearing a short blunt process on each side. The eyes are small, and situated on each side of the flat round head. It has short, somewhat hairy antennæ, and six short legs. Two straight blunt appendages project from the hinder end of the body. In most of these points, as will be seen later, the mealy bug resembles the young of the scale, but it is much fatter, rounder and covered with meal. If it is disturbed, it may take a step or two, but its nature is very sluggish, and it seems quite contented to remain in one spot, busily fattening itself. Both the mealy bug and the scale are female cocci, the males of which are furnished with wings.

The particular scale which I examined, attacks the Abutilon trees in our green-house, and both it and the mealy bug do considerable damage. It is a small oval, yellow or brown in colour, and varies in length from one-sixth of an inch to a size barely visible to the naked eye. It is best examined by opaque light with 1-3 in. objective, either on the leaf or on a slide. The young are seen by taking an old scale of the leaf and laying it, lower surface upwards, on a slide. It will then be seen that the scale is more hollowed out in one part where it is black or dark in colour, and that here four or five young cocci are ensconced. They usually present very obvious signs of vitality, and walk all over their shield, evidently unaccustomed to the light of day suddenly brought to bear on them. Their bodies are oval in shape and very flat, with two bright eyes and two long hair-like curved caudal appendages. They have six legs, and two hairy antennæ, which are used as feelers, when they walk about. Their body is divided into several narrow segments, which are elevated into a slight ridge in the middle line. In appearance they some-

Fig. 25.—Scale on Leaf.

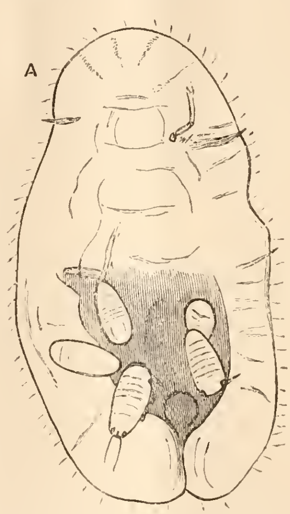

Fig. 26.—(A) Inside of Scale, showing Young.

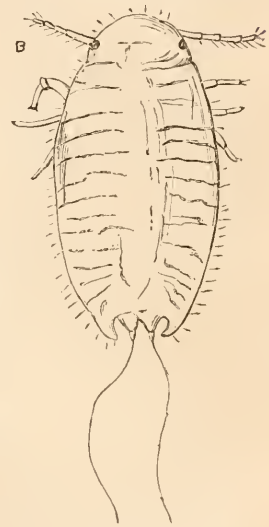

Fig. 27.—(B) Young, much magnified.

what resemble the mealy bug to which they are near relatives. In spite of the fact that later in life they are very inactive, at this early period they walk freely about and thus it is that the scales are found at some distance from each other. Very soon the young coccus settles down and begins to degenerate.

By very little care you may find scales no larger than these young. At this stage, they are slightly red in colour, and preserve more the appearance of the young than they do later: the eyes are still distinct; the segments are more clearly marked off from one another, the caudal appendages are still present, and the general shape of the body is only slightly convex. As the scale gets older, it becomes larger, more convex and more scale-like. Sometimes the back is marked with a few black lines which give it a somewhat tortoiseshell appearance. It is at first yellowish-green, then as the markings get stronger it turns brown. Even at this late stage, traces of its former condition may be seen. Thus you usually find at the posterior end a well-marked indentation, and this marks the interval between the two projecting angles of the last segment near the root of the caudal appendages. The eyes, which are very indistinct, and the useless legs and antennæ can still be seen. The body is very thin, except—if the specimen be not too old—near the middle line where it is sac-like, and contains the young in an embryonic condition.

In short, the scale is now a degenerate organism, motionless, feeding, increasing in bulk so that it may develop young, and form a shield over them for their protection. The useless organs—that is the organs not concerned in this task—have shrivelled away, and the structure has modified itself to suit this purpose.

This is a very interesting object for microscopic study, and may be easily possessed by those who have access to a green-house. Besides the species here described, there are others common in green-houses which attack different plants.

BERNARD THOMAS.

ON SOME ADDITIONAL ACCESSORIES TO THE MICROSCOPE.

By THOMAS H. HOLLAND, A.N.S.S.

IN an examination by reflected light of such objects as sand-grains and small crystals, it is desirable, sometimes, to investigate the characters of surface-markings, such as etch-figures, oscillatory combinations of two distinct crystalline forms, or other external peculiarities of minerals. Again, the great numbers in which the remains of small and low forms of life are found in the fossil state, adds to the importance of their accurate determination by the palæontologist. In studying specimens of, say, foraminifera, bryozoa, or small brachiopoda, it is necessary to turn the individual about in all sorts of manners to examine the appearances presented on all sides.

Now, one of the chief difficulties in dealing with such small specimens, whether of minerals or of fossils, is to find a convenient method of handling the object, whilst subjecting it to a microscopic examination. In holding the object in the hand, from the way in which one's hand persists in going in the wrong direction when one's attention is occupied with the specimen, it is more a test of patience than a process attended with satisfactory results. The absurdly simple contrivance described below, may, to a large extent, obviate this difficulty.

A sphere of wood, ivory, cork, or other suitable

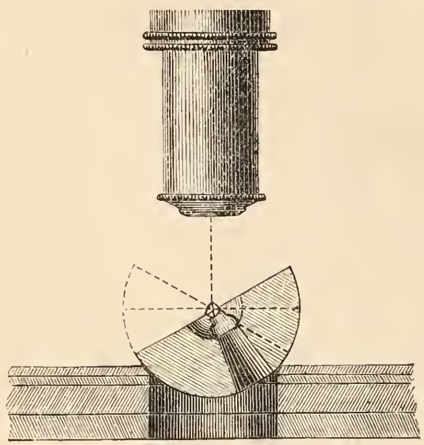

Fig. 28.

material of about $\frac{7}{8}$ in. diameter, is divided into two along the plane of a great circle. Each half is available for use, and out of each, a concentric hollow hemisphere, of less than $\frac{3}{8}$ in. diameter, is

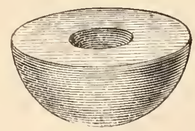

Fig. 29.

turned as shown in Fig. 29. By using a small piece of wax, the specimen to be examined may be so mounted that it is, as nearly as possible, coincident with the centre of the hemisphere, which can be placed, as shown in Fig. 28, over the central circular aperture of the microscope-stage. Seeing the edge of this hole touches the hemisphere in a circle of constant diameter, equal circular sections of the sphere are always cut off, no matter to what angle the plane of the great circle of the hemisphere be tilted. The circle, therefore, is always the same distance from the centre of the sphere, consequently, any object, mounted centrally, always remains at the

(*Continued on page* 56.)

SCHEDULE OF PARTICULARS OF THE DISCOVERY OF LIVE TOADS, FROGS, &c., IN COAL, &c.

Collected by W. S. Gresley, F.G.S., M.E.

Date.	Locality.	Colliery, &c.	Description of Animal.	Depth.	In what Material.	Under what circumstances.	By whom seen or found.	Peculiarities.	Remarks.
1795	Derbyshire	Bolsover Field	Live toad	..	$1\frac{1}{2}$-ton block of stone	Breaking the block	..	Died immediately	No crack or joint was perceptible. See Watson's "Derbyshire Strata," 1811, p. 2.
..	(?)	Eastwood Colliery, "Fire-Engine Pit"	Live toad	120 ft.	"Ferruginous grit"	..	Watson himself possessed it in a dried condition	Do.	See Watson's "Derbyshire Strata," p. 10.
..	(?)	Cowden, near Ashford	"2 toads alive"	..	Marble	Quarrying	..	Were 6 in. apart; died immediately	See Watson's "Derbyshire Strata," p. 44. This marble is carboniferous limestone.—W. S. G.
..	Caermarthen	..	3 small live toads	..	..	Quarrying	"A gentleman, who vouches for them"	In the solid rock	See "Jesse's Gleanings," 6th edit., 1845, p. 339.
1835	Ayrshire	Auckincruive	Toad	..	Under a coal-seam in ironstone	..	..	..	See "History of Fossil Fuel," 1835.
1840?	Derbyshire	Mapperly Village	Large, fat toad	Surface	A compact block of sandstone, say 6 cwt.	Breaking the stone for building a wall	Seen by Thos. Bradshaw	Lived a few seconds only	Bradshaw related this to W. S. G. in 1886. The stone was so hard and solid that it had to be split by wedges.
1846	Yorkshire	Near Pontefract	7 live frogs	4 ft.	(?) Limestone or sandstone	Excavating	..	Each frog in a separate mass or nodule of rock	Found in very compact rock entirely free from fissures or "backs," and required blasting. Frogs were in nodular masses between the sandstone and the limestone strata.
..	Derbyshire	Paswick	Toad	12 ft.	Large lump of iron ore (3 cwt.)	..	..	Died immediately	In a cavity near centre of block 6 in. diameter, lined with crystals of carbonate of lime.
..	Lincolnshire	Frodingham	Toad	5 ft.	Between two blocks of lias stone	Quarrying	..	No aperture in stone visible	
1856	Fife, N.B.	Dundonald	Frog	270 ft.	In freestone, the floor of coal-seam	Coal-getting	..	In a cavity; soon died	Found 400 yards away from the outcrop of the seam. Freestone peculiarly solid and free from joints. Size of cavity, 10 in. by 3 in. by 3 in., and lined with slime.
..	..	..	Toad	(?) 12 ft.	New red sandstone	(?) Quarrying	..	Lived two days	Was injured by the fall of the block of stone in which it was imbedded. On one side of stone was a flaw.
1851	France.	Blois	Large toad	3 ft.	In a flint weighing 14 lbs.	Well-sinking.	..	Toad exactly fitted cavity in very centre of nodule	No crack or flaw could be detected on exterior of the flint nodule.

1859	Somerset	Bridgwater	2 live toads	14 ft.	Stiff clay	..	..	..	Below clay a bed or peat. Toads close above peat.
1857	Derbyshire	Measham	A small yellow frog	51 ft.	"A kind of rock"	Sinking a pit	Richd. Shirwin, — Wright, and William Ellis	Jumped about when got out	A workman smashed it, and its inside was as black as ink. (Shirwin told W. S. G. about this.)
1860	Do.	Bailey Brook	Live toad	450 ft.	Underclay-floor of the "bottom hard" coal	..	..	..	German Buxton, now (1880) of Moira Colliery, informed W. S. G. of this find.
..	Lancashire	Near Ormskirk	Toad	108 ft.	A lump of coal	..	..	Revived on coming to surface	See "Coal Fields of Great Britain," by E. Hull.
..	Warwickshire	..	..	..	..	..	..	..	See "Coal Fields of Great Britain," by E. Hull.
..	Kent	Tunbridge Wells.	Live frog	7 ft.	A stiff clay	..	Owner of the surface	..	Was taken to London, lived several weeks, and then accidentally killed. See "Jesse's Gleanings."
..	..	..	Live toad	..	"A large and hard stone"	..	..	No visible aperture in stone	See "Jesse's Gleanings," p. 68. From "The Annual Register."
									Blumenbach, in his "Elements of Nat. Hist.," says that living toads have been found on sawing through blocks of stone, trees, &c.
..	Monmouthshire	Tyr Nicholas	Live frog	531 ft.	"Russell's New Rock Vein" coal	Coal-mining or (?) sinking	..	Coal-seam = 7 ft. 4 in. thick	See "Strata Book," No. 2. The property of W. S. G.
1865	Derbyshire	Ch. Gresley	Live newt	840 ft.	Underclay of "Little" coal	Holing coal "face"	One Adey and Henry Clamp	Jumped about until a man killed it	Henry Clamp, then a collier, vouches for this account. Adey found the newt.
1859	Do.	Do.	Live toad	840 ft.	Coal in lower part of a 12-feet seam	Coal mining	Robert Walters, the then manager	Died in two or three days	Henry Clamp, then a collier, vouches for this account to W. S. G.
1868	Notts.	High Park	Live newt	(?) 600 ft.	In "Top Hard" coal holing	Do.	Found by one Levers	Died before he got it home	John Tomlin (Granville Colliery) knows the man who found the newt.
1855	Derbyshire	Hallam	Live toad	..	Holing dirt under coal	Do.	Thos. Bradshaw	"Soft Coal" seam	Bradshaw himself told me this.—W. S. G.
1870	Salop	..	Live toad	..	Holing dirt under coal	Do.	..	..	Geo. Spencer, of Measham, told me this.—W. S. G.
1870	N. S. Wales	Plenty Valley, Victoria	Live frog	30 ft.	A block of hard tertiary clay	..	..	Measured $2\frac{1}{2}$ in. by $1\frac{1}{4}$ in.	At first blind and sleepy; after some weeks became very lively. A cat killed it. See "Engineering," Nov. 2, 1888.
1826?	Cheshire	..	Live toad	180 ft.	..	Sinking a pit	Hy. Finch, and one Miles	..	Robert Finch, Hy. Finch's son; a Moira man tells me this.—W. S. G.
1875	Scotland	Shield Muir Pit, Motherwell	30 to 40 live young frogs	330 ft.	Sandstone	Tunnelling	Mr. Wilson the manager, and other men	Frogs when released make at once for water	All present declared no crack existed in the block, but that the frogs were in a cavity in it. Pools of water lay about in the mine close by, and frogs went for them.

(To be continued.)

same distance above the stage, and hence never moves out of *focus*. And, because, in every sphere, a horizontal circle has always a vertical axis, the centre of the sphere must be vertically above the centre of the circular aperture of the stage; hence, no amount of rotation of the hemisphere can move the object out of *field*. The specimen, then, can be turned about in all sorts of ways, without the faintest chance of the observer being inconvenienced by its shifting, either out of field or focus, and, at the same time, permitting the use of objectives of fairly high powers.

By turning out a conical hole of the size and shape shown in Fig. 28, this simple contrivance may be employed in transmitted light, for adjusting sections of crystals, which are supposed to have been cut in any particular direction; but, which, as is almost always the case, only approximate what they are represented to be. Suppose, for example, a section of a doubly refracting, uniaxial crystal is required, normal to the optic axis. Then, by employing the hemisphere, the section can be so adjusted that its optic axis is exactly parallel to the line of collimation of the instrument.

Another simple addition I have found useful in the examination of imperfectly transparent mineral fragments. It consists of a hollow cone of blackened cardboard, made somewhat after the style of a Bunsen cone. The cone may be so placed that its wider end rests upon, and is concentric with, the stage of the microscope; whilst its narrower end above, loosely encircles the objective and allows of a limited amount of focussing down. Thus the stage with the cone may be freely and uninterruptedly revolved, and, at the same time, every trace of reflected light cut off. This appliance, which can be made of varying sizes to suit the various objectives employed, is especially useful in examining well-worn sand-grains of, for example, some pleochroic mineral, when it is obviously essential to be rid of all reflected light, seeing reflected light, would, in any case, be prejudicial to a correct observation of pleochroism, and in some cases, where the specimen is but imperfectly translucent, be sufficient to completely eclipse the very feeble amount of transmitted light.

Normal School of Science, South Kensington.

ABNORMAL GROWTHS ON FOREST-TREES.

The Beech Knot.

AMONG the many curious and abnormal growths which are found on branch, root, and stem of our forest trees, the above, the beech knot, is among the many curious and interesting.

I have of late, and on previous occasions, observed in some journals and papers a short notice of the above growths, attributing their origin to fungus, insects, accident, and such like. I have recently collected many specimens of the above abnormal growths and other tree excrescences and diseases. I have made a close study of them in many woods on many large trees, on various extensive properties where I have been engaged.

They are not previously treated nor illustrated in any journal, as far as I am aware; after a careful study of them, I shall, with the help of the following illustrations, try and interpret, in an intelligible way, what I consider to be the cause of their origin and after-development.

I have termed them the Beech Knot, because they are most numerously found upon that tree; but we find them common upon the oak, ash, elm, alder, chestnut, holly, evergreen oak. They are not due to insects, fungus, nor accident; but are perfectly

Fig. 30.

natural. Neither may they be taken as an indication of health nor disease, nor are they in any way attributable to any particular soil or situation. They are perfectly numerous on some trees; on others comparatively rare; some die off early and rarely attain the size of a pigeon's egg, while I have found some really large and remarkable specimens. How are they caused, is the main inquiry, and particularly, how do they grow? In the barks of our forest trees are contained a multitude of latent buds which are developed and grow under certain favourable conditions. Some trees possess this property in a remarkable degree, and often when the other parts are killed down by frost in severe winters, this property of pushing out these latent buds into growth often preserves the life of the plant.

These buds having once begun to grow adhere to the woody layer at their base, and push out their point through the bark towards the light. The buds then unfold and develop leaves, which elaborate the sap carried up the small shoot. Once elaborated, it descends by the bark, when it reaches the base or inner bark. Here it is arrested, so to speak, and deposited between the outside and inner layer of bark, as can be observed

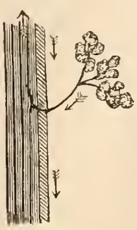

Fig. 31.

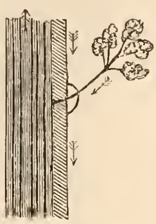

Fig. 32.

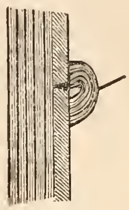

Fig. 33.

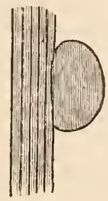

Fig. 34.

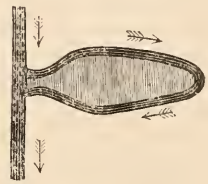

Fig. 35.

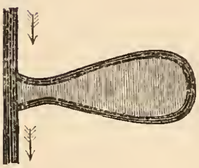

Fig. 36.

Fig. 37.

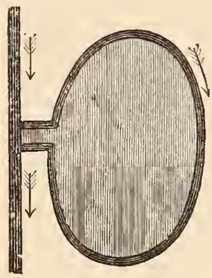

Fig. 38.

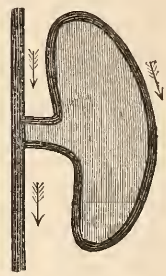

Fig. 39.

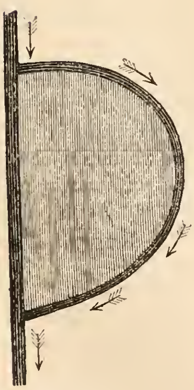

Fig. 40.

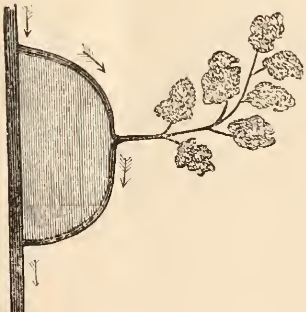

Fig. 41.

Fig. 42.

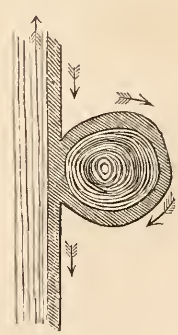

Fig. 43.

on examining specimens on trees in the wood almost anywhere.

Then this growth, as we shall see, is due to a defective circulation, because in these trees such as the ash, sycamore, and oak, where the shoots are more vigorous and strong, there are fewer knots found, because the strong growth of the shoot causes a better circulation.

First, we note the bark of the silver fir, and the base of the branch where it originally sprang from. Observe this is cf importance, for when the bark is expanding for the future layer of woody matter, if the base is not firmly connected, it is liable to be pushed out, and lose its connection inwardly. Then the knot may be said to be now entirely between the inner and outer bark; with a knot of woody matter; or, the woody layers and leaves.

In those knots that retain their hold at the base they are very liable to be enclosed in the future layers of woody matter, where they are found on sawing up timber. The knot may be said to have passed its first stage and is represented at Fig. 32, and, as we have observed, is first due to the buds and small shoots springing out of the bark. They are also fed by the leaves which they develop, as they generally lose their leaves about the second and third year. The shoots also dying back (see Figs. 33, 34, 35, 36, 37, 38, 39, 40). Then how do they grow and attain a large growth, seeing that they are deprived both inwardly and outwardly of any visible means of obtaining and manufacturing nourishment for their support?

I have shown in a former paper, how a root of a tree can grow and form layers of woody matter after being deprived of any visible means of obtaining nourishment. We have observed how the knot is formed. Once deprived of all visible means of obtaining matter by leaves of its own, it is fed by the bark, and will live and increase yearly in size, adding additional layers of woody matter, hence its growth, and will live and increase in size in this manner as long as the bark supplies it with matter. These growths are many times irregular and curiously twisted. The layers of woody matter when cut up and polished, present a beautiful surface. I have examined several hundreds of these knots of all ages and stages of growth. I have found at least the half of them have no connection inwardly, they have lost connection (see Fig. 43). They are seated between the bark, and are most easily knocked off the tree. At this stage any one can take a knife and pick out the inner bark which is between the knot and the layer of wood, and see this for himself.

Among the various forms to be found, these (see Figs. 34, 37, 40) are the forms most likely to live longest. These (38, 39), from their neck-like connection, are more likely to die off earlier, because the sap, when descending down the stem, does not circulate so freely around the knot as these others which have a closer and better connection.

It must not be supposed that all knots lose the shoots. I have found several instances (see Fig. 41), where both branch and knot continued growing. In time, the knot would be enclosed in the growth of the branch.

On some trees, for instance, the Cryptomeria, I have found knots of woody matter, not caused in the same way as these described, but due to branches which impede the sap and cause the bark to rise in folds, so to speak, which form knots of woody matter at such parts where there is a stagnation of sap and impediment to the free enlargement of the bark.

The Scotch pines, both those of a moderate and those of a larger size, are liable to curious knots. I had often wished for some trees to be cut so that I could get them dissected and examined. Latterly, by the effects of the great gales, this opportunity did come. I found that these growths (Fig. 30) were due to broken and pruned branches, particularly if two or three were quite close together. This caused a stagnation and irregular deposit of woody matter, at those parts which caused these curious growths. I have found some very large and remarkable examples of these growths.

The larch is not very guilty of such growths. I have found many instances of them. After investigating them, I found them due to broken and to pruned branches, which caused an irregular growth of the bark overlapping, so to speak, resulting in an irregular growth of the bark. The arrows in each figure, mark the course of the ascending and descending sap.

ROBERT COUPAR.

Ashford Castle, co. Galway.

COLOUR DEVELOPMENT IN LEAVES AND FLOWERS.

WITH regard to my quotations from Hermann Müller as to the visits of bees to the poppy and two periwinkles, Mr. Bulman cautions me that the absolute number of visits, not the number of species observed on the flowers, is the important point. This, of course, is quite true, but there is nothing to show that in the cases mentioned, the distribution of the total number of visits was not roughly proportional to the number of species; indeed, Müller's remarks seem to indicate that this was so. Mr. Bulman's own observations on the comparative number of insect visits to the chickweed and *Veronica Buxbaumii*, growing in the same garden, are interesting, and with his other observations certainly seem to tell against the theory. I do not, however, feel justified in giving up the theory of the production of blue flowers by the selective action of bees merely on the strength of these experiments, which are possibly capable of being explained away on a further knowledge of the conditions. With regard to Sir John Lubbock's experiments, the interpretation seems plain enough, that bees, from whatever cause, prefer blue to other colours, and as to the inconsistency with "observed facts," I must say that this is, in my opinion, far too comprehensive a phrase to apply to a difference of result arrived at by Mr. Bulman. At least, I hope, it is clear that the experiments upon which Sir John's opinion is founded are not a matter of "teaching" bees "to take honey off different colours"!

Mr. Bulman says that "it is hardly possible to be otherwise than dogmatic" upon questions touching "advanced" flowers. This may be so, but he immediately afterwards goes on to speak of the "lowly mark of symmetry," &c., and as he has ventured on to this dangerous ground, I must, in justice to the theory in question, follow him. To take first, then, his instances of highly developed flowers which are not blue. Mr. Grant Allen considers that the Orchidaceæ "have mostly got beyond the monochromatic stage altogether." As to the *Boraginaceæ*, I cannot consider them at all a primitive type, though they do possess "the lowly mark of symmetry." Their honey-concealing tubes, the various appendages to the corolla for excluding "unbidden guests," and other contrivances for ensuring cross-fertilisation, surely mark them out as highly developed. These are among the characteristics usually considered to constitute an organism "advanced" — increasing complexity of structure adapted to more perfect exercise of function: and because it is in some cases difficult to judge organisms correctly by this standard, that is surely no reason for giving up the word when there can be no doubt as to what it indicates. The *Campanulas*, again, though regular as to the shape of their flowers, may well be considered an advanced type, taking into account the adaptation of the bell-like form to the visits of humble-bees, the honey protected from many insects, the well-marked proterandry and subordinate contrivance for cross-fertilisation: the same may in part be said of the *Scillas*. As to the position of the Veronicas among the *Scrophulariaceæ*, a few words of Müller's throw some light on the question: "In spite of its apparently simple flower, *Veronica* is by no means a primitive genus among the Scrophularineæ; the symmetrical flower, the specially differentiated nectary, the reduction of the sepals and petals to four, and of the stamens to two, are all characters widely removed from the primitive type. The short-tubed species of *Veronica* must be looked upon as the more primitive, from which the long-tubed type of *V. spicata* has been evolved by the agency of bees and sand-wasps." The yellow iris is, I take it, a special case not yet understood; similar cases are ably discussed in the chapter on "Retrogression" in Mr. Grant Allen's "Colours of Flowers." From this I will quote the "hypothetical explanation" of the colours of the Ligulatæ, Mr. Bulman's last instance: "The primitive ancestral composite had reached the stage of blue or purple flowers while it was still at a level of development corresponding to that of the Scabious or the Jasione. The universality of such colours among the closely allied Dipsaceæ, Valerianeæ, Lobeliaceæ and Campanulaceæ, adds strength to this supposition. The central and most primitive group of Composites, the Cynaroids, has kept up the original colouration to the present day; it includes most of the largest forms, such as the artichoke, and it depends most of any for fertilisation upon the higher insects. Very few of its members have very small florets. All our British species (except the degenerate Carlina) are purple, sometimes reverting to pale pink or white, while *Centaurea Cyanus*, our most advanced representative of the tribe, rises even to bright blue.

Next to the Cynaroids in order of development come the Corymbifers, some of which have begun to develope outer ligulate rays. Here the least evolved type, Eupatorium, with few and relatively large florets, is usually purple or white, never yellow. But as the florets grew smaller, and began to bid for the favour of many miscellaneous small insects, reversion to yellow became general. . . . The Ligulates were again developed from yellow-rayed Corymbifers by the conversion of all the disk florets into rays. Appealing for the most part to very large and varied classes of miscellaneous insects, they have usually kept their yellow colour; but in a few cases a fresh progressive development has been set up, producing the violet-blue or purple florets of the salsify (*Tragopogon porrifolius*), the deep blue *Sonchus Alpinus*, and the bright mauve succory, *Cichorium Intybus*."

Mr. Bulman says that he is not at all satisfied that Müller intends in the words quoted by me about the appearance of red, violet and blue in flowers to assert that the most advanced flowers are usually of these colours. As Müller does not categorically state this, it is rather difficult, in the face of Mr. Bulman's warning about the use of the word "advanced," to show it. The general conception of the meaning of the word is, however, I believe, what I have indicated above; and there is no doubt that generally speaking "flowers whose honey is quite concealed and which are visited by more or less long-tongued insects" have undergone various and extensive adaptations of structure which fit them for the more perfect discharge of the function of fertilisation by means of these insects. The blue colour in *Hepatica* and *Verbascum* is to be explained as developed by the *Syrphidæ*, to which the flowers are adapted and which admire bright colours, being themselves brightly adorned, as the result of sexual selection. (Müller).

It is certainly rather startling to be told that a statement of Müller's in his "Befruchtung," "completely annihilates the whole Darwinian theory of the development of flowers by the selective agency of insects," when we consider that Müller seeks all through the book in question to explain the whole of the structures met with in flowers as the result of natural selection acting through insect agency. The fact is that Mr. Bulman has, not exactly misquoted, but given the wrong context to Müller's statement, which really runs: "that *in general anthophilous insects* are not *confined* by hereditary instinct to certain flowers, &c." (the italics are my own); while Mr. Bulman's version of it is "*bees* are not confined,' '&c., which is a very different matter. Keeping the italicised words in mind, we see that Mr. Bulman's argument about the "complete annihilation" of the Darwinian theory falls to pieces; for the phrase "anthophilous insects in general" is not synonymous with "bees," and to say that they are not "confined" to certain flowers by hereditary instinct is not at all the same thing as to say that they have no hereditary preference for certain flowers; yet this is the conclusion which Mr. Bulman has drawn. To enforce this obvious difference we have only to read another statement of Müller's: "The most specialised, and especially the gregarious bees have produced great differentiations in colour, which *enable* them, on their journeys, to keep to a single species of flower." I am afraid, therefore, that I cannot agree with Mr. Bulman that Müller's conclusions on this point would have been more in place in his paper than in mine.

Mr. Bulman then goes on to say, that he "cannot make out from what premises" my "remarkable conclusion" on the evolution of red and blue in flowers is drawn. Now it is quite obvious that the passage alluded to is not a "conclusion" in the logical sense at all; I should have thought, indeed, that it was perfectly clear that I had not attempted, and could not possibly have attempted in a paper of the length of mine, any *arguments* upon which such a conclusion could be based; but that I had simply pointed out the results obtained by two representative men on the subject, and indicated, in the passage referred to, their common conclusions. If, therefore, Mr. Bulman looked for "premises," it is not wonderful that he could not find them.

I am very sorry that Mr. Bulman finds it "an inscrutable mystery" how the facts and arguments of my paper are supposed to oppose his views. I am afraid that to convince him on this point is a task to which I am quite unequal, but I may remark here that, supposing it to be so, it is curious that he should think it necessary to write nearly nine columns, presumably with the object of refuting them.

As to Mr. Bulman's argument about the distrust of red which bees would acquire from visiting reddish buds and faded flowers, it seems to me that is based on an altogether unjustifiable assumption, viz. that bees, the representatives of one of the longest lines of descent among anthophilous insects, are so unintelligent as not to know the difference between a faded flower or a bud and a flower in its prime. Mr. Grant Allen does consider the *chemical* process in the faded flower analogous to that taking place at the appearance of variations, but it is surely clear that the new colours could not be evolved *from* colours appearing after fertilisation.

In conclusion, I must submit that Mr. Bulman has not made good his charges against the theory of colour development through insect selection; he has, I think, in the course of his attacks, revealed several points where our knowledge is not sufficient to enable us to speak authoritatively, but though there are very likely some details, such as, for instance, the supposed strict sequence of colour-development put forward by Mr. Grant Allen, which will have to be modified later, the general principle of the theory remains untouched. Apart from the *à priori* argument derivable from the theory of natural selection, the hypothesis must, of course, to have a firm basis, be established by the inductive method, and I do not think that, at present, the evidence is sufficient to establish it as a great scientific generalisation, though it has gone far in that direction. As Mr. Darwin said of his own great induction, of which this theory is but a comparatively insignificant branch, it must at present find its support chiefly from "connecting under an intelligible point of view a host of facts."

A. G. Tansley.

PARASITES OF THE WHITE ANT (BENGAL).

By W. J. Simmons.

THE depredations of the white ant in India have earned for it the hearty dislike of all classes of the community. Its reputation is so distinctly and exclusively evil that mischief is sometimes attributed

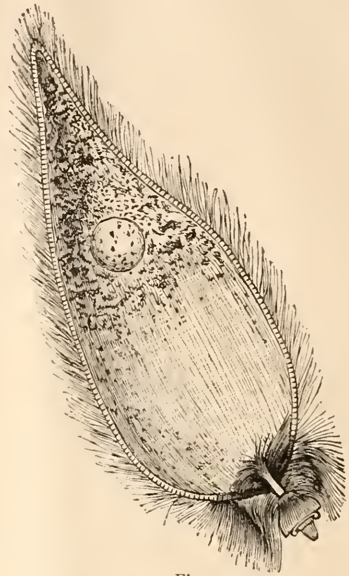

Fig. 44.

Fig. 45.

Parasite No. 1. The Figs. show the mouth—parts, ciliation, nucleus, and ingested particles of food. In Fig. 44, Trichocysts are observable.

to the poor insect which it could not by any possibility perpetrate. The story goes that the native record-keeper of a Mofussil Court, being unable to produce certain valuable documents, defended himself by solemnly declaring that their mysterious disappearance was due to white ants, which had not faction to many out here to learn that our termite does not get off scot-free; but that the relentless destroyer of books, clothes, furniture, papers, grain,

Fig. 46.

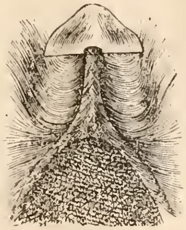

Fig. 47.

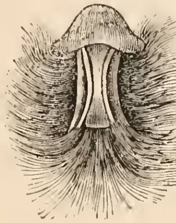

Fig. 48.

Fig. 49.

Fig. 50.

Fig. 51.

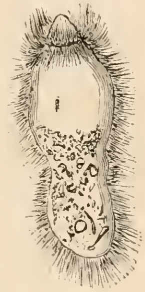

Fig. 52.

Fig. 53.

Fig. 54.

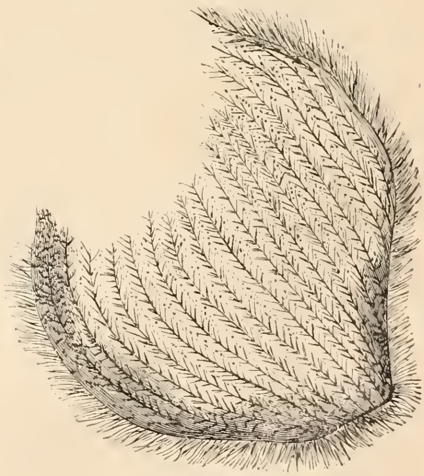

Fig. 55.

Figs. 46 to 54.—Specimens in which the hyaline cap is replaced by a hyaline sphere. Figs. 49 and 50.—Views of a form of mouth-parts differing slightly from those observable in Figs. 44 and 45. Fig. 49 is focussed for the surface, and Fig. 50 for the constricted interior of the "pharyngeal tube." Figs. 49 to 53.—Views of the Parasite in various amœba-like forms: ingested food-particles occupy the posterior portions of the infusorians delineated. Fig. 55.—Ruptured cuticle of parasite flattened out, as seen with Seibert's $\frac{1}{16}$th water immersion.

only devoured the missing papers, but had entirely demolished the very iron safe wherein they had been deposited! It is, therefore, a source of quiet satisfaction and even garden-plants, is himself victimised by parasites. The readers of your Journal in other parts of the world may also be interested in a short notice of work on the Infusoria which I have found in the intestinal canal of white ants in Calcutta.

These parasites are referable to the order Holotricha. They appear to differ specifically from the Infusorians, also Holotrichous, drawings of which from Professor Leidy's paper on the Parasites of the Termites, are reproduced in Plate xxviii. of Mr. Kent's "Manual of the Infusoria." The changes of form in the Bengal species are almost as Protean as in the Amœba (Figs. 49 to 52 and 53). The animalcule, which for want of a name I shall designate Parasite No. 1, is a strong and a rapid swimmer; in these respects its movements are suggestive of the Paramæcia (Figs. 44, 45, 46). The measurements of four of average size, taken after death, were as follows: (*a*) length $\frac{1}{125}''$, breadth $\frac{1}{200}''$; (*b*) length $\frac{1}{125}''$, breadth $\frac{3}{1000}''$; (*c*) length $\frac{1}{125}''$. breadth $\frac{1}{290}''$; (*d*) length $\frac{11}{1000}''$, breadth $\frac{1}{250}''$. The cilia at the anterior extremity are directed forwards, and being longer than those distributed over the body, they form a ciliary collar around what I take to be the mouth-parts of the organism. In some cases the cilia at the posterior extremity are slightly elongated, and form a more or less conical tuft; but in respect of length they do not approach the cilia of the collar. The body frequently shows parallel spiral markings, which may indicate the position of the cilia, or a ridged surface. I have observed what I take to be trichocysts in a few cases (Fig. 44), though I doubt if these are constantly present in the cortical layer of the parasite. There is a distinct and large nucleus, of circular form; but I have not yet detected any contractile vesicle, a feature this organism shares in common with the genera Trichonympha and Pyrsonema of Leidy. The body is generally gorged with food, identical in appearance with the contents of the alimentary canal of the termites in which the parasites occur. They appear, therefore, to live directly on the semi-digested food-contents of the intestine of their host. No one who has once examined the living active mass which inhabits the white ant will be surprised at the voracious appetite of that destructive insect! I have spoken of the "mouth-parts" of the organism, by which I mean an external hyaline cap, surmounting a narrow tube, perhaps pharyngeal, which is in most cases prominently located at the anterior extremity, and fringed by the ciliary collar (Figs. 49 and 50). It does not occur in all the parasites I have had under observation, and, moreover, in some instances the cap is replaced by a minute hyaline sphere (Figs. 46 and 54).

The tube which I refer to as being probably pharyngeal is constricted in the middle. In favourable positions it can be "worked down" through the hyaline cap (Figs. 49, 51), and it then resembles an oral opening. Such of the parasites illustrated in Professor Leidy's paper as have been reproduced in Kent's work have no mouth-parts resembling those observable in the animalcula which infested a large proportion of the white ants I examined; and there are other differences. I nevertheless express myself provisionally as to these organs being mouth-parts: I have not seen food pass into them, nor through the constricted tube, nor have I detected food in its immediate neighbourhood, indeed the dimensions of some of the ingested particles have been such as to preclude the possibility of their having traversed that tube, unless it be dilatable. From the identity of the food-stuffs in the parasite with those in the intestinal organs of the termite, we must infer with Mr. Leidy that an oral aperture exists; or else assume that temporary digestive cavities are formed, and the food particles involved as in the Amœba. The latter assumption, however, is scarcely tenable; the cilia appear to spring from a cuticle. I have paid some attention to this point, because it would be interesting to determine how the abundance of ingested food in the animalcule gains admission into its body. I have often observed the infusorian spinning rapidly on its longer axis without making, or seemingly even attempting to make progress forwards. Its revolutions have been too rapid to admit of my ascertaining whether or not it was feeding. Again, in swimming through the semi-digested food of the termite, the anterior extremity of the parasite often assumes the helicoidal form observed by Professor Leidy in *Trichonympha agilis*. Tentatively I incline to the belief that on one or other, or it may even be on both, of these occasions the animalcule is taking in food. In two instances I found parasites with two tubes terminating in a single cap, and I was at first disposed to regard this as evidence of longitudinal fission; but I have more recently obtained the animalcule in forms suggestive of reproduction by transverse fission, and it is obvious the subject needs further investigation.

Calcutta.

ASTRONOMY.

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

At the meeting of the Royal Astronomical Society held on the 11th of January, the Rev. S. J. Perry read a paper on the surface of the sun in 1888. Observations of the sun were made at Stonyhurst on 241 days in the year; the sun was without spots on 102. The number of days without spots is rapidly increasing. There were nine such days in 1886, twenty-nine in 1887, and forty-two in 1888. As a number of small spots in a group were observed on the last day of the year at the high latitude of 36° south, the minimum period is probably drawing to a close, as the appearance of such groups generally portends a new period of maximum disturbance.

A paper by Mr. I. Roberts on "Photographs of the Nebulæ in the Pleiades and in Andromeda," was read. A photograph of the nebulæ in the Pleiades, which was shown, was enlarged four diameters from the negative, which was exposed four hours, and was taken on the 8th of December, in which the structure within the nebula is well defined. An admirable photograph of the nebula in Andromeda had also four hours' exposure, and shows that the nebula is a bright central mass, which is surrounded by a stream of nebulous matter, spiral in form at a considerable inclination to the line of sight. These photographs were taken with a reflecting telescope of 20 inches aperture, and they agree with those taken with a 13-inch refractor by the brothers Henry.

Mr. Taylor, at Sir H. Thompson's observatory at Hurstside, has observed nine lines in the spectrum of the nebula in Orion, and two faint lines in the green in the nebula in Andromeda, also one faint line in the green in the nebula in Lyra.

In March, Mercury is a morning star in Capricornus.

Venus is an evening star, shining brilliantly in the north-west after sunset.

Mars is an evening star.

Jupiter is a morning star.

Saturn is a morning star.

March 5th, Venus will be at the least distance from the sun at 8 hrs. aft.

March 18th, Mercury will be at the greatest distance from the sun.

March 25th, Venus will be at her greatest brilliancy.

There will be no occultations of interest during March.

Rising, Southing, and Setting of the Principal Planets in March.

	D.	Rises. h. m.	Souths. h. m.	Sets. h. m.
Mercury ☿	5	5 44M	10 32M	3 20A
	12	5 36M	10 27M	3 18A
	19	5 29M	10 30M	3 31A
	26	5 23M	10 39M	3 55A
Venus ♀	5	7 33M	2 56A	10 19A
	12	7 11M	2 50A	10 29A
	19	6 48M	2 41A	10 34A
	26	6 22M	2 28A	10 34A
Mars ♂	5	7 25M	1 52A	8 19A
	12	7 7M	1 44A	8 21A
	19	6 48M	1 36A	8 24A
	26	6 30M	1 28A	8 26A
Jupiter ♃	5	3 31M	7 27M	11 23M
	12	3 7M	7 3M	10 59M
	19	2 43M	6 39M	10 35M
	26	2 19M	6 15M	10 11M
Saturn ♄	5	2 37A	10 15A	5 57M
	12	2 7A	9 46A	5 29M
	19	1 37A	9 17A	5 1M
	26	1 8A	8 48A	4 32M

NOTES ON NEW BOOKS.

A Monograph of the British Uredineæ and Ustilagineæ, by Charles B. Plowright, F.L.S. (London: Kegan Paul). Mr. Plowright is well known to the readers of this Journal, many of whom will remember with pleasure his numerous contributions on a subject to which he has ardently devoted many years of patient investigation. He has now laid students under a debt of gratitude by the publication of this handsomely got-up volume. The two natural orders of fungi here treated upon are perhaps the most interesting and common of any groups of fungi. Mr. Plowright deals very fully with their biology and life-history, also with the methods of observing the germination of their spores and of their experimental culture. To agriculturists particularly this work will prove invaluable, for the special subjects the author describes are those under which so many of their crops suffer. There are thirteen chapters, the last two of which, on "Spore Culture," and the "Artificial Infection of Plants," are deeply interesting. Then follow long and technical descriptions of the British species of these two orders. The work is illustrated with eight plates, containing a large number of exquisitely drawn figures illustrating the points of Mr. Plowright's work. We heartily recommend those of our readers interested in the subject to procure it for themselves.

Rock-Forming Minerals, by Frank Rutley, F.G.S. (London: Thomas Murby). Mr. Rutley is well and widely known as one of the best mineralogists and petrologists of the day. He has been equally successful both as a lecturer and a writer on these subjects. We are often requested by readers to recommend a work of this kind, and the notice of Mr. Rutley's book, therefore, will be a sufficient answer. It is admirably adapted to the wants of practical students, and the fact that it has been issued in a cheap form will make it none the less welcome to them. The author deals with the necessary apparatus, methods of preparation and examination, including examination by polarized light, optical axes, single and double refraction, reflection, and general microscopic determination. After having fully explained these methods of investigation, Mr. Rutley next leads the student on to learning the leading characters which distinguish the common rock-forming minerals from one another, and he gives such a detailed description of the various kinds, accompanied by illustrations, that no reader can fail to identify them by the aid of this book. It is illustrated by 126 woodcuts.

In and About Ancient Ipswich, by Dr. J. E. Taylor, F.L.S., &c. (Norwich: Jarrold and Sons). The Editor's position with regard to this handsomely got-up work precludes criticism; he may be allowed to state, however, that in it he has endeavoured to describe the origin and growth of an old English town. The palæolithic and neolithic inhabitants of Ipswich and the neighbourhood are referred to as far as material afforded. The author then proceeds with a chapter on "Roman Ipswich," and gradually traces the antiquarian and historic development of the town up to the present time. The work is printed on hand-made paper, and is embellished by fifty capital illustrations of the most picturesque and historic parts of this very old town, by Mr. Percy E. Stimpson. Two editions were simultaneously issued—a large imperial 4to., and a demy 4to. The number of the large-paper edition being limited, the price has gone up a guinea since the day of publication.

OUR SCIENTIFIC SOCIETIES.

[The Editor will be obliged, if, for the benefit of his numerous readers, secretaries of scientific societies will send notices like the following, also place and time of meeting.]

East London Natural History and Microscopical Society: President, W. Smart; Hon. Secretary, A. Dean.

Wakefield Naturalists' Society: President, J. Gerrard, Esq.; Hon. Secretary, W. Rushworth.

Manchester Working Lads' Association. Lads' Literary and Scientific Society: President, Sir Henry Roscoe, M.P.; Hon. Treasurer and Secretary, Mr. G. Devine; meeting room, The "Museum" Lads' Club, Mulberry Street, Hulme.

Huddersfield Naturalists' Society: President, J. H. Kirk, Esq.; Hon. Secretary, S. L. Mosley, Beaumont Park Museum.

Huddersfield Board Schools Natural History Society: President, J. W. Robson; Hon. Secretary, ; Conductors of Ramble, Mrs. H. Rawlings and Mr. S. L. Mosley.

Haslingden Natural History Society: President, Mr. Thomas Holden; Secretary, Mr. David Halstead.

SCIENCE-GOSSIP.

We have received from Mr. Cecil Carus-Wilson his paper on "Musical Sand," read by him before the Bournemouth Society of Natural Science. He enumerates the localities in which this sand is found, especially that of the Isle of Eigg. He shows that the musical sound is probably due to the grains, which are smooth, round, and nearly the same size, rubbing together. If any dust or water, or in fact anything which would in any way interfere with this rubbing together, is added the sound is at once lost. Starting on these data, Mr. Carus-Wilson set to work to make an artificial musical sand. Up to the time of reading his paper he had only succeeded in making a sand, which, on being struck "gave out the same characteristic 'swish' that we get from all musical sands when they become mute."

We have received Numbers viii., ix., and x. of the "Illustrated Manual of British Birds," by Howard Saunders. The illustrations are exceedingly truthful, and very artistic, and the letter-press is all that could be desired.

The experiment of founding a centre of University Extension in Chelsea has proved very successful. Mr. Lant Carpenter's lectures on "Electricity in the Service of Man" have proved extremely satisfactory. The Committee have arranged for a course on "Astronomy," with lantern illustrations, by Mr. J. D. M'Clure, on Friday evenings. There will also be an evening course on Tuesdays on "Wealth and Industry," by Mr. Llewellyn Smith. Dr. S. R. Gardiner will continue his Monday afternoon lectures on "Modern History."

The Rev. Arthur C. Waghorne has in preparation a complete list of the flora of Newfoundland and Labrador, as far as it is known, to be published the coming summer. Hitherto the most compete list has been that of Mr. Reeks, which only comprised 371 species, besides varieties. Mr. Waghorne's contains about 900 species of flowering plants, about 50 ferns, and over 250 mosses and lichens. His list will give the common English, and, as far as it is known, the common Newfoundland names. It will also include the flora of St. Pierre and Miquelon.

The January number of "Research" contains a capital portrait and biographical sketch of Mr. J. W. Davis, F.L.S., F.G.S., the now famous ichthyologist. Mr. Davis is only forty-three years of age, and he has had much work to do in his own commercial business, as well as public, municipal, and other work. Nevertheless, he has found time for original research of the most accurate and valuable kind, and "Research" is perfectly justified in according to this genial and hard-working Yorkshire amateur scientist that high meed of praise which those who know him best also know he best deserves.

B. B. Le T. will find an account of Lord Bute's beavers in "Notes and Jottings from Animal Life," by Frank Buckland.

The "Echo" states that Dr. Kruss, a celebrated chemist of Munich, has succeeded in decomposing cobalt and nickel—substances hitherto believed to be elements. There is one constituent common to both. Can readers afford further information?

Mr. Alfred C. Haddon writes from Thursday Island (Torres Straits) to "Nature," describing the employment there of the sucker-fish (Echeneis), in fishing for turtles. The natives make a hole in the caudal fin, or tail, of the fish, and fasten a cord to it, so as to make the fish secure. Another cord is passed through the mouth and out by the gills. By means of these two cords the fish is retained, while slung over the sides of the canoe, in the water. When a turtle is sighted deep down in the water, the front piece of string is withdrawn, and plenty of slack is allowed for the tail string. As soon as the sucking-fish spots the turtle, after swimming round it, it attaches itself to the reptile's carapace. Then a man with a long rope attached to his arm, dives into the water, and is guided to the turtle by the line which had been fastened to the sucker's tail. As soon as he reaches the turtle he gets on its back, passes his arms behind and below its fore-flappers, and draws up his legs in front and below the creature's hind-flappers. In this position he is rapidly drawn up to the surface, of course bringing the turtle with him. It is as good as a chapter of "Alice in Wonderland." On the arrival of the intrepid diver at the surface, the sucking-fish changes its position from the turtle's back to its plastron, from back to front. Then, Mr. Haddon tells us, after the gaper, or sucking-fish, has done its work in turtle-catching, it is eaten. That is thoroughly human. Nevertheless, he informs us, that the natives have a "great respect" for the gaper.

We have received an interesting paper on the "Evidences of the Antiquity of Man in Leicestershire" by Montagu Browne, F.G.S., Curator of the Town Museum, Leicester. The paper consists of four divisions. In the first, dealing principally with bone and horn, mention is made of a wattled well discovered in Leicester about fourteen feet below the surface of the ground, which, as our author shows, had most probably an origin long before the Romans occupied the site. The rest of the paper describes the implements, &c., found in the well, and on the various ground-surfaces above, and others found in the neighbourhood. Thus the second chapter deals of pottery, the third of bronze, horse-trappings, &c., and the fourth of stone implements, such as hammer-stones, or pestles, and querns. The most important remains are figured by the Collo-type process.

MICROSCOPY.

The Quekett Club.—The January number of "The Journal of the Quekett Microscopical Club" contains the following papers:—"On the Structure of the Valve of Pleurosigma," by T. F. Smith; "On the Formation of Diatom Structure," and "Some Observations on the Human Spermatozoon," by E. M. Nelson; "On some Remarkable Coccids from British Guiana," by S. J. M'Intire; "Notes on Mounting Diatomaceæ," by H. Morland; "On *Perophora Listeri*," and "On *Limnias cornuella*," by C. Rousselet.

Preparing Coffee-Bean for Sections.—Mr. J.'s failure in preparing a coffee-bean for section-cutting by soaking in water, is probably due to his neglecting to destroy its vitality. This may be effected by soaking in methylated spirit, or in a one-per-cent. solution of chromic acid in water, and then it may be prepared as Dr. Marsh recommends. —*Ernest O. Meyers, Hounslow.*

"The Journal of Microscopy" for January is to hand. The following are the most important papers:—"The Nutritive Processes in Saccharomyces," by Henry C. A. Vine (illustrated); "Microscopical Imagery," by Dr. Royston-Pigott (illustrated); "Spider Gossip," by H. M. J. Underhill (illustrated); "Development of the Tadpole," by J. W. Gatehouse, Part v. (illustrated); "The Mammalia: Extinct Species and Surviving Forms," by Mrs. Alice Bodington (illustrated), besides an abundance of interesting notes, &c.

Folliculina Boltoni.—I am pleased to say I have found this curious and interesting infusorian this month (Feb. 1) in fairly considerable numbers in a pool in the suburbs of Birmingham. Named after the late Mr. T. Bolton, its original discoverer, it seems to have been so seldom seen at any microscopical society's meetings, that I am very pleased to again come across it; its rarity possibly is more apparent than real. I have only found it once before, and then only one. No doubt its extreme timidity has something to do with its so seldom being seen by any one. I can only get it to show itself by patiently waiting, and allowing it to stand a time in the trough in which I have placed it. It is easily mistaken when retracted for a platycola, but when once it appears its identity is plainly manifest. It is interesting from the fact of its being our only freshwater representative (so far) of the folliculinas, all the others being marine forms; it much resembles also *Freia elegans*, only its peristomal lobes are unequal, one lobe, the left, being about twice the size of the other; also in *F. Boltoni* the lip of the lorica is even, not everted. Saville Kent's figure hardly does it full justice, I fancy. I have examined about twenty specimens, and none of them fully represent his sketch. They are represented by Kent as $\frac{1}{200}$ in. in length, but my specimens measured rather more by the micrometer and crossed line ocular. It comes out well by good dark-ground illumination with a $\frac{2}{3}$-in. objective; I think you see (in this case) rather more detail than by direct light. —*E. H. W., Edgbaston, Birmingham.*

New Automatic Regulator.—Mr. J. H. Steward, 406 Strand, London, has brought out a new small-size automatic regulator for use with the limelight. As will be seen by illustration, it is fitted with a cap, cylindrical in form, and inside this is an indiarubber bellows, fitted top and bottom to metal discs, the upper one being acted on by a spiral spring, and the lower attached to a pair of lazy levers connected to eccentrics that open and close valve of cylinder. When the bellows is full, the opening from valve of cylinder is closed, and, when partly or wholly empty, is partly or wholly open; in this way a constant supply is kept in this miniature bag, and the pressure is always equal right up to the last atom of gas. The spiral spring is of the strength that, after considerable experiment, has been found to be perfect for either triple, bi-unial, or single lanterns,

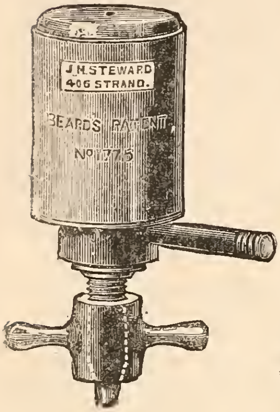

Fig. 56.

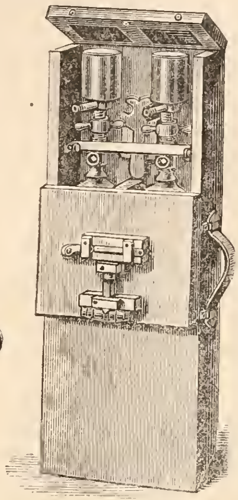

Fig. 57.

but for special purposes, lighter or stronger springs can be fitted, it being readily done by simply inserting them in their seatings after unscrewing the brass cylindrical cap of regulator. This valve will doubtless be appreciated by all those who use the oxy-hydrogen lamp with the microscope.

ZOOLOGY.

Parasite on Arvicola Arvensis.—Has Mr. C. F. George noticed the singular situation in which a parasite resembling *Laelaps arvolica* occurs, viz:—the tail of the short-tailed field-mouse (*Arvicola arvensis*)? Some time since, whilst preparing for the microscope the skin of this member, I was somewhat puzzled by the discovery of sundry oval bodies, apparently adherent to the hairs, and which at first I took to be the eggs of some creature. A closer inspection, however, revealed the fact that they were oval cavities, in the substance of the skin, in each of which was snugly ensconced a mite, which fitted its cell as closely as does the unhatched chick the egg-shell. At the time I failed to distinguish the form of the parasite, but was, subsequently, fortunate enough to find one or two sluggishly perambulating the surface, and this after being submitted to such rude treatment as the following: First, the skin was brushed with a very hard brush, to remove all adherent particles; it was then submitted to a scrub in a strong soap lather; rinsed; again brushed with a stiff brush; soaked in water for some hours; stretched; and finally subjected to pressure until quite dry. Yet, upon examination, sundry of the parasites were, as stated, discovered still living, although not particularly active. I regret that inexperience in the study of these parasites precludes me from determining whether or not this particular mite is identical with that figured by Mr. George, and, unfortunately, the immersion of the tail in balsam, and consequent obliteration of many of the creature's distinguishing features, renders identification next to impossible.—*Edward H. Robertson.*

Acalephæ (Physalia).—I have received a very fine specimen of the Portuguese man of war, Acalephæ (Physalia), a kind of Medusa. This marine animal, which is a very fine one, I have not seen on our South Devon coast for over fifty years. I remember gathering when a boy, after a long southerly gale, nearly twenty of them, and having my sleeves turned up, I placed them in my arms, and was fearfully stung by them, until the doctor applied remedies, which gave me relief, so I have cause to remember the occurrence. I should like to know if any one (reader of Science-Gossip), has seen these marine animals on our coast this winter. The animal was found at the back of the Ness rocks, Shaldon, near Teignmouth, and given to me by a Mr. Woodhouse, who was staying at Col. Brines, the Ness House, Shaldon. I have kept it in a large glass vessel, and hundreds of persons have been to see it. The colour of the tentacles was a beautiful deep blue, and they were about sixteen inches in length. The floating part, with the body of the animal was about six inches in length, of a sky-blue colour.—*A. J. R. Sclater, M.C.S., Bank Street, Teignmouth.*

Deilephila Galli.—I have a specimen of this moth which was caught here in 1887.—*Henry Lamb, Maidstone.*

Dysthynia Lactuosa.—I caught a single specimen of this little noctua on the N. Downs, near Maidstone, last summer.—*Henry Lamb, Maidstone.*

Anodonta cygnea, Linné.—To be classed with a conchologist of such long standing as Dr. Henry Woodward is indeed an honour, and one to which I make not the slightest pretension. Mr. Williams cannot have read my note with any more care than did Mr. George Roberts, or he would have seen that the singular number, "variety-monger" was used, and he would not have placed the following atrocity, viz. "variety-mongerers," in inverted commas, as if it were a quotation from my note. It is only in fairness to myself, believe me, that I mention a single grammatical blunder. Further, the pretence is made, and very clumsily made, that my wish was to constitute *Anodonta anatina*, a variety. Now the word I used with regard to this form was "variation," and it will be seen directly by those who "understand why and wherefore the term variety was instituted," that, even had I the impudence, in my wildest dreams, to think of dogmatizing to the slightest degree, there would not be many grounds to go upon, though, according to the "modern" shell-collector, that would be of little consequence. The anatomical differences described by Mr. Lloyd * resolve themselves on reference to the following assertion: "In *Anodonta anatina* the branchial cavity is not only comparatively, but actually much larger and fringed with much more delicate and numerous tentacles than in *Anodonta cygnea*." No details are given, no statement of how many specimens of each form were examined, and no measurements are recorded. Perhaps the words "had you been a little more modern," mean had you taken the trouble to look up trivial references, very recently? If, however, Mr. Williams should be able to dissect the two forms, and to find out any real anatomical differences between them, "then"—returning the compliment—"when he has gained a scientific knowledge of what he is talking about we shall be pleased to hear from him again."—*Wilfred Mark Webb.*

Perforating Birds'-Eggs.—Your correspondent signing K. D. will find that by stopping the holes in his birds'-eggs, he will prevent the moth and other insects getting into the shells. If the eggs are not stopped, and there is the least moisture left in them, the moth will very probably find its way in and spoil the shell by eating away all the inside membrane. I have a large number of species all stopped, and I have never but once found a moth in any of them, and, in that case, I must have stopped the moth in. The egg was sent to me from a distance. I now examine all blown eggs which come in, and in one egg I found a moth had established itself during the short journey from Nottingham. If K. D. intends being a large collector, I recommend him to use a pair of common bellows for blowing eggs, as they save so much lung power. The rough apparatus which I made two seasons ago, consists of a pair of bellows, with about eighteen inches of elastic tube, one end being bound to the nosel and at the other end a glass blow-pipe. With this simple machine I have often blown from fifty to one hundred eggs, with no other exertion to myself beyond holding one egg in one hand, and the blow-pipe in the other. It will blow eggs cleaner and much more quickly than they can be blown in the old way, by the mouth.—*Joseph P. Nunn, Royston.*

The Activity of the Moth Kind.—In the summer of 1865, I was a young and ardent entomologist, and my curiosity was drawn to marvellous restlessness of the moth kind, whose occupation lay amongst the flowers of a Hampshire garden. On the nineteenth and twentieth of July, I entered a memorandum. *Byophila perla*, *Triphœna interjecta* and the humming-bird moth have lately connected the flight of the day and night vagrants. *Interjecta* commences its nimble motion a little before sunset glows in the trees, and when twilight falls the Bacchanalian Gamma moth comes swarming to the blooms, having spent the morning with me on the commons and meadows where it usually sleeps at noon. I watched them pilfering the petunias until the lights went out at midnight, and descending into the garden at the chilly hour that precedes the dawn, I came on one that loitered at the revels, leading me to suppose it had drunk both long and deep. As its friends were absent I conclude that they were overcome with the morning drowse. I eschewed the company of Gamma until this season, when, observing a noonday sleeper on a wheat stalk, half way between Ramsgate and Margate, I was tempted to snip his perch and bear him away in order to show his pretty ruff and silver *g*. I had carried him a good mile by the milestones, when awakening to suspicion he bethought him to play truant and skipped away.—*A. H. Swinton.*

Balia Perversa, var. Irridula, Jeff.—On November 23rd last, I took four specimens of this variety from under the bark of old holly bushes in this parish. Has it been previously recorded from Great Britain? The only locality I find mentioned for it in Jeffreys' "British Conchology," and Rimmer's "Land and Freshwater Shells," is the neighbourhood of Cork.—*John Hawell, M.A., Ingleby Greenhow Vicarage, Northallerton, Yorks.*

BOTANY.

Notes on the Flora of the Wye.—It was my good fortune to spend my holidays this year in the beautiful Wye valley, when, in spite of the dull, rainy weather which characterised the summer months, I obtained a very fair list of the West of England plants. Making the pretty market town of Ross my centre of operations, I made frequent excursions to the outlying districts. A list of some of the characteristic plants of the neighbourhood will show more clearly than I can hope to describe, the wealth of vegetation to be met with here. Symonds Yat is a rocky gorge of precipitous limestone cliffs, richly and densely wooded from the rugged ivy-grown summits down to the base, where the Wye alternately glides deep and silent between steep banks, and tears itself into foam over the sharp stones that form its bed, with a noise like that of a cataract, as it spreads itself out over the shallows. It is difficult to imagine a more beautiful and verdant spot. The banks and dells are carpeted with mosses in infinite variety. There are

* "Annals and Magazine of Natural History," vol. v. (1870) pp. 65–6.

long tufts of dark Polytrichum, elegant mosses of transparent Mnium, and vivid Dicranum; cushions of hoary Grimmia and rare Orthotrichum on the jutting rocks; a mantle of feathery Hypnum spread over the ground and rocks. The cliffs have great pendent masses of the undulated foliage of *Neckera crispa* and its near ally *complanata*; while a profusion of *Asplenium trichomanes* fills up the clefts. A few minutes' search at the foot of the slope and *Cephalanthera ensifolia*, *Melica uniflora*, and its elegant little relation, *nutans*, *Luzula Forsteri* and *pilosa*, *Orchis maculata*, *Listera ovata*, *Epipactis latifolia*, *Cardamine impatiens*, Conium, Viscum, and a host of others are in my portfolio. Mounting by a steep intricate path, I find the gooseberry looking indigenous, the maple, cornel, *Viburnum Lantana*, and *Opulus*; reaching the top of the Yat, the pretty *Valeriana dioica* in a stream, *Lysimachia nemorum* and *Luzula multiflora*; in the boggy road, Milium, *Luzula maxima*, and the fox-glove in abundance are followed by the lady-fern, *Filix-mas*, *Oreopteris* and *dilatata*, *æmulum*, and the oak-fern are not uncommon among the rocks. Once more descending the slope, I find *Ophrys apifera*, *Habenaria chlorantha*, *Hieracium boreale*, *Allium ursinum*, *Lithospermum arvense*, *Carex remota*, and *muricata*. There is also plenty of *Hypericum montanum*, *hirsutum*, and *Androsæmum*, *Bromus erectus*, and *Geranium lucidum*. *Atropa belladonna* still grows about here, a specimen from near the Wye was gathered for me by a cottager. On the Coldwell Rocks, *Paris quadrifolia*, mostly five-leaved, *Daphne laureola*, *Vinca minor*, *Veronica montana*, Cotyledon; on a tree, *Chrysosplenium oppositifolium* on the edge of a fountain in the rock, were found, with *Valeriana officinalis* and a plentiful growth of woodland herbs, woodruff, sanicle, hemp, agrimony, speedwells, polypody, galia in many species. By the river, *Mentha rotundifolia*, *Thalictrum flavum*, *Rhinanthus*, and *Stellaria umbrosa*; climbing over the bushes *Valeriana sambucifolia* were common on the banks and in the wood. On the slope opposite, *Ophrys muscifera*, *Chlora perfoliata*, *Sclerochloa rigida*, were yielded after a little search. Space forbids me to notice many interesting plants, but some idea of the abundant flora may be gathered from the fact, that nearly all the above were found within half a mile from the station, and all within a mile and a half. About Ross a few plants worthy of notice may be found. The soapwort, *Stellaria nemorum*, *Ægopodium podagraria*, *Onopordum acanthium*, *Ranunculus arvensis*, *fluitans*, *Allium compactum*, *Œnanthe crocata*, *Potamogeton* in numerous species with other such plants as may be found on most river-banks. At Tintern, among an abundant flora, *Euphorbia striata* takes front rank, it is still plentiful both by the river and roadsides. Altogether the above localities yielded nearly four hundred species, omitting *rubi*, *rosa*, and numerous species of *Potamogeton* which I have left for another year.—*H. W. Monington.*

The Sunflower.—Mr. G. Wheatcroft asks you about this flower turning its face to the sun. I had many opportunities of watching them some years ago, and my conclusions were that they did turn their heads with the sunlight. The one that your correspondent observed as not turning was probably in the shade, as even a tree acts upon the flower and stops the motion. All the light that can be got is required by this flower to bring its seed to maturity, and this is dependent on the light falling full on the flower. It is no freak and no marvel; it is a necessity; but man has not dived into the causes of the visible actions around him. Sunlight is always with us somewhere, and without it no vegetation reaches perfection; yet all grow to the light; oats in Italian cellars stretch their long white heads to the window; yew-trees on our open downs grow slender in their own shade, while their foliage extends chiefly to the south and east. Plants in our windows all stretch their tendrils to the light, yet no two seem to accept it in the same way. Colour has much to do with this, aided by the constituents of the body; all of this is formed of water attracted as sap from root to highest leaf, and this foliage gives the plant its body, its flower, its fruit, and its seed. All is done by the wondrous powers of light. The sunflower is not the only one that shows its lore; there are many that shut their petals as evening draws on, and I have heard tropical forests awakening with an audible murmur as the rising sun fell on their resting foliage. It was these visible actions that led to the publication of "Sunlight," where it is treated as a motor, with force enough in itself to create this earth from gaseous or nebulous matter more or less sensitive in its constituents to light, while in its whole it became the heterogeneous mass we live on, accepting light as a cause, and giving out warmth from that absorbed light to a zone extending some four or five miles above, and below the sea level. While science is occupied in useless endeavours to make their ends meet from the nearly ruined Nebular hypothesis of Laplace, a few outsiders are studying nature, and are coming to the true conclusion that sunlight rules this world now and was the cause of its creation. Hence vegetable and animal must have light. The more we study the subject, the more we see of that lore which dominates all the sunflower kinds.—*H. P. Malet.*

Clifton Botany.—My criticism on the list of Clifton plants furnished to Science Gossip by "Wayfarer" has been acknowledged by the author with such excellent temper that I am sure he will permit me to represent that "deliberately mis-stated precise localities" for plants, be these correctly named or not, must in effect be entirely pernicious. No useful purpose can be served by publishing the most pleasantly-written account of discoveries made under impossible circumstances. Grabbers of rarities and exterminators can be effectually baffled without making meadow-rue to flourish on solid limestone; or stirring the bile of plodding botanographers by defining habitats which turn out to be several miles distant from the spots where specimens were actually observed. Slips of the pen seem innocent and harmless, but unluckily they retain vitality enough to pass from book to book, gathering authority as they go, long after the possibility of taking the careless writer to task has passed away. If not shot at first sight, such lapses are hard to kill.—*Jas. Walter White, Clifton.*

GEOLOGY, &c.

"Geology and Mining Industry of Leadville, Colorado, with Atlas," by Samuel Franklin Emmons (Washington: Government Printing Office). This voluminous and well got-up volume (which forms the eleventh vol. of the "Monographs of the United States Geological Survey"), sustains the high reputation earned by the preceding volumes. The author (Samuel Franklin Emmons) opens with a topographical description of Leadville; its position, discovery, and development. The narrative of the discovery of gold here, and the subsequent rush to the gold-fields is most interesting, and the stories of the fortunes made there, make a poor editor's pockets feel very light. Mr. Emmons describes the microscopical and chemical composition of various rocks and minerals associated with the district he has so well studied. The volume is artistically illustrated throughout, and a very useful geological atlas is added. One of the most important chapters is that on the Composition of Vein Materials and the Origin of Ores. This important contribution to mineralogical and geological science extends to nearly 800 pp. quarto. We cannot but compare the generosity with which the United States Government send out gratuitously to English scientific journals, with the beggarly conduct of our English Stationery Office, which does not even send out for review to the English Press any of the scientific volumes, brought out at such vast expense either by our own Geological Survey, or of the "Challenger" Expedition.

Misconceptions regarding the Evidence which we ought to expect of former Glacial Periods.—Dr. James Croll, F.R.S., recently read a paper on the above subject before the Geological Society. He said the imperfection of the geological record is greater than is usually believed. Not only are the records of ancient glacial conditions imperfect, but this follows from the principles of geology. The evidence of glaciation is to be found chiefly on land-surfaces, and the ancient land-surfaces have not, as a rule, been preserved. Practically the several formations consist of old sea-bottoms, formed out of material derived from the degradation of old land-surfaces. The exceptions are trifling, such as the under-layers of coal-seams, and dirt-beds like those at Portland. The transformation of an old land-surface into a sea-bottom will probably obliterate every trace of glaciation; even the stones would be deprived of their ice-markings; the preservation of Boulder-clay, as such, would be exceptional. The absence of large erratic blocks in the stratified beds may indicate a period of extreme glaciation, or one absolutely free from ice. The more complete the glaciation, the less probability of the ice-sheet containing any blocks, since the rocks would be covered up. Because there are no large boulders in the strata of Greenland or Spitzbergen, Nordenskjöld maintains that there were no glacial conditions there down to the termination of the Miocene period. The author maintained that glaciation is the normal condition of polar regions, and if these at any time were free from ice, it could only arise from exceptional circumstances, such as a peculiar distribution of land and water. It was extremely improbable that such a state of things could have prevailed during the whole of the long period from the Silurian to the close of the Tertiary. A million years hence it would be difficult to find any trace of what we now call the glacial epoch; though if the stratified rocks of the earth's crust consisted of old land-surfaces, instead of old sea-bottoms, traces of many glacial periods might be detected. The present land-surface will be entirely destroyed in order to form the future sea-bottom. It is only those objects which lie in existing sea-bottoms which will remain as monuments of the Post-tertiary glacial epoch. Is it, then, probable that the geologist of the future will find in the rocks formed out of the non-existing sea-bottom more evidence of a glacial epoch during Post-tertiary times than we now do of one, say, during the Miocene, Eocene, or Permian period? Palæontology can afford but little reliable information as to the existence of former glacial periods. In the discussion which followed, the president considered that the author underrated the amount of old subaerial surface. Many freshwater deposits, such as the Wealden, were fluviatile and hence subaerial. And if glacial materials had then been in the neighbourhood they would have been preserved. Professor Prestwich thought if glacial periods had formerly existed we should not be dependent only on land-surfaces, but the molluscan fauna of the Arctic seas, and the glacial debris and boulders spread over the bed of those seas would bear evidence of analogous conditions. We had in India and Australia some evidence in favour of such conditions in Permian and Carboniferous times, but these even were not yet fully established; and as to Eocene and Miocene times, he knew of no evidence. Dr. Evans said, whether the theory were true or not, glacial conditions must in all probability have prevailed in some parts of the globe during all periods, though probably not always in the existing centres of glaciation; and of these former glacial conditions some evidence was already forthcoming. The alleged misconceptions did not seem to him to exist, unless to a very small extent; Professor Seeley observed that in this case it was unsatisfactory to have to deal mainly with negative evidence. As Dr. Croll has not attempted to estimate the significance and origin of the boulders which occur in many geological deposits, we are not bound to do the work for him. Every geologist admits that glaciation would be a necessary incident in any period of time if the land were high enough. Boulders thus formed on land might be imbedded in a marine stratum when the land was subsequently depressed without indicating their age or origin. The contention for glacial periods was superfluous.

The Antiquity of Man in America.—We have received a copy of Dr. C. C. Abbott's address on the above subject delivered before the Cleveland Meeting of the American Association for the Advancement of Science (Section of Anthropology) in August of last year. Dr. Chas. C. Abbott entitles it the "Evidences of the Antiquity of Man in Eastern North America." This evidence consists almost entirely of the stone implements which have been found in such abundance in the Trenton Gravels in the Delaware valley. Dr. Abbott shows that the implements made of argillite are not, as has been supposed of Indian origin, but date back far previous to the occupation of America by the Indians to a time when they were manufactured by man coeval with the mammoth and the mastodon, and when the climate of Greenland extended to the mouth of New York Harbour. That the argillite implements were not made by the Indians, nor the flint and jasper ones by Paleolithic man is shown by the fact, that, except where they have become associated by subsequent cultivation of the soil, the two are seldom found together, the Indian implements occurring in the surface soil, while the paleoliths are found in the gravels. The theory of the Esquimaux being the descendants of the paleolithic men of North America is upset by three skulls found in the Trenton gravel. These skulls are unlike either those of the Esquimaux or those of the Indians.

NOTES AND QUERIES.

Migration of Butterflies.—This "Indian summer" has closed with a heavy thunderstorm that raged all last night. Just now the air down here is perfectly still, not a leaf stirring, but looking up we can see by the motion of the clouds that a current of air is coming from the north. Borne along by it are hundreds of butterflies, some flying so high that they only appear like black specks on the fleecy white clouds, but all moving onward as if with a fixed intent. They fly with a rapid movement of the wings, now and then soaring and floating on the air, and so are carried onwards until the rapid motion begins again. Unless you saw them, I think you would hardly believe how high these small creatures fly, and how strong they are on the wing. This migration of butterflies is nothing new to us. Every year about this time we have what we call "a butterfly norther." One year it was stormy, and the butterflies blown about, settled in hundreds on the trees about our home. One large white oak was covered with them, and when the sun shone out they looked monotonously beautiful as they opened and closed their fire-coloured, silver-lined wings. I should like to know whence they start, and whither they go. Wherever they are born, in their larval state, they must commit great havoc on the foliage. It is a curious fact that these clouds of butterflies always consist of this one species. I will try and get one and send it as a specimen, and shall be greatly obliged if any reader of Science-Gossip will name it for me. While I write they are still coming from the north, and passing high over our heads on their journey south, they have been doing so all day; some that are flying lower seem disposed to settle, so I hope I may secure one to send. Several people in different parts of this country have also noticed this yearly migration of butterflies.—*J. W. B. Blunt, Kerr Co., Texas. November*, 1888.

The Sheep Panic near Reading.—We beg to call attention to a remarkable circumstance which occurred in this immediate locality on the night of Saturday, November 3rd. At a time as near eight o'clock as possible the tens of thousands of sheep folded in the large sheep-breeding districts, north, east, and west of Reading were taken with a sudden fright, jumping their hurdles, escaping from the fields, and running hither and thither; in fact, there must for some time have been a perfect stampede. Early on Sunday morning the shepherds found the animals under hedges and in the roads, panting as if they had been terror-stricken. The extent of the occurrence may be judged when we mention that every large farmer from Wallingford on the one hand, to Twyford on the other, has reported that his sheep were similarly frightened, and it is also noteworthy that with two or three exceptions the hill-country north of the Thames seems to have been principally affected. We have not heard, nor can any of the farmers give any reasonable explanation of the facts we have described. The night was intensely dark, with occasional flashes of lightning, but we scarcely think the latter circumstance would account for such a wide-spread effect. We would suggest the probability of a slight earthquake being the cause, but, perhaps you or some of the readers of Science-Gossip may be able to offer a more satisfactory explanation.—*Oakshott & Millard.*

Centipedes.—I have been greatly interested in Miss Gould's article, and should much like to see a complete list of the British species, with short hints by which to distinguish them, or be referred to a work giving this information. Some are probably local. I have turned over a great number of stones and sought in other likely places when searching for mollusca, but I never remember to have seen either No. 4 or No. 7 in the illustration. My experience with *Geophilus electricus* is that it gives much more light than the glow-worm; I remember seeing one among grass on a road side, the surrounding grass was also luminous and my fingers became so on capturing the animal.—*W. A. Gain.*

Herring in Shore.—A friend and I had our holidays at the sea-side on the 10th and 11th August last, and had some sport, fishing among the rocks. One of the fish we caught was a saith, which we cut up and found two large herrings in its stomach. To all appearance it had just caught them in the pool where we were fishing; they were entire and fresh. The herring were near the shore. The Banff and

Macduff fishermen shot their nets at from one to three miles out, and had good average catches.—*W. Sim, Fyvie.*

CATS.—Mr. Mattieu Williams's note in the last number of SCIENCE-GOSSIP anent "Cats at the British Association," reminds me that at the little village of Dinas Powis, about four miles from Cardiff, a Manx cat was introduced to the neighbourhood very many years since and long ago went the way of all flesh. Nevertheless, to this day, individuals appear minus the caudal appendage, while its brothers and sisters adopt the prevailing fashion of cats in general, and appear fully equipped in this particular.—*W. H. Harris, Cardiff.*

PIPS GERMINATING.—I see in a recent SCIENCE-GOSSIP an account of a lemon pip germinating inside the fruit. The following came under my notice. Early in September of last year, my wife, having cut a lemon in two, was surprised to find in one of the halves what she supposed to be a piece of stick, which she took out and threw away. On examining the pips, &c., in the strainer after the juice had been strained, she found one of the pips with a root. On being told this I searched for the supposed piece of stick, and found it to consist of a plumule about three inches long, part of which was green, and two leaves, $\frac{3}{8}$ inch by $\frac{1}{4}$ inch, also green. The light must have penetrated through the rind, or how comes it that the leaves were green? I have mounted the specimen, which I shall keep as a curiosity.—*J. Taylor.*

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.

G. F. STUTTON.—If possible, we reply to queries sent us in the following month, but many objects have to be sent to specialists to name, and we have to wait their time. See the column in the "Wesleyan Naturalist." Get Stank's "British Mosses," coloured plates.

M. P.—Get Thorne's "Botany," published by Longman, price 4*s.* 6*d.*, for details of structure, &c., and the vol. published by the Christian Knowledge Society, "Flowers of the Field," by Mr. Johns, for figs. and descriptions of British plants.

J. J. HOLSTEAD, AND OTHERS.—There ought to be no difficulty in your getting SCIENCE-GOSSIP earlier now. We are publishing it a week earlier this year than before.

F. C. KING.—Many thanks. We were promised to have a continuation of the papers on "The Two Mirrors of the Microscope," as soon as the author could find time.

A YOUNG COLLECTOR.—The specimen you sent is *Geranium sylvaticum.*

W. SIM.—Thanks for nice mounted specimen of insect, which is *Tingris crassiochari.* See coloured plate in the number for January, 1884.

JOHN COLLINS.—Your specimen appears to be a specimen of Nostoc.

MR. C. CARUS-WILSON, of Bournemouth, Hants, wishes some correspondent to give him the address of the manufacturers of wool slag used for non-conducting purposes.

A. H. MCBEAN.—The "locusts" mentioned as being the food of John the Baptist, are usually regarded as the insects, which are much eaten by the Arabs to this day, and not the bean pod which goes by this name.

MR. CECIL CARUS-WILSON requires a meteorite, *Eozoon Canadense*, platyscopic lens, geological diagrams or lantern slides (photo), the "Year Book of Facts" for 1878, by James Mason, the number of "The Atlantic Monthly" containing p. 657 (vol. xii.), and Nummulitic limestone.—Athlone, West Bournemouth, Hants.

WANTED, a geological hammer. Offered, micro-slides of freshwater algæ (Batrachospermum, Œdogonium, Draparnaldia, &c.), and fresh, unmounted and mounted, but not cleaned, diatomaceæ. Also numerous dried seeds and fruit.—Otto V. Darbishire, Ball. Coll., Oxford.

EXCHANGES.

WANTED, teeth and bones of different animals; also any rock specimens. Liberal exchange offered in first-class microscopic slides.—A. J. Doherty, 63 Burlington Street, Manchester.

WHAT offers for A. Naquet's "Principles of Chemistry," W. Lee's "Acoustics, Light and Heat," F. Guthrie's "Magnetism and Electricity," "The Mechanic's Friend," and Vols. i. and ii. of "English Mechanic?" Micro accessories preferred. —A. W. Watson, 186 Downham Road, Islington, N.

AN herbarium, British and foreign, in exchange for books of interest, or offers.—J. H. Lewis, F.L.S., 145 Windsor Street, Liverpool Street.

WANTED, fossils from London clay, gault and permian, in exchange for good carboniferous limestone, coal measures, lias, or chalk fossils.—Peter J. Roberts, 4 Shepherd Street, Bacup.

FOR exchange.—Beck's small microtome, D'Anvert's "Elementary History of Art," M. C. Cooke's "Microscopic Fungi" (coloured plates), Milne's "Earthquakes and other Earth Movements," all new. Wanted.—Numbers of "Nature" (all or any), Nov. and Dec. 1887; lantern slides to illustrate paper on "Clouds and Rain;" Lyell's "Elements of Geology" (state edition), and the following of International Scientific Series: "Volcanoes" (Judd); "Geological Hist. of Plants" (Dawson); "Weather" (Abercromby); "Forms of Water" (Tyndall); "Sociology" (Spencer); "The Sun" (Young).—F. Worgan, 34 Cedar Street, Derby.

OFFERED, three microscopic fossil pearls, on slide. Wanted, *Argiope cristellula, capsula, Lima elliptica, subauriculata, Avicula hirundo, Modiolaria nigra, Lepton squamosum, Loripes divaricatus, Isocardia cor, Tellina balaustina, Lyonsia Norvegica, Thracia distorta, pubescens, Nearea* 4 *sp., Saxicava Norvegica, Gastrochæna dubia, Pholadidea papyracea, Chiton scabridus, Trochus Grœnlandicus, occidentalis, Ianthina rotundata, Buccinum sinistrorsum, Humphreysianum, Buccinopsis Dalei, Fusus Norvegicus, Turtoni, Islandicus, Berniciensis.*—J. Smith, Monkredding, Kilwinning.

WANTED, odd numbers of Braithwaite's "Moss Flora," or any British or foreign works on Hepaticæ. Offered, stuffed or live birds, birds' eggs, micro slides, &c. Have a large number of stuffed birds for selection.—J. A. Wheldon, Chemist, York.

WANTED, to exchange mosses and flowering plants for others; also land and freshwater shells for others.—J. A. Wheldon, York.

WANTED, Herbert Spencer's "Psychology," "Political Institutions," "Ecclesiastical Institutions," "Descriptive Sociology," and "Essays." Offered, dried flowering plants, mosses (mostly in fruit), Lyell's "Principles of Geology," Berkeley's "British Mosses," &c.—J. W. B., 56 Vine Street, Liverpool.

CONCHOLOGY.—About 300 specimens of *U. tumidus, U. pictorum*, and *A. cygnæa*; also a number of engravings of British and Continental varieties of unios and anodons. Wanted, Continental unionidæ, varieties of *U. pictorum*, or rare British helices, or offers.—Geo. Roberts, Lofthouse, near Wakefield.

DUPLICATES.—*S. corneum*, var. *scaldiana, P. fontinale*, var. *henslowana, A. cygnea*, var. *incrassata, P. contecta, P. nautileus, P. glaber, P. dilatatus, P. albus, P. hypnorum, V. pellucida, Z. glaber, Z. excavatus*, var. *vitrina, H. arbustorum*, var. *flavescens, H. concinna, H. sericea, H. ericetorum*, vars. *minor* and *alba, P. umbilicata*, var. *curta, C. rugosa*, var. *dubia, C. tridens, C. minimum.* Desiderata,—*P. roseum, L. involuta, H. revelata, B. montanus, V. lillejeborgi, V. moulinsiana, V. angustior, V. munitissima, A. lineata*, and many varieties.—Chas. Oldham, Ashton-on-Mersey, Cheshire.

ENGLISH land, marine and freshwater shells (named), in exchange for foreign examples, birds' eggs, or medals.—F. Stanley, Margate.

WANTED, British and foreign sponges, gorgonias, &c.; fragments taken. Also starches (genuine), large spines of echinodermata, holothuriæ, parasites, freshwater algæ, wood sections, polyzoa, micro-fungi, entomological and other unmounted material. British land and freshwater shells, and unmounted micro material in exchange.—Ernest O. Meyers, Richmond House, Hounslow, W.

WANTED, micro slides illustrating stages of potato disease (*Peronospora infestans*). Good exchange offered in British shells or other slides.—J. W. Cundall, Carrville, Redland, Bristol.

WANTED, turn-table for making cells, &c., or section cutter for soft substances; will give in exchange 21 parts of "Cassell's Popular Educator," one vol. of "World of Wonder" (unbound), and good specimens of *Limnæus stagnalis.*—J. J. Edwards, 43 Calvert Road, E. Greenwich.

WANTED, dragonflies and grasshoppers; large or small are equally acceptable. Rare British lepidoptera, shells and echinoderms, offered in exchange.—W. Harcourt Bath, Ladywood, Birmingham.

To beginners only. Will send fifty duplicate shells to first six who will forward box (about 1 lb. weight), and return postage before the 5th inst.—W. Harcourt Bath, Ladywood, Birmingham.

Pecten opercularis and *maximus*, *Cardium echinatum*, *Cyprina Islandica*, *Tectura testudinalis Trichotropsis borealis*; *Trophon truncatus*, *Fusus antiquus* and *gracilis*, *Pleurotoma turricula*, *Otina otis*, in exchange for insects or other shells not in collection.—Wm. D. Rae, 15 Cotton Street, Aberdeen, N.B.

WANTED, all naturalistic magazines, preserved vipers, lizards, &c., and foreign shells, in exchange for choice micro slides, anatomical, botanical, diatoms, parasites, &c. — R. Suter, 5 Highweek Road, Tottenham.

FRESH gatherings of marine diatomaceæ and foraminifera, from ripple marks. Desiderata, miscellaneous mounts.—C. H. Walker, Mossy Bank, Egremont, Cheshire.

WANTED, recent and fossil sponges, nummulitic limestone, graptolites, ammonites, any Silurian or Devonian fossils, also crystals. Offered, carboniferous fossils, fossil sponge spicules, micro slides of foraminifera and diatomaceæ, also pitchstone, spherulite, cone in cone ironstone, prehnite and analcime, &c. —Robt. Pettigrew, jun., 66 Flowerhills, Airdrie, N.B.

OFFERED, pupæ of *S. ligustri*, *S. tiliæ* and *Jacobæ*. Desiderata very numerous, especially butterflies of *V. polychloros*, *C. edusa*, *A. paphia*, *aglaia*, *M. galatea*, and many others. Send list to—Fredk. Glenny, The Orchard, Walsoken, Wisbech.

DUPLICATES.—*V. Io*, *cardui*, *urticæ*, *P. ægeria*, *S. semele*, *A. caja*, vars. of *H. lupulinus*, *P. bucephala*, *A. psi*, *B. perla*, *P. gamma*, *T. pronuba*, *U. sambucata*, *H. vanaria*, *H. strigata*. What offers? Desiderata numerous. Send lists to—Fredk. Glenny, The Orchard, Walsoken, Wisbech.

WANTED, transverse and part of longitudinal sections of earth-worm (Lumbricus), mounted; also redia and cercaria stages of liver fluke (*D. hepaticum*) mounted as microscopic slides.—Chas. A. Whatmore, Much Marcle, Gloster.

WANTED, Grant Allen "On the Colour of Flowers," and any good botanical works.—Chas. A. Whatmore, Much Marcle, Gloster.

OFFERED, "Midland Naturalist," vols. vii. and viii. (1884, 1885), unbound, clean as new; "The Naturalists' World," vol. iv. (1887), unbound; "Knowledge," vol. iv. (1883), five numbers missing, ond other periodicals. Wanted, a vol. of Jeffrey's "British Conchology," rare British land, freshwater and marine shells, or offers.—A. Marshall, care of W. Handley Kay, Gresham Chambers, Nottingham.

WANTED, animal parasites, mounted or unmounted, for mounted slides of various kinds, animal or vegetable.—The Rev. J. E. Vize, Forden Vicarage, Welshpool.

WANTED.—Unmounted parasites (particularly all human species) in exchange for micro slides, or offers. Wanted also, Gosse's "Marine Zoology," and parts of "Quekett Journal," vol. i., 2nd series.—C. H. Oakden, 51 Melhourne Grove, S.E.

OFFERED.—"Letters of Rusticus," by Newman; "Aptera," by Murrey; "Voyages of Columbus' Companions;" also a lepidopterist's setting case and boards. Wanted, "Siberia in Europe," and "Siberia in Asia," by Seebohm; "Entomologist," or other natural history periodicals prior to 1872.—S. L. Mosley, Beaumont Park Museum, Huddersfield.

OFFERED, butterflies and moths, good species. Wanted, two-winged flies, set or unset.—S. L. Mosley, Beaumont Park Museum, Huddersfield.

CHOICE Wenlock limestone, coal measure and other fossils, in exchange for fossils from chalk, red crag, oolite, or offers.—A. T. Evans, Cottesville, St. Oswald's Road, Small Heath, Birmingham.

WANTED, butterflies and moths in exchange for land, freshwater and marine shells (British).—John J. Holstead, 19 Millholme Terrace, Upperby Road, Carlisle.

ASTRONOMICAL telescope on stand, 3½-inch glass, by Wray. No reasonable offer refused.—Mrs. Webster, Ruislip, near Uxbridge.

HERBARIUM.—Offered, L. C., 8th ed.: 62, 70, 80, 88, 98, 112, 115, 158, 173, 180, 189, 200, 274, 291, 302, 547, 611, 625*b*, 638, 699, 709, 730, 733, 737, 742, 902, 904, 933, 938, 970, 990, 995, 1076, 1101, 1116, 1131, 1190, 1240, 1329, 1351, 1422.—E. C. Robinson, 46 Fishergate, Preston.

DUPLICATE diatom micro slides, in exchange for other good mounts. Lists exchanged.—E. A. Hutton, Mottram, Manchester.

DUPLICATES.—Euphrosyne, algon, corydon, *S. ligustri*, lupulinus, atomaria, piniaria, unidentata, vinula, impura, pallens, segetum, and dentina. Desiderata, British or exotic lepidoptera not in collection, preserved larvæ, or offers.—F. E. Warner, 20 Hyde Street, Winchester.

OFFERED.—L. C. of Mosses: Nos. 33, 37, 41, 47, 51, 53, 65, 78, 81, 86, 88, 105, 137, 162, 167, 188, 190, 224–230, 282, 284, 294, 305, 308, 313, 316, 318, 337, 345, 387, 393, 399, 408, 410, 412, 415, 420, 421, 424, 426, 429, 437, 448, 454, 476, 480, 482, 489, 493, 495, 511, 513, 514*b*, 517, 519, 528, 539, 545, 551, 555–563, and many others. Lists requested.—F. C. King, Bank Villa, Fulwood, Preston.

OFFERED.—"The Microscope," by Jabez Hogg, 6th ed. "The Microscope and its Revelations" (Carpenter), 5th ed.; "The Naturalist's World," bound vols., 1884–6; "A Year at the Shore" (P. H. Gosse), coloured plates; "Scripture Gallery of Illustrations" (Doré), vol. i., magnificent: vols. of "Quiver" (unbound), 1871–3. Rack, slide box, polished bay wood, to hold 144 slides; camera obscura, 18 × 13 × 10, polished pine, fine meniscus lens, protected plate-glass mirror, draw-out box. Micro slides.—Scales *Lepid. curvicollis*, *lepisma*, *A. pellucida*, *Plen. angulatum*, Möller's *Hyalod. subtile*, all mounted for high powers Opaque—diatoms *in situ* from Dawlish, Vancouver's Island, Santa Barbara, and California. Transparent ismia *in situ*, and transparent diatoms from Cuxhaven (beautiful slide); diatoms and poly., Nicobar Islands; crystals of zeolite, beautiful polariscope object.—Wanted, double nose-piece (bent), books on natural history, or "Pen and Pencil" series, and photographic lantern slides. Reply to accepted offers.—J. E. Lord, 16 Mount Terrace, Rawtenstall.

WANTED, microscopic accessories, books on the microscope, or slides, in exchange for mounted slides, chiefly anatomical.—S. Robinson Hallam, 55 Comyn Road, St. John's Road, New Wandsworth, London, S.W.

WANTED, to exchange many specimens of British shells, also some foreign ones from Burma and Australia. Will receive shells not in collection, and foreign stamps. Correspondence invited, and lists exchanged.—Mrs. Heitland, The Priory, Shrewsbury.

WANTED, entomological cabinet, drawers full size, in exchange for small turning lathe and tools.—W. A. Cheesman, Valley View Villas, Warlingham, Surrey.

I WILL exchange four vols. "Amateur Work," illustrated, unbound, also a quantity of cardboard trays, for micro slides.—R. C. Chaytor, Scrafion Lodge, Middleham, Yorkshire.

"BRITISH Medical Journal," June 1883 to Dec. 1885 (5 vols.), unbound. Offers solicited in microscopical or other books, periodicals, apparatus, or other exchange.—G. H. Bryan, Thornlea, Cambridge.

WANTED, dried leaves, *Deutzia*, *Eleagnus*, *onosma*, &c.; also lepidoptera, *Ulysses morpho*, *ryphens*, &c. Good exchange.—Henry Ebbage, 344 Caledonian Road, London.

OFFERED, good specimens from red and coralline crag, in exchange for fossils of palæozoic age. Address—D., High School, Ipswich.

WANTED, a mahogany cabinet or nest of drawers, for geological specimens; the drawers must be 2½ inches deep inside. Send measurements. Also, fossils from the London clay, Woolwich beds, Neadon beds, Osborne beds, Bembridge beds, and Bracklesham beds. Send lists, in exchange for others.—Geo. E. East, jun., 10 Basinghall Street, E.C.

LEPIDOPTERA (duplicates), loniceræ (bred), segetum, oculea, oleracea, exclamationis. Also in shells—*H. virgata*, and vars. *submaritima* and *major*, *B. acutus*, and vars. *bizona* and *striata*, *L. glabra*, *L. stagnalis* (very fine), *P. corneus* (very fine), *P. contortus*, *P. umbilicata*, also eggs of water-hen, partridge, magpie, missel thrush, starling, chiff-chaff, &c. Desiderata, eggs, shells, and lepidoptera, coleoptera, &c.—William Hewett, 3 Wilton Terrace, Fulford Road, York.

BOOKS, ETC., RECEIVED.

"A Summary Account of the Wild Berries and other Edible Fruits of Newfoundland and Labrador," by Rev. A. C. Waghorne.—"Excursions of the London Geological Field Class, 1888."—"Practical Microscopy," by George E. Davis, F.R.M.S., F.I.C., &c.—"On Variations of Climate in the Course of Time," and "The Probable Cause of the Displacement of Beach-lines," by A. Blyett, Christiania.—"First Report of the Microscopical Society of Calcutta."—"Research." —"Midland Naturalist."—"Wesley Naturalist," &c. &c. &c.

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

"SOILS, THEIR ORIGIN, ETC."

DR. J. E. TAYLOR recently gave a lecture on the above subject before a crowded gathering of the Framlingham Farmers' Club, of which the following abstract appeared in the Ipswich papers:—Dr. Taylor first pointed out that the thin veneers, the surface soils which covered the habitable portions of the globe, had been for ages the cradle of all life; remove these soils, he said, and terrestrial life would be removed with them; and it would not be long before marine life would follow suit, and general vital extinction would take place. The earth would still roll on in space obedient to the same astronomical laws as at present, but it would not be the abode of life. Having thus shown their importance to animal and vegetable life, Dr. Taylor proceeded to explain

THE FORMATION OF SOILS.

There were, he said, several ways in which soil could be produced. Of late years it had been recognised that wind was both a former of soils and a distributor of them, and one English geologist had recently shown that much of the surface soil of East Anglia was produced before the German Ocean was formed, when England was a continental prolongation; and that when the east winds blew, perhaps more fiercely than they did now, they brought with them dust to distribute over the surface of East Anglia and help to form and enrich its surface soils. In many parts of India the dust brought by the persistent winds from certain directions had accumulated and formed soils and subsoils many feet in thickness, which were known by the name of laterite. In North China the accumulation of soil and subsoil by the action of the winds had in some places amounted to nearly 1000 feet, and the banks of such soils were deposited in ledges at different heights up the mountain sides to 9000 feet above the sea level. In Arabia and Africa there were vast accumulations of moving sands. The sun's heat fell upon the rocks and caused particles to decompose. These particles dropped down and the wind blew them away, and in that manner the sandy deserts of Arabia and Africa were formed. These sands and soils were full of nourishment, but there was no rainfall to dissolve the mineral substances contained in them and render them fit for vegetable life. On the other hand, in rainy countries the rainfall became the means of washing the dust of the lands to lower levels; hence the rich soil in our valleys which went by the name of alluvial, from a Latin word, signifying to wash down.

THE SOIL CIRCULATOR.

As a rule underneath the soils which were in cultivation there was a layer called the subsoil, but this was not always the case. The most solid rocks were reached by rain water percolating through the upper surface, and were decomposed *in situ*, so that even in districts not affected by the changes he had referred to, the solid rock beneath the surface soil was usually in a state of decomposition. It was known to geologists that the average rate of wear and tear of the terrestrial surface of the globe was about one foot in four thousand years. This meant a loss of soil and what the soil contained, for it was carried into the sea. Fortunately the decomposition of the rocks beneath went on at the same rate, so that new soils were constantly being formed—there was a circulation of matter in the soil as there was in the atmosphere. One of the greatest helpers in this respect was the common earth-worm, which might be called the soil circulator. Earth worms, however, were almost confined to surface soils and soils rich in organic matter—indeed, they were seldom found away from agricultural areas, *i.e.* areas where the land had been under long cultivation, and had been well manured; they were not found in the prairies of America, nor in the uninhabited plains of Australia —they were peculiar to districts where manure had been spread and organic matter had decayed. Earthworms sometimes found their way down to considerable depths in the soils and subsoils, and by their castings brought up vast quantities of material from below to top dress the area above. Darwin had shown in his interesting book on the subject that sometimes a single acre of meadow land contained 18 tons of worm castings, and it had since been found that in 10 tons of these worm castings there was at least 80 lb. of nitrogen, which was equivalent to that required by two acres of wheat. Apart from this top-dressing by worms, their perforations allowed the air and rain water to find their way more readily down through the soil, and in that way to decompose either the surface rocks beneath, or to convert the subsoils into actual soils.

ORIGIN OF HEAVY LANDS.

In the Eastern Counties and partly in the Midland Counties the subsoils were very kind to the farmers. By ice action during the glacial period boulder clays and drift sands had been strewn over these areas. The heavy lands of Suffolk and Norfolk were once masses of clay—old glacial moraines, rich in all kinds of rocks brought from the north and north-west of England, and of Scotland, and elsewhere—rocks from almost every one of the older geological formations which, having been ground down, formed a clay matrix in which they were imbedded, and, being slowly decomposed, formed subsoils than which none richer could be found in the whole world.

THE CHEMISTRY OF THE FIELDS.

Dr. Taylor then directed attention to the action of the weather on the hilly countries, showing that the reason they were so unproductive was that the soil was nearly all washed off the surface. He next dwelt upon the colour of soils, showing that light soils radiated heat, the difference meaning a great deal to the warmth of the soil and the germination of the crop. Then different crops require different materials or kinds of mineral food. The elements which were the basis of all life, animal or vegetable, were six in number, viz.: carbon, oxygen, hydrogen, nitrogen, sulphur, and phosphorus. All the carbon which plants require, was obtained from the atmosphere; none from the soil. Oxygen and hydrogen were obtained from water, which was a chemical combination of both. The difficulty of the plant was to get its nitrates, potash, soda, sulphur, and phosphorus, as well as other substances, which were not included in the six he had mentioned, but were essential to the nourishment of particular species. The distinctive characters of many great groups of plants depended upon the fact, that they might contain and utilise some particular element which other plants did not. He drew attention to the importance of phosphorus to both animal and vegetable life, particularly the higher forms. Take for instance the young wheat plant. Phosphorus was to be found in the stem and in the first leaves when they were shed. As the plant advanced in growth the phosphorus migrated upwards, until when the flowering began it was drawn from every part of the plant to where the flower was formed. Then came the most important part of the wheat plant's life, the time of flowering. Every farmer knew the importance of that time, and the weather which affected it. The Lecturer then described the fertilisation of the wheat plant, which, he explained, was effected by the wind. The pollen was in the first instance contained in minute bags, in such incredible numbers that every acre of wheat was estimated to yield 5 lb. in weight of this precious dust. On the distribution of that dust depended the fertilisation of the ovule, which became the seed-corn; if the operation were carried out well, there would be a good crop; if it were not, there would be so many coombs less. The full amount of work might have been done in the field, but if the plant had not enough phosphorus to store in its pollen so as to fertilise these ovules the yield of corn would be deficient. The importance of phosphorus was similarly felt by other plants, and yet this was the most difficult mineral for plants to obtain. Phosphate of potash was essential in the muscles of all animals, and there could be no good grazing unless the plants contained that material. Why, said Dr. Taylor, take an average size man; whatever may be his habits, he is a teetotaller in spite of himself. There is under a stone weight of solid mineral in the composition of his body—all the rest is moisture. Of this mineral matter, over two-thirds were composed of phosphate of lime. How was that to be obtained unless the food he consumed contained phosphate of lime?

MODERN SANITATION AND ITS EFFECT ON AGRICULTURE.

The Lecturer dwelt at considerable length on the great change in farming operations, caused by the adoption of the sewerage system for the removal of soil. Much of the manure which was available for agricultural purposes forty years ago was now conveyed into the rivers and seas. The consequence of this was the opening of the markets for all kinds of artificial manures. He showed that these artificial manures were only fossilised manures, the remains of wild animals of the Old World, whose accumulations were quite as much as the accumulations of the farm-yard heap. He further showed how soil, when rich in organic matter, might contain an abundance of nitrates which were yet not assimilable by the roots of plants. Plants were in that respect like human beings. Their food must be prepared for them. His hearers would remember the story of the Irishman who expended his last penny in buying a pennyworth of liver, which he received instructions how to cook, and when the liver was snatched out of his hands by a passing dog, consoled himself by saying, "Now the fool doesn't know how to cook it." [Laughter.] That was the position of many plants in regard to their food, and it was of no use for them to be supplied with nitrogen or any other food in a form in which they could not avail themselves of it. Before it could be made assimilable soil had to be haunted by millions of bacteria or ferment germs, which exercised so important an influence as to change the character of the nitrates into free nitrogen, which in that form could be taken up by the plants. If they were to take a little soil, and calcine it so as to destroy these germs, it would be impossible to grow plants on it.

THE ADVANTAGE OF A CLOVER CROP.

Dr. Taylor also noticed the influence of crops upon soils. Taking clover and wheat as examples, he showed that although more nitrogen was required by clover than by wheat, wheat had difficulty in finding it in the soil, whilst clover appears to have found the art of extracting the nitrogen from the atmosphere; this power, it had been said by Professor Ville, was a property of clover in common with other leguminous plants. If any man could discover what the clover had discovered there was 10,000*l*. awaiting him. That sum was offered by the French Government more than twenty years ago to the chemist who could discover the means of tapping the great nitrogen supply which the atmosphere contained.

MANURES.

Farmyard manure, which might be called the general or all-round manure, if enriched with phosphate of lime, was, perhaps, the very best manure in the whole world. It had been found by experiments carried on by Mr. Lawes, at Rothamstead, and those experiments had been confirmed by others on Messrs. Packard's experimental farm, near Saxmundham, that about one ton of farmyard manure to one cwt. of super-phosphate was the best mixture. Nitrate of soda ought to be used as a top-dressing very carefully. Potash was one of the most important and essential elements of plant life. For potato growing potash was essential, and he was often surprised that the cheap artificial manure called muriate of potash was not more largely used by East Anglian agriculturists, more particularly by potato growers. Dr. Taylor dwelt upon the origin of iron pans, lime pans, the effects of draining, the results of mixing soils, and the mechanical action of stones upon the land. (With reference to the last-named part of his subject the Lecturer deprecated the practice of picking the stones from the land.) He showed that the stones radiated heat and kept the land warm, and mentioned instances in the West of England in which the wheat crops had fallen off through farmers picking stones off the land. The Lecturer concluded by showing how the so-called soil after all was nothing but the cupboard in which the plant-food was contained. If the plant-food was not there, the plants were in the condition of the poor dog in the story of Mother Hubbard. [Laughter.] If they were there in a scanty proportion the plant was only half-fed and weakly. All plants, even the healthiest, were, like animals, liable to attacks of epidemics. The Lecturer related instances he had seen in South Australia and elsewhere of poor and unmanured soils poverty-stricken in plant-food, producing stinted, poor, miserable, workhouse-looking plants, attacked by rust and bunt, and showing evidence of the poverty of the soil in which they were grown.

ASTRONOMY.

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

THE Annual meeting of the Royal Astronomical Society was held on February 8th.

The most interesting portions of the report were read: from these it appears that Mr. Common's new reflector of five feet diameter was completed in September last. Some trial photographs have been taken with this instrument which are satisfactory. It is proposed to apply this telescope to the direct photography of the most important nebulæ, and to spectroscopic objects which require a very large aperture.

As it has been proposed to make a railway across Blackheath, experiments have been made during the year at the Royal Observatory, Greenwich, on the tremor caused by railway traffic. An observer at the transit circle noted the times of all disturbances of the image of the wires seen by reflection from the surface of mercury, and other observers in trains or at railway stations noted independently the positions and movement of a great number of trains. On comparing these two sets of observations it was evident that tremors were caused by the trains when they were a mile from the Observatory, and when the trains were much nearer the mercury was so disturbed that the reflected image was no longer visible.

The Astronomer Royal delivered his address on delivering the Society's Gold Medal to Mr. Loewy.

The interest in Mr. Isaac Roberts's wonderful photograph of the nebulæ in Andromeda increases with further investigation, as it is spoken of as a new cosmical revelation.

Government has granted a pension of £100 a year to the widow of Mr. Proctor.

In April there will be no occultation of anything

Rising, Southing, and Setting of the Principal Planets in April.

	D.	Rises. h. m.	Souths. h. m.	Sets. h. m.
Mercury ☿	2	5 15M	10 51M	4 27A
	9	5 5M	11 7M	5 9A
	16	4 56M	11 26M	5 56A
	23	4 49M	11 51M	6 53A
	30	4 44M	0 21A	7 58A
Venus ♀	2	5 56M	2 11A	10 26A
	9	5 27M	1 47A	10 7A
	16	4 57M	1 15A	9 33A
	23	4 28M	0 37A	8 46A
	30	4 1M	11 54M	7 47A
Mars ♂	2	6 11M	1 20A	8 29A
	9	5 53M	1 12A	8 31A
	16	5 35M	1 4A	8 33A
	23	5 18M	0 56A	8 34A
	30	5 3M	0 49A	8 35A
Jupiter ♃	2	1 53M	5 49M	9 45M
	9	1 28M	5 24M	9 20M
	16	1 0M	4 57M	8 54M
	23	0 33M	4 30M	8 27M
	30	0 7M	4 3M	7 59M
Saturn ♄	2	0 40A	8 20A	4 4M
	9	0 11A	7 52A	3 37M
	16	11 44M	7 24A	3 8M
	23	11 17M	6 57A	2 41M
	30	10 50M	6 30A	2 14M

larger than the fourth magnitude, and no astronomical occurrence of popular interest.

Mercury will be an evening star at the end of the month.

Venus will be an evening star.

Mars will be an evening star.

Saturn will be nearly stationary between the constellations of Cancer and Leo.

SINGULAR MIMICRY.

THE enclosed drawings illustrate a curious case of mimicry between an hemipter and a thrips. The hemipterous insect was found associating with

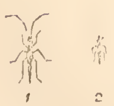

Fig. 58. Nat. size.

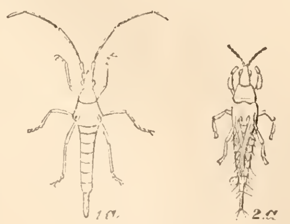

Fig. 59. Mag.

colonies of thrips on the leaves of a ficus. I have been unable to satisfy myself that this mimicry is for predatory purposes, as although confined together for several days in a glass tube the bug has not attacked any of the thrips. These, however, were all adult specimens; it is possible it may feed upon the larval insects. The colour of the bug is a dark reddish-

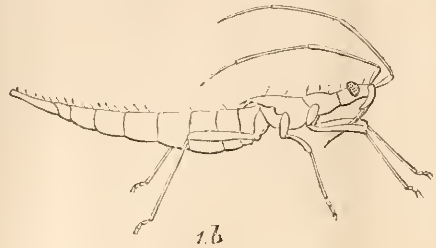

Fig. 60. Side view, mag.

purple; it has small wing pads, and has probably not reached its perfect stage.

Punduloya, Ceylon. E. ERNEST GREEN.

PARASITES OF THE WHITE ANT (BENGAL).

By W. J. SIMMONS.

[*Continued from p.* 62.]

ASSOCIATED with the infusorians described on page 61, I have found another smaller and rarer parasite (E G), which I designate Parasite No. 2. Although it entirely lacks the mouth-parts to which I have directed special attention in previous paragraphs; it is not identifiable with any of the figures or descriptions in Kent's Infusoria of the animalcules which Leidy discovered in the termites of America. The cross-markings shown in my sketch are best seen when the

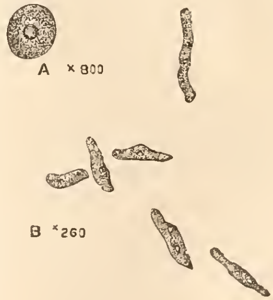

Fig. 61.

objective is focussed for the central axis of the body, and are due to the parallel spirals on opposite sides of the body being in view together. This is readily proved by using a power of eight hundred diameters.

(F) The shape of this animalcule is less variable than that of Parasite No. 1; the cilia at its posterior extremity are slightly longer than those distributed over the rest of the body; and, though the ciliation at the anterior end is directed forwards, it does not assume the collar-like appearance which is so conspicuous a feature in Parasite No. 1.

My observations so far lead me to believe that both the infusorians I have described above are confined to the ileum and colon of the white ant. I have not yet observed them in the œsophagus, or the proventriculus, or the chylific ventricle. In passing, I may note that the "gizzard" of the white ant is a curious organ, and well worth examination. The questions arise: how, and in what stage do the parasites gain admission to the lower portions of the intestine? They have to run the gauntlet of the "gizzard." It must be remembered that much of the food-stuff consumed by the insect-host would be congenial to the lower forms of life: the white ant flourishes in damp houses, lower and insufficiently raised floors, and damp places generally. The limitation of the parasites to the portions of the intestine specified, for one thing serves to show that food is there obtainable in a state suited to the requirements of the infusoria. The life-history of the parasite still has to be worked out. Is it a case of degeneration, or the reverse? Its evolutionary history, which may be shadowed in its life-history, would be deeply interesting. I have not succeeded in keeping it alive for any length of time, but there may be media (albumen diluted to the proper strength, which I have not yet hit upon), in which its life could be prolonged for the purposes of continued observation.

In closing, I should observe that the infusoria described above, are only two of the forms which abound in the alimentary canal of our white ants. I have found a moniliform organisation (C C) in the renal excretory tubes of the insect, which may be an alga. In some cases I have met with myriads of non-ciliated bodies (B) of an irregular, elongated shape, containing vacuole-like spaces; also, with (A) circular, nucleated, non-ciliated, unicellular organisms; both of these may be immature stages in the development of other forms. I have frequently met with Nematoid worms; in many instances hosts of bacteria and spirilla (D) have presented themselves. Briefly, the intestinal tract of our white ants here teems with parasitic forms of life. I have purposely confined my attention to only two types of that life, but it is obvious that a wide and promising field of research awaits observation in the parasites which find a habitat in the digestive organs of the termites of Bengal.

Calcutta.

Fig. 62.

Fig. 63.

Fig. 64.

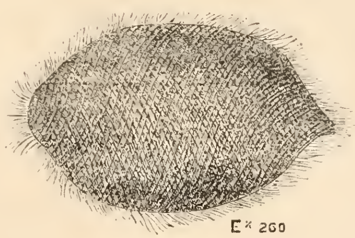

Fig. 65.

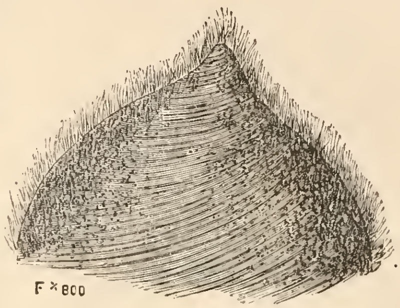

Fig. 66.

Fig. 67.

NOTE.—From a ruptured specimen of Parasite No. 1, obtained since the foregoing paper was written, I have secured a preparation of the cuticle which shows with a high power (Seibert's $\frac{1}{16}$ in. water immersion), that the parallel spiral markings are due to the distribution of the cilia in parallel lines (Fig. 55). Observations made during the last week induce me to regard what I have termed "the pharyngeal tube," as chitinous, but this needs confirmation.

SCHEDULE OF PARTICULARS OF THE DISCOVERY OF LIVE TOADS, FROGS, &c., IN COAL, &c.—*continued from page* 55.

Date.	Locality.	Colliery, &c.	Description of Animal.	Depth.	In what Material.	Under what circumstances.	By whom seen or found.	Peculiarities.	Remarks.
1876	Italy	Quarry	Large live toad	..	Marble	Breaking the slab to ascertain cause of a damp spot	H. A. F.'s father's friend	..	See "Chatterbox," No. 1, Dec. 2, 1876, headed "A Curious Fact," written by H. A. F.
1881	Derbyshire	Clay Cross	Live frog	(?) 450 ft.	(?) Sandstone	Sinking shaft	Sinkers and (?) manager	Its mouth was sealed up	Men descended after firing a shot, and froggie was found in the bottom, or sump-hole. My brother, who lived close by (Rev. L. S. Gresley), saw the officials, who said this was true.—W. S. G.
1882 Feb. 9	I. of Wight	1 mile from Brading	Live black toad	5 ft.	Stiff clay beneath Roman remains	Exploring Roman villa	John Thorp	Lived some time in Mr. T.'s garden	Mr. Thorp is my cousin. He wrote me an account of this find on Oct. 31, 1882.—W. S. G.
1883	Shrewsbury	..	Live toad	10 ft.	Red elay	Removing old foundations	..	Its mouth was sealed up	Colour of toad same as clay, but changed into natural eolour. Became very lively. "Daily Telegraph," April 17, 1883.
1859?	Leicestershire	Califat Pit	Live toad	520 ft.	Roof shale of "Main" coal	Coal-mine	..	..	A collier took it home in his "snap" bag. John Kirk's brother was at the pit at the time.
1886 Nov.	Somersetshire	Bridgwater	A small live toad	..	A lump of Forest of Dean coal	Breaking coal for fire	Mr. Bowering, landlord of an inn	Colour dark brown	It hopped about on the floor. A cavity exactly form and size of toad was found in the coal. See "Western Chronicle," Dec. 1886.
..	Warwickshire	Kettlebrook	Toad	..	Sandstone	Quarrying	Charles Allbridge	The size of his fist	Cavity was twice the size of the toad. Lived half-an-hour. The stone was used as a plinth in the Birmingham Town Hall.
1885	(?)	(?)	Toad	..	"Stone"	Well-sinking	(?)	Lived in a bottle a few days	See "Colliery Guardian," July 17, 1885.
1866	Derbyshire	near Teversall	Live toad	..	..	Sinking a coal-pit	..	Lived several days	William Gascoyne's statement to W. S. G.
1873	Co. Durham	Mainsforth, nr. Ferry Hill	2 live frogs	26 ft.	Limestone (? Permian)	Do.	Sinkers	One had its mouth sealed up	One became very lively; the other is not mentioned. Found two days apart.—"Newcastle Chronicle."
1886	Maryland	Swanton Mines, Barton	2 live winged bats	(?)	Bituminous coal	Coal-mining	One Rees found them; a Mr. Hoopman had them in alcohol	Lived nine days	Were in solid coal; impression of bats clearly formed in the eoal; no crevice could be found. Plaster casts were taken of the impressions. See "Animal World," Aug. 1886.

1885	Yorkshire .	West Retford Colliery	A live toad .	960 ft. .	"Barnsley Bed" of coal	Coal-mining .	Jos. Booth came upon it whilst holing	Lived twenty hours	Length, $3\frac{1}{2}$ inches; colour, black. Cavity exactly fitted it, even to finest points of its claws, and was perfectly smooth. See "Colliery Manager," July 17, 1885.
(?)	Staffordshire	..	A live snake.	180 ft. .	Coal-seam . .	Do.	2 colliers . .	..	These two men went to a clergyman to make affidavits that they found this in the coal-seam.
1887	(?)	(?)	Live toad .	40 ft. .	Solid block of yellow freestone	Quarrying .	..	No visible crevices	The toad was sent to the "Zoo." in London. A letter cut out of some newspaper, dated "Blockley, Oct. 8, 1887," and signed "R. B. B."
1887	..	..	Live toads, &c.	..	..	..	..	..	Mr. T. A Southern, Inspector of Mines, Derby, writes to W. S. G., Feb. 16, 1887: "I have heard many instances from trustworthy sources of live toads, &c., in coal strata;" but he himself does not appear to possess any particulars.
1888	Cumberland	Frizington .	2 live frogs .	70 ft. .	Solid carbon (?) limestone	(?) Hæmatite mining	..	One died immediately; the other is still living (Jan. 20, 1888)	These two frogs were in a small cavity. "This can be vouched for," says the "Colliery Guardian" of Jan. 20, 1888.
1888	Gloucestershire	Forest of Dean	A live toad .	(?)	Solid block coal .	Coal-mining .	..	Still living (Sept. 7, 1888)	The creature "seemed firmly embedded in the coal, and its form was imprinted upon the face of the mineral." See "Colliery Guardian," Sept. 7, 1888.
1888	Scotland .	Greenock .	A live toad .	(?)	A bed of clay—probably boulder clay	Railway cutting	A Mr. T. L. Patterson	Still living (Sept. 28, 1888)	"Seems to have no bones; its legs bend any way; its mouth is sealed up; has two beautiful eyes, though it does not seem to see; is very inactive and semi-torpid." See "Colliery Guardian," Sept. 28, 1888.

[We gladly insert Mr. Gresley's schedule, as it gives in a definite form the evidence of this subject up to date. For ourselves, we have not the slightest hesitation in declaring against the possibility of live frogs and toads being found in coal. Both geological and physiological facts are dead against it. Some years ago Professor Owen published an account of the numerous cases submitted to him during his long life. No man had a larger experience in the numerous frauds and self-deceptions connected with the subject. Mr. Alex. Bryson, of Edinburgh, gave a clear explanation of how frogs and toads got into mines. The green fodder taken down in spring and summer for the ponies and horses in the mine, fully explains the presence of these live batrachians there.—Ed. S.-G.]

NOTE ON MOUNTING SHARKS' TEETH.

THERE are fashions in jewellery as in everything else. At the present time it is "all the go" to wear jewellery made of old watch-cocks, but a new fad bids fair to beat it out of the field. I mean that of mounting fossil sharks' teeth as brooches, tie-pins, necklaces, &c. Considering that such teeth are fairly common, and are easy to mount, and, moreover, that they look very well when finished, they ought to become very popular, especially amongst geologists.

As, most probably, very few of the readers of SCIENCE-GOSSIP possess either a flatting mill or a draw-plate they will find it best to get both their silver wire and sheet at a silversmith's, as also the pins and catches for brooches. I have found the following a good recipe for solder. Take of silver, 5 parts; of brass, 6 parts, and of zinc, 2 parts. First, melt the silver, then add the copper, and when the two are mixed, add the zinc. This is to be done with the blowpipe on charcoal. If you cannot manage this, the next best recipe I know of, is to buy the solder ready made at the jeweller's.

As a tie-pin is the easiest to make, I shall commence with that. The wire should be of the size known to jewellers as seventeens, and the sheet silver that known as sevens. The tooth most suited for the purpose is *Lamna plicata*. A specimen should be chosen with the two sides equal. Take the measurement of that part of the tooth round which the band goes (see Fig. 68) in pattern lead (the tinfoil off tobacco will do). Cut the silver according to pattern, and solder the wire, previously sharpened at one end, to it at the back, leaving a piece of the wire long enough to turn over the tooth at the top. When you have done this, the tooth will present the appearance shown at Fig. 68.

A brooch is made in much the same manner, as will be seen by Fig. 69, only instead of a lamna we prefer a good specimen of *Oxyrhina hastata*. Cut narrow ribbons of silver sheet, and solder two short pieces on to the longer piece, as in Fig. 69. Solder the catches on at the joints; turn the ends over on the other side. This is a much easier job than it looks.

Having succeeded in these, we will now tackle a more difficult one, namely, that of mounting teeth as pendents or necklaces. For this, we shall want thin silver sheet, say about fives. Take the pattern in tinfoil, and then cut the silver to the pattern with a stout pair of scissors. Solder the two edges together. Then bend a piece of the sheet to fit in the curve at the top, and after having soldered it, cut off the edges. Then, if it is to be used as a pendent, solder a ring on at the top; if as part of a necklace, one must be soldered at each side. Fasten the tooth in with shellac. If you can, engrave some scroll work on the silver cap with a sharp scauper. (See Figs. 70, 71.)

Many other patterns will doubtless suggest themselves to the ingenious reader. I hope I have pointed out plainly enough, how these simple, yet withal handsome articles may be easily made by anyone with a slight idea of how to use the blowpipe. At any rate, if the reader cannot make them himself, a practical jeweller would do so for a trifle, on

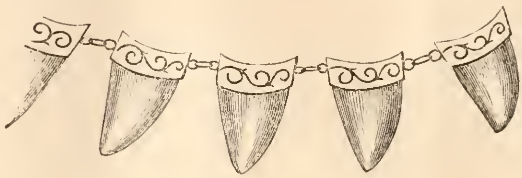

Fig. 69.

Fig. 68.

Fig. 70.

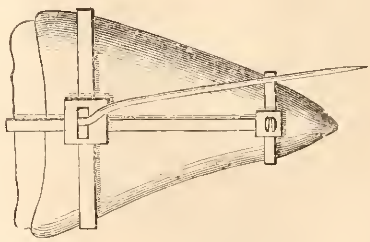

Fig. 71.

being instructed as to patterns, &c., but then, of course, he (the reader) would lose all the honour and glory of having made them himself. The best fossil fish teeth to mount, are those from the Red Crag, on account of their rich colours. They may readily be obtained at Ipswich.

P. TRACY.

Ipswich.

of single cells. The basal cell is club-shaped towards the apex of the plant, gradually getting narrower and narrower, before it widens out into the branched attachment disc. The apical cell is frequently elongated into a long trichome structure (Fig. 72 : 1).

The cells are filled with spindle-shaped chlorophyll grains, and the nucleus (with nucleolus) is occasionally quite clearly visible without staining (Fig. 72 : 3).

Fig. 72.—(1.) Young plant with hair at apex. (2.) Œdogonium showing annular cushion at *a*, which has actually been drawn out at *b*. (3.) Œdogonium cell. (4.) Formation of androgonia at *b*, and result of intercalary growth at *a*. (5 and 6.) Escape and germination of zoogonidium. (7.) Fertilised oosphere (= oospore). (8.) Androgonia settling. (9.) Three dwarf males on an oogonium. (10.) Dwarf males germinating on cells below the oogonia. (11.) The act of fertilisation. The anthrozoa is just vanishing as a black spot into the substance of the oosphere. (12.) Mature oospore.

NOTES ON ŒDOGONIUM.

ONE of the commonest and prettiest green freshwater algæ is Œdogonium; it is found growing on the submerged parts of water-plants, and on other solid bodies; it is not branched, but consists of a row

The filaments grow by intercalary growth; a kind of annular cushion, consisting of cellulose, is formed at one end of the cell. The cell wall ruptures circularly, and the cushion stretches over the gap; this rupturing is repeated for several times, thus, the end of the cell, which had the cushion, looks as if it consisted of numerous caps tilted one over the other (Figs. 72 : 2, and 72 : 4).

Œdogonium has a sexual and asexual method of reproduction; the latter is effected by zoogonidia. The contents of any cell are converted into a zoogonidium, which in due time escapes from its mother cell (Fig. 72 : 5), and germinates (Fig. 72 : 6).

Frequently the contents of a still unicellular œdogonium produce a zoogonidium, which escapes and germinates in the same way as the ordinary zoogonidium.

As regards the sexual method we have monœcious and diœcious filaments. Let us examine one which has the male organs on it; on this we will notice here and there two or more cells, abutting on each other, but of much smaller longitudinal diameter than the ordinary cells. In each of these two zoospores are formed, which for some reason, which we will see later on, are called not antherozoids, but androgonidia (Fig. 72 : 4). We will now pass on to the examination of the female organ, or oogonium. This consists of a thick cell-wall with a small gap on one side, and is of a more or less round shape, being flattened, where it abuts at both ends on to the remaining part of the thallus; it contains the oosphere, or egg-cell. We will now go on with the androgonidia. They are motile, and move about till they settle either on a cell below or above the oogonium, or on the oogonium itself (Figs. 72 : 8, 9, 10). Immediately they have attached themselves they begin to germinate into the so-called dwarf males. These consist of from two to three cells; the uppermost cell is the antheridium, and contains one antherozoid (Fig. 72 : 8, 9, 10). Fertilisation takes place by the antheridium losing part of its cell-wall by a rupture (Fig. 72 : 9), and, by being applied more or less closely to the orifice on the side of the oogonium, the antherozoid has no great difficulty, after leaving the antheridium, in getting into the oogonium. It is assisted in this act by the oosphere, which partly sucks it in by sending out a protoplasmic protuberance (Fig. 72 : 11).

When the oospore is ripe, it is surrounded by a thick investing membrane, and the whole oogonium, having gradually detached itself from the remaining part of the thallus, sinks to the bottom of the water, where it passes through a period of rest, before again germinating. The oospore has by this time acquired a very strong red colour (Fig. 72 : 12).

As a mounting medium, acetate of potash has proved the best for all green fresh-water algæ (and marine too), as it does not in any way affect the green colour, and hardly the cell contents in general. One has to be rather careful, when using it, as it evaporates very quickly when under a coverslip.

I found all stages in the development of the reproductive organs of Œdogonium very nicely in May, in a pool near Rhoscolyn, Anglesey.

OTTO V. DARBISHIRE.

Balliol College, Oxford.

NOTES ON NEW BOOKS.

PRACTICAL MICROSCOPY—by Geo. E. Davis (London: W. H. Allen and Co.). A young man taking up microscopic work could hardly find a better helper than this book. It contains over three hundred illustrations, and deals with every part of the subject, from the structure of the human eye to the recipes. It is now some years since we had the pleasure of recommending this book when it first came out, and, as every prophet likes to see his prophecy fulfilled, we are glad to find that new editions have been called for. In this latest edition, Mr. Davis has very properly completely revised his book so as to bring it down to the necessities of modern times. The chapters on the improvement of the structure of the microscope, and the microscopic apparatus in use all over the world, will prove of great value to the student.

Dictionary of Photography, by E. J. Wall (London: Hazell, Watson and Viney). Some months ago we had occasion to call attention to the useful and timely articles which were appearing in the "Amateur Photographer" under the above heading. The work under notice is really a collection of the above articles in the form of one of the handiest text-books that any photographic student or worker could desire. It will prove useful also to others than photographers, as a reference book on numberless subjects connected with physics.

The Naturalist in Siluria, by Capt. Mayne Reid (London: Swan Sonnenschein and Co.). Readers of this author's books will hardly be surprised to find that in the present volume he is coming out purely as a Natural History writer. All his novels and stories of adventures are crowded with natural history references. Capt. Reid resided in Woolhope, the centre of the district termed by Sir Roderick Murchison, Siluria. It is a wonderful country, as every geological student knows who has wandered through its green valleys and over its low-lying well-wooded hills. Capt. Reid's book deals chiefly with the birds of the district, and that in so pleasant a form as to remind us of the novelist. A few of the mammals come in for notice, and there are a number of etceteras which make up a highly readable volume.

An Assistant to the Board of Trade Examination, by Capt. Forbes (London: Relfe Brothers). The want of a little manual to put in the hands of candidates for Board of Trade examinations has long been felt, and in this little book Capt. Forbes has done his best to meet it. We cordially recommend it to those whose interest it affects.

The Cruise of the Marchesa, by F. H. H. Guillemard (London: John Murray). This is one of the most delightful books of natural history travel which have appeared since Professor Moseley's "Cruise of the Challenger." The scenic and biological description of Kamtchatka alone would make it worth buying; but there are, in addition, even more vivid accounts of the Aleutian Islands, the Philippines, many well-known and little-known islands of the Malayan Archipelago as well as of New Guinea. The book is abundantly and excellently illustrated, and is exceedingly well written.

The Best Forage Plants, (London: David Nutt, 270 Strand). This is a translation, by Mr. N. McAlpine, of Doctors Stebler and Schroter's well-known work on the above subject. The translation is well done, and the thirty beautifully coloured plates add to its botanical and utilitarian value.

A Handbook of Cryptogamic Botany, by A. W. Bennett and George Murray (London: Longmans and Co.). A book on this subject has long been required by students, and we have been frequently asked to recommend one of this description, but hitherto have been only partially able. It is with pleasure, therefore, that we very cordially bring this book before the notice of our readers. It is the result of several years' hard work on a subject in connection with which, perhaps, more new facts have recently accumulated than any other in the domain of practical botany. We need hardly say that the names of its authors are sufficient to show that the work here prepared for students, is of a high class description. It is illustrated with 378 excellent woodcuts, and deals with the vascular cryptogams, the muscinæ, characeæ, algæ, fungi, mycetozoa, protophyta, &c. It is well printed and strongly bound, and in every respect got up as a practical work for earnest students.

THE FLORA OF THE PAST.

By Mrs. Bodington.

FOR many years the students of evolution have longed for some master, who would do for the science of Botany, what has been done for the sister-science of Zoology by Darwin, Cope, Haeckel, Huxley, and other distinguished naturalists. We want some one who shall have the courage of Darwin and Haeckel to give us, so far as present knowledge goes, a genealogical history of plants. Professor Coulter, in his presidential address before the Indian Academy of Science, blames a "public which listens with pricked-up ears, and discusses endlessly concerning the evolution of birds, mammals and man, yet which cares not a straw for the wonderful structures of gymnosperms and lycopods, although these latter furnish irresistible arguments in favour of a theory that has revolutionised scientific thought. One who staggers at the evolution of the horse can find amongst plants such interminable intergrading that fixity of species becomes a dream of the past." But Professor Coulter goes on to say, "Botanists have no family tree arrangement for plants, and will not attempt the construction of one until they know more about the life-histories of the lower groups, and more about structure of all the groups." That is to say, botanists are timid, and will not dare to do for their science, what zoologists have done for theirs. And so long as this is the case, how can the public be blamed? How can they take an interest in what has never been put before them? I venture to say that, if Professor Coulter ever makes up his mind to construct a "family tree" for plants, he will find an eager public ready to prick up its ears and hear all he has to say. When Darwin and Haeckel first wrote, only a fraction was known of all the evidence now accumulated bearing on the descent of animals. Some mistakes were necessarily made.

Darwin, notwithstanding his matchless patience, was too hasty in assuming the marsupials to be in the direct line of ancestry of the placental mammals. ("Descent of Man," p. 209). Haeckel, who, in his "Evolution of Man," was almost as hasty in his conclusions as Darwin was cautious, made a false assumption which caused great joy in the reactionary camp. In his anxiety to avoid acknowledging the necessity of a creative act for the first introduction of life upon the globe, Haeckel pronounced an inorganic slime of the Atlantic, to which Huxley gave the name of Bathybius, to be a representative of the earliest form of protoplasm or organised matter. Much delight was given by this mistake to all reactionaries, who have, however, founded no moralising on the more enormous mistake of Dawson, whose *Eozoön Canadense* has sunk under the enquiries of German scientists into mere green serpentine. Chemistry has now told us that "Life" as an entity has no more existence than the phlogiston of the earlier chemists, and that the series of phenomena to which we give the name of Life are the changes undergone by complex compounds of carbon composing very large and unstable molecules.

In the earlier stages of the cooling of our globe, this complex molecule was perhaps one of the latest to combine its atoms; when, we are never likely to know, but the how is neither more nor less mysterious than the coming together of any other combination of atoms, and requires neither slime from the Atlantic, nor the impact of a stray planet to account for its existence. Owing to anxiety to demonstrate all the steps in animal descent, Haeckel, as well as Darwin, too hastily assumed that the marsupialia are in the line of our ancestors. There was evidence then that the marsupials belonged to a distinct and highly differentiated line of descent from that of the placental mammals, and now far back in the jurassic strata the remains of each may be found as widely differentiated as they are now. There is a tremendous break in the palæontological evidence, and we must make up our minds to endure it for the present.

But who would blame those intrepid travellers who first explore an undiscovered country, if they make some mistakes on the road? Where they have ventured, others will soon follow and the errors of those original thinkers who have been to science what Columbus was to navigators and Galileo to astronomers, will not even dim the lustre of their glory. When will a great botanist stand forth and hew out a road for us, never heeding scratches and bruises and inevitable mistakes, but content if he has only pointed the way to the goal, which other men will reach? Alas! in the year of grace, 1888, when we take up a so-called "Geological History of Plants," we find it written by an eminent botanist indeed, but also by one of the fast diminishing band of anti-evolutionists. Can any one even imagine a "Geological History of Animals," written from an anti-evolutionist point of view at this date? So strong in some places is the evidence for evolution by a mere statement of bare facts, that Sir J. W. Dawson is obliged to explain that his remarks are "not to be taken in a Darwinian sense." He even thinks that, after "specific types have been created, they may, by the culture of their Maker, be 'sported' into new varieties or sub-species." If the changes in plants came about as they have done in animals, then "sports" can have very little to do with creating new varieties or species. Man truly avails himself dexterously of so-called "sports," as in the familiar case of the Ancon breed of sheep. But nature in forming new species, if we are to believe the evidence of palæontology, or even the slow changes going on before our eyes, does not work by "sports." She effects her changes by almost imperceptible degrees; a tooth, for instance, first retarded in its development, then losing a cusp, then appearing only occasionally, and slowly vanishing altogether. Such changes need not be sought for in fossiliferous rocks; they are going on at this day in the teeth of civilised man, as they once took place in the ancestors of the camel, the cat, and the dog.

But as a practical palæo-botanist, Sir J. W. Dawson has perhaps no superior, and much may be learned of vivid interest from his "Geological History of Plants."

In the massive rocks of Laurentian and Huronian age, whose united depths have been estimated at fifty thousand feet, no undoubted fossils have been found. Imagination utterly fails when we try to form an idea of the stupendous cycles of time, which must have elapsed during the deposition of these tremendous masses, or to picture to ourselves the condition of the globe. Science allows us to imagine oceans almost at boiling-point; violent eruptions of the still hot crust of our planet; tides which would have swept away the inhabitants of the Midlands of England, had so insignificant a speck of land as England then existed. In the lower part of the Laurentian rocks, thirty thousand feet thick, there is no trace of the existence of any living thing. But in the middle portion of the Laurentian, great beds of limestone, of graphite and of iron-ore are found. In more recent formations, deposits of this nature infallibly point to the existence of animal and vegetable life, but it is impossible to pronounce whether the condition of our globe in Laurentian times would or would not have allowed of the independent deposition of these minerals. Sir J. W. Dawson strongly inclines to the belief that the graphite of the Laurentian rocks is of vegetable origin, and if this be so, the vegetation must have been profuse, though probably of the lowest type, consisting of cellular plants, such as algæ, mosses, and lichens, or of organic carbon compounds of a lower type than any protoplasm now existing.

The quantity of graphite in the lower Laurentian series is enormous. "In the Green Lake limestone; on the Ottawa river the vertical thickness of the veins of graphite is estimated at from twenty-five to thirty feet thick. At one place in this district a bed of graphite, from ten to twelve feet thick and yielding twenty per cent. of the pure material, is worked. As it appears in the excavation made by the quarryman, it resembles a bed of coal. When it is considered that graphite occurs in similar abundance at several other horizons, in beds of limestone, thirty-five hundred feet thick, it is scarcely an exaggeration to maintain that the quantity of carbon in the Laurentian is equal to that in the carboniferous system."

In the Silurian and Devonian formations, bituminous shales and limestones have been metamorphosed by extreme heat and pressure and converted into graphitic rocks not very dissimilar to those in the less altered portions of the Laurentian. "In the Quebec rocks of Point Levi, veins more than a foot thick, are filled with a coaly matter having a transverse columnar structure regarded by Logan and Hunt as an altered bitumen." It is probable that the Laurentian graphite, if of vegetable origin, was thoroughly "disorganised and bituminised before its change into graphite."

The climate and atmosphere of Laurentian times may have been well fitted for the development of low organic life. Vast quantities of carbon dioxide afterwards sealed up in limestones and carbonaceous beds must have still floated in the atmosphere, and given rich nourishment to vegetable tissues. The internal heat of the earth would still warm the waters of the sea, and the whole world must have resembled the very hottest of tropical green-houses. Sir J. W. Dawson thinks that towards the close of this period, algæ may have attained gigantic dimensions, and "may even have ascended out of the water in some of their forms." The lowly "cellular and tabular plants now occupying humble positions as flat lichens, or slender cellular mosses, may have been so strengthened and modified as to constitute forest trees. . . ." A little later in this history we shall see evidence in the flora of the Silurian of a survival of such forms.

(To be continued.)

THE BONNET-MONKEY AS A PET.

As an admirer of animated nature, I have for some years past, kept all sorts of queer animals as pets; and have derived much amusement and a large amount of instruction by studying their ways, habits, and different degrees of intelligence. Beginning some years ago with a brief but very interesting study of the more minute and lowly members of the animal world, comprising the sub-kingdom Protozoa, I have endeavoured to gradually work up to the higher order of created beings, as far as my means and circumstances would allow.

Some of my pets, as the too-familiar slugs and snails, and the frogs, toads, and newts have been shuddered at, and pronounced uncanny and repulsive, by, I am glad to say, a minority of my acquaintances, but I have still retained my "queer pets," and have derived a vast amount of pleasure, and have experienced a feeling of satisfaction at the thought, that many an hour has been profitably spent in studying the life-history of these much-despised animals, which might have been squandered in idle and evil pursuits. With what real pleasure can the ardent naturalist take his holiday rambles, with the knowledge that every tree, bush, hedge, or boulder, may screen some animal or plant that will be of interest to him! If a conchologist, or botanist, or entomologist, with what delight he regards the acquisition of some new species, or rare variety or monstrosity of form, be it mollusk, or plant, or insect.

Fig. 73.

Some twelve months ago I made another addition to my list of "queer pets," in the form of a young female Bonnet-monkey (*Macacus sinicus*), from Madras. She was quite a young thing, weighing about three and a quarter pounds, and when first I saw her in the dealer's shop was in a most pitiable state, having several large scabs on her poor little head and shoulders, and a portion of her tail, extending from five to six inches from the extreme end, was in a dead and useless condition, the result of burns and scalds. I really believe I purchased her more out of pity than love, for she was in an extremely dirty and deplorable condition. Her eyes, however, were very bright, and with the exception of her wounds, her general health appeared good. Immediately upon her arrival, I gave her a much needed bath, dressed her burns and tail with vaseline, wrapped her in flannel, and gave her cold potatoes which she eagerly demolished. After giving her a few days to settle down, and become reconciled to her new quarters (she fretted, and her face bore an extremely worried look for some weeks), I commenced proceedings to shorten her caudal extremity, which at times caused her much pain by getting entangled in the bars of her cage. So summoning up the necessary courage, I enveloped "Miss Jennie" in a stout shawl, and with the aid of a sharp knife, and a hammer, her tail was soon the shorter by quite five inches. A few weeks ensued, and I found the tail required still further shortening, as one of the vertebræ had been broken by a fall; this rough surgical operation was soon accomplished, and Jennie was minus another inch of tail. It gradually healed over, but required constant dressing with vaseline, and even now it is apt to swell at the cut end, and break into a sore, but in a day or so it heals again. The wounds on her head soon healed, she now weighs three and three-quarter pounds (having gained eight ounces in weight) and measures twenty-three inches

Fig. 74.

in length, including her abbreviated tail. Her body is covered all over with a beautiful coat of fine silky hair, much resembling human hair under the microscope, but much finer.

In adopting monkeys as members of the household, let it be clearly understood that it is essential to the general peace, to keep them at ordinary times confined in a cage, only allowing them their liberty, when their keeper has time to watch them; otherwise they soon become a nuisance to all, commit numerous delinquencies, and very soon get tabooed and sold to some dealer, or sent in disgrace to the Zoo. Coming as they do from hot countries, of course they must be kept warm, they also need plenty of exercise, for if kept long in a cramped cage, they are subject to paralysis. I have provided several cages for my little "Jennie," one small light cylindrical cage of the ordinary galvanised wire-work, for cold days, when she can be carried anywhere we choose; another larger and more substantially built affair, provided with ropes, a sleeping perch, and a blanket to keep her warm for the night; and a monkey-house in miniature, built in the garden for sunny days and warm weather. The outside cage is about four feet wide, by three feet from back to front, and six feet in height, with brick back and ends, and wire front and door. It is furnished with swings, ropes, perches, and a box in which to retire in case of cold winds prevailing. By keeping my monkey confined in one or other of these cages at ordinary times, and allowing her liberty when we have time to watch her funny little ways, we have an endless source of amusement to draw from during the dull half hours; and no household need be dull, with a monkey as an inmate.

At first Jennie was inclined to be very mischievous when loose, requiring constant looking after, but on the introduction of a poor starving cat into the house (with whom she soon became fast friends) she did not require so much watching; and the cat and monkey will play by the hour together, without either getting cross or ill-tempered. This is all the more singular as there is another cat in the house, with whom the monkey will not be friends. Jennie gets away with a considerable amount of food, her staple diet being potatoes and bread, and occasionally rice, and carrots, turnips, onions, and green-stuff.

She eats more sparingly of fruits, her general favourites being oranges, apples, dates, and prunes. She is, of course, fond of nuts, storing away quite a number in the food pouches provided by nature. She well masticates all food previous to swallowing. As instances of what I presume to be inherited instinct, I notice her extreme caution in drinking, she frequently starts, and turns her head at the slightest noise; also when offered anything that she particularly likes, she will stuff as much as possible into the food pouches. The first habit is, I imagine, acquired through the natural fear of their many enemies in their native wilds, and the latter from their gregarious mode of living, and the necessity of taking care of number one. When alarmed or frightened, the bonnet macaque looks simply frightful, drawing the skin of the face upwards, elevating the eyebrows and a scalp, and showing the whole of the teeth, and uttering shrill cries, giving the head the appearance of a grinning skull. Is this another result of inherited instinct, I wonder, designed to strike terror into their enemies, their other means of defence being by no means powerful?

There are two great families of monkeys, the old world, and the new world species, known respectively to naturalists as the Catarrhines and Platyrrhines, signifying narrow nostrils, and broad nostrils. The bonnet macaque belongs to the first of these families. It derives its common name from the parting of the hair on the forehead, the hair standing up from the head, and radiating from the crown.

It is a small monkey; my specimen would have measured about two feet five inches if the tail had not been cut. The prevailing colour of the hair is olive-grey, with a greenish tint, toning down towards the under parts which are ashy white. The face is smooth, the ears are somewhat flesh-coloured, and slightly pointed at the upper extremities. The hands are beautifully formed, with long slender fingers, and pretty filbert-shaped nails. The opposable thumbs, are rather short and diminutive. The feet are rather ungainly, but are well adapted for climbing purposes. The food pouches are large, the tail non-prehensile, and the dentition is the same as in man, the formula being invariably: $I. \frac{2}{2}$, $C. \frac{1}{1}$, $P. M. \frac{2}{2}$, $M. \frac{3}{3}$, $\times 2 = 32$.

Macacus sinicus has the reputation of being crabbed and savage in old age, but I have an idea that former treatment may be responsible for this; so many people have a natural love of teasing the monkey tribe, a mode of treatment which they naturally resent, and man himself would soon become ill-tempered and crabbed if constantly teased.

In India this monkey, in company with Rhesus and several other species, enjoys great protection from the natives. The Hindoos provide them with food, and shelter them in their temples. In conclusion, I should like to add, that I have not yet regretted the adoption of a bonnet-monkey into my home of "queer pets." Should any reader of SCIENCE-GOSSIP desire to know more about these interesting pets, he cannot do better than procure that capital little handbook, entitled "Notes on Pet Monkeys," by Arthur Patterson, published by L. Upcott Gill, 170 Strand, W.C.

I must not forget to mention the callosities with which the bonnet monkey is provided. They are hard protuberances which enable the animal to sit comfortably.

A. J. JENKINS.

New Cross.

NATURAL HISTORY NOTES.

I HAD another very pleasant "field day" at Heidelberg, about a week after that referred to at page 217, vol. xxiii.

I had arranged to go with my friend M., to look for the large blue butterfly (*P. Arion*) which report said had been seen a day or two before, at the Kohlhof, a large clearing in the woods, lying about five miles south-east of the town.

The garden of the house in which I was staying, opens into the woods, to the south of Heidelberg, and I started in that direction in order to meet M. in the road just above, which, though by a very devious route, led to our destination.

I had hardly left the garden when, to my astonishment, a roe deer jumped up just in front of me, and after cantering a few yards, turned round, and deliberately stared at me. On my waving my handkerchief, it started off again, but was immediately joined by another, for which perhaps it had been waiting, and then both went quietly up the wooded hillside. This deer is very common round Heidelberg, but I had never before seen one in that neighbourhood, though I have, at various times, spent several months there, and have been through the woods in every direction, at all hours of the day. All the noises of the town, and Heidelberg is by no means a quiet place, as well as the horrible shrieks of the steam-tug in the Neckar below, must have been perfectly audible to these animals, but they had evidently become quite accustomed to them, and treated them with the contempt which familiarity is said to breed.

Close by the spot whence the roe started, I came upon quite a colony of a very beautiful feathery spiræa (? ulmifolia) which is common on the Alps, but I had never seen it before in Germany. It is, of course, quite hardy, and worthy of more extensive cultivation in the mixed flower border, in English gardens.

When I met M., he reported that he had just been told of several specimens of Arion having been taken the day before in a meadow on the other side of the river. We therefore determined to try that locality instead of the Kohlhof.

Retracing our steps, and passing across the town, we went over the new bridge, and then, bearing to the right, kept along the sides of the hills above Neuenheim, until we reached the spot indicated, a small meadow lying just above the little town of Handschuhsheim. But our quest was fruitless, Arion could nowhere be seen. The only thing that I saw there worth notice, was a quantity of plants of the evening primrose (*Œnothera biennis*) which were growing about an old stone quarry, at one corner of the meadow. It is very curious, how partial this plant is to situations of that kind.

Being disappointed here, we determined to make the best of our way, to a meadow called the Engelwiese, just above the Neckar valley, on the north side. To reach this, which was nearly due east of Handschuhsheim, we took a road that ran for some distance through a kind of chestnut grove. Here I observed *Orchis maculata*, and *Pyrola minor*, in abundance, and I got one specimen of *Neottia nidus avis*. I also saw in several places the curious seed-vessels of *Col. autumnale*, nestling in the narcissus-like foliage. The path gradually bore too much to the north, so we determined to enter the wood, and take a short cut for the ruins on the Heiligenberg, where we knew we should reach a path that would lead us straight to our goal.

At the point where we left the path, then running alongside a meadow, there was a brook coming down the hillside, and having passed into the wood, here we came upon a little bog in which was a bed of fine plants of the pretty little *Smilacina bifolia*.

We found the hillside very steep, and so slippery from the dry pine needles, which formed the floor, that we had difficulty in keeping our feet, and it was simply impossible to attempt to catch any of the oak eggers, which now and then dashed past us, though I doubt whether we could have accomplished their capture on level ground, their flight being so rapid and erratic.

We saw large numbers of the males of a moth that feed on the pine (*Fidonia pinaria*).

On reaching the Heiligenberg, we saw one or two damaged specimens of *P. machaon* and *P. podalirius*, flying round the ruins. A month before, they had been abundant there and in fine condition. Both these species have a particular fancy for flying round ruins, and high rocky places. I have seen both in dozens flying, and chasing one another round the ruins at Drachenfels. In England, Machaon is found only in the Fens, and in Germany its food-plants do not, so far as I could discover, grow anywhere near the spots it seems most to delight in.

I saw one damaged holly blue (*P. argiolus*), and between the Heiligenberg, and Engelswiese, I took two V. C-albums, and one Polychloros. I also saw a good many Athalias, and several specimens of *L. sinapis*.

When we reached the Engelswiese, we could not find any Arions, but we got five splendid fresh specimens of that brilliant little insect, the scarce copper (*L. Virgaurea*) and we caught sight of a fine Sibylla, which, however, escaped us.

We now resolved to go on to a large meadow, which lies high up in the forest, above the village of Ziegelhausen, and which had been a sort of happy hunting ground to us for some time past, and where, a few days before, we had seen Aglaia and Athalia in profusion.

On our way thither, I saw several plants of the yellow fox-glove (*Digitalis grandiflora*), and a fine clump of the pretty liliaceous plant (*Anthericum* *ramosum*), this being the only spot near Heidelberg in which I have ever seen that species.

We also saw a very fine campanula—I am not certain of its specific name, but I think it is *C. pulla*—it is about two feet high, the flower solitary, and as large as a small egg-cup, the foliage almost linear and the colour bright blue. The headquarters of this species are, apparently, the higher part of the Black Forest, for I have seen it in great quantities near Donaueschingen, where, however, the flower varied in colour between quite white and dark blue.

A. adiantum-nigrum and *A. trichomanes* were plentiful in one part of our route. Four or five years ago, I found fronds of the latter nearly sixteen inches long at the same spot, but the plants that had produced them, were gone last summer.

As we were walking along through the wood, a butterfly, which at the time I took for *A. iris*, suddenly flew up, from some horse droppings that lay in the road. I was quite close to it, but was so surprised that I failed to net it. We stopped a few minutes hoping it might return, but we saw no more of it, though a school-boy the very next day took five perfect specimens of *A. ilia* off the same droppings : he got them in about an hour.

After a time, the path left the wood, and ran along the top of a meadow, that had just been cleared of hay. We could see a lightish coloured butterfly flapping along, rather feebly, about a hundred yards away. This, my companion, who was young and active, soon netted, and it turned out to be a freshly hatched specimen of Galatea, the first of the season. We could not see any more, and I think the rest of the brood must have been carried away in the chrysalis state, with the hay, for I never saw any more galateas near that spot, though they were common, almost everywhere, a little later on.

To reach our destination, we now had to turn due north, up a valley that lies at right angles with the Neckar, the path—a grassy lane—runs alongside the forest, which is on the left, and on the right there is a hedge, beyond which is a narrow valley of meadow land with a stream at the bottom.

There was plenty of honeysuckle in the wood and hedge, and some weeks before I had fixed on that spot as a safe find for Sibylla, when the proper time came, and sure enough, in our progress through the lane, we saw at least a dozen of these elegant butterflies, some floating in and out of the woods, others flying high and settling out of reach, and others resting on the bramble blossoms (for which this species has a great predilection) and off which we managed to capture about half a dozen mostly in good condition, though to obtain really fine specimens the insect should be bred up from the caterpillar.

Just before the path ends, the hedge on the right terminates, and the meadow lies open to the lane. We walked just into the meadow, and after looking across it for a few minutes, without at first seeing anything worth going after, we both caught sight of a dull blue butterfly about fifty yards away. The grass being still uncut, I hesitated, but M. dashed after the insect, regardless of the grass, and of the mowers who were in sight, and succeeded in netting a fine fresh specimen of Arion, the first I had ever seen alive.

I may add that we did not find any more that day, though I had the pleasure of taking three at the Kohlhof two days afterwards, but I had too the mortification of then missing the only Lathonia I ever saw on the wing. It was too quick for me, though not for M., who chased, and was fortunate enough to catch it.

On reaching the meadow we were bound for, M. at once jumped down a rather steep bank into it. He alighted close to a small oak bush, from which, what I took for another *A. iris* flew up ; after alighting on the oaks near by two or three times, and flying round again and again, it at length returned to the very spot whence it had started, and had scarcely settled before M. secured it. I then saw that it was not Iris but Ilia.

We now turned our attention to the meadow. Aglaia was in profusion, and we could have caught them by the hundred, had we been inclined.

I secured one Adippe, at least I took it at the time for that species, though I am now doubtful whether it was not Niobe, which is, I believe, more common in Germany than Adippe, and M. got two Paphias. Athalia was in abundance, but we had taken all we wanted several days before. There were still a few silenes and euphrosynes to be seen, but it was almost sad to look at these shabby and shattered insects, and remember that these were the same bright little beings which we had seen dancing so gaily in the sun two or three short weeks ago.

We were fortunate in obtaining three more males and one female of Virgaurea, the latter a splendid specimen, together with a few of *T. pruni*, all in fine condition ; I also got a pair of *H. fuciformis*.

I was surprised, as well as pleased, to find two patches of the beautiful *Arnica montana* in the meadow, and quantities of Orchises in three species, *O. maculata* and *O. conopsea*, and *H. bifolia*, the first was very abundant and varied in colour, from almost white to purple.

I have never seen the Arnica in any other German locality, though I suppose it would be found, in the higher parts of the Black Forest.

On our way home, M. discovered a half-grown caterpillar of the puss moth, feeding on aspen, and I had the great pleasure of securing a large brood of caterpillars of *V. antiopa*, consisting of more than a hundred individuals. I reared them all, except one or two that met with accidents, and they all hatched out safely, after remaining in the pupa state thirteen or fourteen days. I had previously made many fruitless searches for the larvæ of this fine species and had almost come to despair of meeting with it, though I knew that the perfect insect occurred in plenty at

Heidelberg. These were feeding on the broad-leaved sallow. Ichneumons seem to be singularly capricious in their attacks on the larvæ of the Vanessidæ; not one of these hundred of Antiopas had been attacked, though of two large broods of *V. xanthomeles* (very like polychloros) which I found (also on willow) three-fourths had been "struck," and more than half of all the Ios I got, were in a similar plight.

During the day, I saw several large spotted woodpeckers, and two or three common buzzards. The shrill querulous cry, of these last, as they sweep round in graceful curves, often at such a height as to be almost invisible, though their cry is still distinctly audible, must always attract the attention of the naturalist. For my part I was never tired of watching the elegant flight of these beautiful birds.

R. B. P.

Eastbourne.

OUR SCIENTIFIC DIRECTORY.

[The Editor will be obliged, if, for the benefit of his numerous readers, secretaries of scientific societies will send notices like the following, also place and time of meeting.]

BURY (Lanc.) *Literary and Scientific Society*: President, Rev. Douglas Walmsley, B.A.; Hon. Secretary, Mr. Thomas K. Holden, Blackford Bridge, Bury, Lanc.

Nottingham Naturalists' Society: President, W. J. Abel, B.A., F.R.M.S.; Hon. Secretary, W. Hanley Kay, Gresham Chambers, Beastmarket Hill.

The Practical Naturalists' Society: President, S. Robinson Hallam, F.R.M.S.; Hon. Secretary, G. K. Gude, 5 Giesbach Road, Upper Holloway, London, N.

The Penarth Entomological Society: President, Mr. J. Wallis; Hon. Secretary, G. A. Birkenhead, Downs View, Penarth, near Cardiff. Meetings are held on the second Tuesday evening in each month.

Norwich Science-Gossip Club: President, John Bidgood, B.Sc.; Hon. Secretary, Frank Balls.

Petherton Microscopical Society: Founded 1882. Meets third Thursday in month at 80 Petherton Road, Highbury New Park, N.; excursions on third Wednesday. Museum and library. President, Bernard H. Woodward, F.G.S.; Hon. Secretary, D. Mottram.

SCIENCE-GOSSIP.

THANKS to strict preservation, and to the fact that the inhabitants are realising the value of the bird, the eider has greatly increased in number in Iceland during recent years. The people do all in their power to attract the bird to their property. Among these attractions are bells worked by the wind or by water, the hanging up of dress material of a glaring colour, and the keeping of brightly-coloured fowls. A society has been formed for the granting of premiums for the killing of animals preying upon the eider, and last year 1155 such prizes were awarded.

THE Secretary to the Committee on Science and the Arts of the Franklin Institute asks us to make it known to our readers that the Committee is empowered to award, or to recommend the award, of the following medals, &c., for meritorious discoveries and inventions tending to the progress of the arts and manufactures:—(1) The Elliot Cresson medal, gold; (2) The John Scott legacy and premium and medal, twenty dollars and a medal of copper. For further information, application should be made to the Secretary, The Franklin Institute of the State of Pennsylvania, Philadelphia.

AT the Brockley and St. John's Scientific Society (late New Cross Microscopical and Natural History Society), a lecture on "Crabs, Lobsters and Shrimps," was delivered at the St. John's Church Room, Lewisham High Road, on the 7th February, by W. J. Spratling, Esq., B.Sc., F.G.S. The development of the Crustaceans was explained, and exemplified by Trilobites found in the Cambrian Rock, Palæozoic and Secondary and Tertiary Rocks up to the crabs of the present day. The lecture was illustrated by photographic slides, which were shown by means of the society's oxyhydrogen lantern.

NICKEL AND COBALT.—In reply to a query in the March number of SCIENCE-GOSSIP as to the reported decomposition of nickel and cobalt, the following facts may be of interest. The task which Dr. Krüss set himself was the determination of the atomic weights of nickel and cobalt; and for this purpose he employed Winkler's process. Having accurately determined the atomic weight of gold, a definite quantity of nickel or cobalt was treated with a solution of gold chloride and the precipitated gold weighed. As the amount of this gold varied, without any apparent cause, after eliminating possible sources of error, the gold itself was examined. After being dissolved in nitro-hydrochloric acid and reprecipitated, it was found that it had lost weight, and that the washings were coloured. These washings when concentrated were found to give reactions characteristic of none of the metals operated upon, so Dr. Krüss endeavoured to obtain larger quantities of the unknown material; and ultimately he found that by igniting fresh oxide of either nickel and cobalt with potassium hydrate, and washing out the mass, he got a solution containing two or three per cent. of a substance with the characters of none of the substances operated upon, while the pure oxide of nickel or cobalt was left. From this solution a white oxide was obtained, and from this by means of blow-pipe and charcoal was obtained a brown malleable metallic powder, soluble in hydrochloric acid; the solution afforded reactions not characteristic of any known metal, this brown powder was accordingly inferred to be a new element. Further investigation has shown that the oxide resembles alumina and zinc oxide, though it distinctly differs from both; the amount obtainable from nickel oxide is about one from fifty. Further investigations are in progress; and I believe that up to the present time (March 1st) the new substance has not been named.—*Arthur W. Harrison, Westminster Hospital, S.W.*

WE are sorry to have to announce the death of the Rev. J. G. Wood, M.A., F.L.S., &c. the popular science lecturer and writer, who died suddenly on Sunday, March 2nd, at Coventry. The Rev. J. G. Wood was at one time a frequent contributor to our columns. He was born in London, in 1827, where his father followed the profession of surgeon: and finished his education at Merton College, Oxford, where he was elected Jackson scholar. On leaving college, he became chaplain at St. Bartholomew's Hospital. Amongst the deceased gentleman's most important works are "Natural History," "Insects at Home," "Insects Abroad," "Homes without Hands," and numerous others. Perhaps no writer has more thoroughly influenced the minds of young people towards natural history than Mr. Wood.

TWO other old contributors to SCIENCE-GOSSIP have recently died, both of them well-known botanists: Professor the Rev. Churchill-Babington, of Cockfield near Bury St. Edmunds; and Mrs. Merrifield, of Brighton.

THERE is a capital portrait, and an equally good biogrrepresentational sketch, of Professor Boyd Dawkins, F.R.S., &c., in the March number of "Research."

"THE NATURALIST" for February contains a capital paper, on the "Bibliography of the Geology and Palæontology of the North of England, 1887," by S. A. Adamson and A. Harker. This the fourth annual list is very exhaustive, and contains many names of men of note as well as those of humbler pretensions.

MICROSCOPY.

THE ROYAL MICROSCOPICAL SOCIETY.—No. 67A of the Journal of the Royal Microscopical Society contains the title-pages, index, &c., for 1888. No. 68, besides the summary of current researches, contains the following papers: "Observations on the Special Internal Anatomy of *Uropoda Krameri*," by Albert D. Michael; "List of Desmids from Massachusetts, U.S.A.," by Wm. West; "Reproduction and Multiplication of Diatoms," by the Abbé Count F. Castracane.

ZOOLOGY.

THE DARTS OF THE HELICIDÆ.—Replying to the query of C. A. W. in SCIENCE-GOSSIP for February, the darts are to be found in the helicidæ all the year round. In specimens which have been long hybernating the dart does not present that firm appearance it would at any other time, and is more likely to be overlooked. I think if your correspondent boils the dart sacs in a solution of caustic potash, he will find that the majority of specimens have darts. The following table shows the percentage possessing darts out of a number of dissections I have lately made from hybernating specimens:—

Species.	No. of Specimens.	Number possessing Darts.
Helix pomatia . . .	5	5
,, *aspersa* . . .	15	12
,, *nemoralis* . . .	11	9
,, *rufescens* . . .	20	20

—*W. E. Collinge, Blenheim Place, Leeds.*

DARTS.—It would be interesting to know where C. A. W. procured his "dartless" *H. aspersa*; Early in the summer of 1888 Mr. Standen and myself examined a number of mature shells of the same species, collected on the coast near Blackpool, without finding a single dart. This is all the more remarkable, because specimens of *H. nemoralis* collected at the same place and time yielded a large percentage of darts. Early in December, I received a large quantity of *H. aspersa* from Ross, Herefordshire, taken from their winter quarters. About sixty per cent. had darts. About the same time I dissected twenty-four hybernating *H. pomatia*, all these, or a hundred per cent. had perfect darts. On Feb. 2nd, 1889, I examined four species of Helix, all hybernating, with the following results.—From one *H. hispida* I got two darts (there are only four species having two darts each), from four *H. virgata* I got three darts. Four specimens each of *H. caperata* and *lapicida* all had perfect darts. This proves, without doubt, the dart is present at all seasons of the year, provided the sheet is full grown. Perhaps the sheets examined by C. A. W. were immature?—*W. H. Heathcote, M.C.S., Preston.*

LOVE DARTS IN SNAILS.—I have only just seen the note of C. A. W. on page 44 of the February number of SCIENCE-GOSSIP, asking me to help him over his difficulty, relative to his not finding darts in the hibernating specimens of *Helix aspersa* he has examined. I have found darts in various degrees of development in hibernating *H. aspersa*, but I am not going to state that they are invariably to be found in hibernating specimens, for during hibernation all metabolism in the animal is in abeyance, and possibly those I dissected out were formed previously to hibernation. If the animal has had the need to use his dart previous to hibernation, I do not think it feasible on physiological grounds that another will be formed to replace it during the quiet and slow physiological state of hibernation. He will doubtless have no difficulty in finding darts, if he will examine some specimens in spring, for then anabolic processes are at their greatest development, and it is wonderful to note with what rapidity they are produced by the secreting activity of the cells at the posterior end of the lumen of the dart-sac (fundus); for C. Arndt, in a paper entitled "Entwicklung des Pfeils bei *Helix nemoralis*," in Arch. Ver. Mecklenb. xxxii. pp. 87–95, states that he has found the dart of *Helix nemoralis* to be reproduced within a week. It is interesting to note in this place, the various abnormal situations in which one finds a dart during dissection. I have several times dissected darts out of the connective tissue around the receptaculum seminis, an abnormal place for them, to which I believe Lloyd Morgan, in his "Animal Biology," refers, and during the last Christmas holidays, my friends Mr. George Mellors and Mr. A. Paling found one in the crop of a *Helix aspersa*.—*J. W. Williams.*

Pallas Sand Grouse in Worcestershire.—On December 29th, a farmer shot in this parish two males and two females out of a flock of five. I have not seen any record of the previous occurrence of this species in this county.—*K. D. Cofton.*

The Senses of Insects—have been made the subject of speculation during the course of a late address to the Entomological Society of London, by Dr. David Sharp. With regard to the notions of foreign comparative anatomists on this and cognate subjects there is, of course, a fine field of research in the rooms of the Linnean Society of London, where any moderate linguist may sit and sip the flowers of philosophy very enjoyably. But while thus occupied let us never fail to mark, learn, and inwardly digest. Now in order to controvert the Mosaic theory of Johannes Müller promulgated about sixty years ago, that the picture in the insect's eye is composed of a large number of separate pieces, the Doctor—and may we suppose also Sir John Lubbock? whose views are similar—held that the picture formed on our retina is flat, and that consequently any ideas of capacity we may possess are the results of mental experience. Let us put this assertion to a crucial test. Suppose at the present moment I am thinking of nothing and you are thinking of nothing. Now I see a man, and not allowing the idea of a man access into my thoughts, I shut one eye and look at him with the other. For the life of me I cannot suppose that he is flat, and so I open the two. If I ever before could fancy that he was otherwise, he most certainly has now capacity—Why is this? The images in our two eyes are different truly, and is it not likewise true that they are inclined at an angle to each other like an inverted V?—*A. H. Swinton.*

Coronella lævis in Hampshire.—It may interest some of the readers of Science-Gossip to know that I have had this rare snake brought to me from Hampshire. It is not uncommon on the continent from Norway to the southern parts, but it has been doubted to be a British reptile. I hope it has now really taken its abode here, for it is both harmless and useful.—*A. J. Field*, 43, *Medina Road, Finsbury Park, N.*

Litt. rudis *v.* sinistrorsum.—With reference to this monstrosity, recorded last month from Weymouth, Mr. Marshall informs me that the specimens are full grown and belong to var. *tenebrosa*, Mont. I have now discovered four specimens in all—three of them being also scalariform.—*B. Tomlin, Llandaff.*

Birds of Hampshire.—Having been asked by the Hants Field Club to compile a briefly annotated list of the birds of Hampshire and the Isle of Wight, I should be glad to hear from any of your correspondents of the occurrence of rarities or the nesting of local species, such as the cirl bunting, wood lark, Dartford warbler, and raven, not necessarily for publication. Our list contains about 280 species, notable absentees being the shore lark, Lapland bunting, and roseate tern.—*J. E. Kelsall, Fareham.*

BOTANY.

Alchemilla vulgaris in the South-East.—In answer to Mr. H. Lamb's inquiry, "Is *Alchemilla vulgaris* rare in the south-east?" I reply, "Yes, decidedly so. It occurs in E. Sussex, in Surrey (about three stations are known), and it is reported for W. Kent in the "Journal of Botany," 1888, p. 311, by Mr. H. W. Mornington. In Middlesex it is more plentiful, and in some parts of Herts may be called common; it also occurs sparingly in N. Essex. The station Mr. Lamb found *Sonchus palustris* in has been known for some years, and been gathered from several times. I have seen specimens in several herbaria from thence.—*Arthur Bennett.*

The South Wiltshire Flora.—Through the kindness of Mrs. Howard, of Ula, Colorado, I have been permitted to examine an interesting collection of plants, made recently in the neighbourhood of South Newton, near Salisbury. The species are mostly such as one finds in the chalky districts of Kent and Surrey, and include the following:—*Aconitum napellus*, *Adonis autumnalis*, *Hippocrepis comosa*, *Anthyllis vulneraria*, *Atropa belladonna*, *Butomus umbellatus*, *Sagittaria sagittifolia* (R. Avon), *Reseda lutea*, *Saxifraga granulata* (Broken-bridges), *Scutellaria galericulata*, *Nepeta cataria*, *Impatiens* *noli-me-tangere*, *Epilobium angustifolium*, and *Polygonatum multiflorum*. Comparing this with the Surrey list, Aconitum alone seems to be wanting in the latter county, and although found apparently wild, it is conceivable that the Wiltshire examples originated from some accidental introduction.—*T. D. A. Cockerell.*

ABNORMAL GROWTH OF PLANTAGO MARITIMA.—I do not think the growth the Rev. Arnold names is very common; I have seen a somewhat similar one at Hythe, in Kent, and less so in specimens gathered on the north coast of Norfolk. The late Mr. H. C. Watson had an analogous instance in *Scilla nutans*, with bracts two inches long, in his garden at Thames Ditton; but in this case the flowers were merely larger, but unaltered in arrangement.—*Arthur Bennett.*

ABNORMAL GROWTH OF BRACTS.—I have not seen the abnormal growth referred to by Mr. F. H. Arnold, but the involucral bracts surrounding the capitulum of a large specimen of the sunflower, grown here last summer, were nearly all developed into leaves, some of which were seven or eight inches long, giving the flower the appearance of resting on a cushion of leaves, all radiating from a common centre.—*Ernest O. Meyers, Hounslow.*

MONSTROSITY IN PLANTAIN.—The monstrosity of spikes of plantago, alluded to by Rev. F. H. Arnold, was observed a long time ago on *Pl. lanceolata* and *Pl. major*. A paper about it by Germain de St. Pierre may be found in "Bulletin de la Société Botanique de France," 1857, p. 625. I do not think that the same case was ever observed on *Pl. maritima*.—*C. C., Doullens, Somme.*

DOUBLE BLOSSOMING.—Trees and plants of various species blossoming twice in the same year are not unfrequent, and that phenomenon was studied and accounted for by W. de Schœnefeld and G. Maugin in "Bulletin de la Société Botanique de France," 1859, pp. 37, 465.—*C. C., Doullens, Somme.*

COLORADO FUNGI.—I am having fairly good success with the fungi in Custer County this year, adding several species to my list. Mr. J. B. Ellis has been good enough to identify a number of species from this locality recently, and among them he finds *Elaphomyces variegatus*, Vitt.—a curious, yellowish tuber I found while digging an irrigation ditch; *Polyporus arcticus*, Fr.; *Dermatea pruinosa*, E. and E., so named in ms., a probably new species; *Odontia fimbriata*, Pers., on wood ashes; *Puccinia bigeloviæ*, on Bigelovia, another apparently new species, named by Ellis and Everheart in ms.; *Æcidium euphorbiæ*, Gmel., and *Uromyces scutellatus*, Schrank, growing together on *Euphorbia montana*, Engelm.—which is suggestive of their relationship; *Æcidium compositarum*, Mart.; and *Oidium monilioïdes*, Lk., on grass. Dr. W. G. Farlow has also named some Custer County specimens for me; *Æcidium monaicum*, Peck.; on Arabis, *Hypocrea richardsoni*, Berk. and Mont., on dead poplars (*Populus tremuloïdes*), *Bovista circumscissa*, Berk. and Curt., and *Polyporus biformis*, Kltz. And from Wellsville, in Fremont Co., "*Corticium*" *setosum*, Berk. and Curt. (ms.), which, however, is not a true corticium, the generic position being at present doubtful.—*T. D. A. Cockerell, West Cliff, Colorado.*

A PALE VARIETY OF OPHION.—On October 17th, 1887, I took at Saguache, Saguache co., Colorado, a very remarkable-looking pale-yellow ichneumon of the genus Ophion, which I sent to Mr. W. H. Ashmead, who says it is a pale variety of the common *O. bilineatus* of Say. I will call it *O. bilineatus* var. *pallida*, and at the same time ask, do the British species of this genus vary in a similar manner? I have captured or seen hundreds of them, and never saw any noteworthy variation in colour.—*T. D. A. Cockerell, West Cliff, Colorado.*

OPHRYS APIFERA AGAIN.—Glad to be able to inform your readers that I have found this interesting plant again, and that it has not wholly deserted us. On Sunday, Feb. 24th, eight plants were growing where it was before its strange disappearance. Did it disappear? When first I saw the plant in this district in 1884, I dug up a specimen for my herbarium and detached the young tuber, which I planted in a pot, using for soil a piece of turf taken from the same spot. This tuber began to show leaves early in the autumn, and these leaves continued deciduous throughout the winter and early spring. When throwing up a spike, the root leaves began to decay. I had before noticed the decayed appearance of the leaves of the specimen I had dried, and have since noticed that generally when apifera is in bloom its leaves are more or less decayed. Now, 1st, do all tubers bloom the first year? The one I reared did, though a small one, but it was a puny spike of two insignificant flowers. At the time, I thought that this was owing to its being grown in a pot, knowing that this family is, as a rule, rather averse to cultivation. 2nd, If not, why may not the leaves have, owing to the overgrowth of surrounding plants, wholly decayed by June or July, the time apifera should be in bloom and the time when botanists naturally look for it. In this case, the tuber would still be there, but no outward appearance would betray its presence. It would be a good plan to search spots frequented by this fast-becoming rarity, in the early spring-time, and see whether these observations are correct. I say spring-time, because then the herbage is short and the glaucous green leaves would show plainly.—*John Taylor, Fairford, Gloucestershire.*

BOTANY AND PUNCTUATION.—Will you allow me space to correct a few errors in the printing of my paper on the Wye Valley plants (p. 68)? By the insertion of two semicolons and the transposition of a word, *Valeriana sambucifolia* is made to "climb over bushes;" and the Chrysosplenium to grow on a tree; instead of which *Stellaria umbrosa* was the climber, and the navelwort the parasite. *Euphorbia* "*striata*" is a misprint for stricta. While upon this subject, may I add the following? In the vicinity of Blakeney, in the Forest of Dean, *Hypnum atro-virens* was growing, a moss which I thought to be confined to the summits of a few Scotch mountains. Can any of your Gloucestershire readers inform me if this is frequent in such low-lying districts?—*H. W. Monington.*

NOTES AND QUERIES.

Sense of Smell.—With all due deference to Mr. Woodroffe Hill, I should somewhat doubt the ability of even a well-trained blood-hound to track a criminal in a crowded thoroughfare. What it might be able to do at an hour when there would be little or no traffic is a different matter. A bloodhound might be staunch on the trail of a nigger and not swerve even were it crossed by a white man, but supposing other niggers were to touch upon the trail of the man on whom it was first laid, would it not be very likely to follow up the freshest scent? Let us imagine a bloodhound following the footsteps of a bloodstained murderer, and for some unfortunate who had freshly cut himself, to cross the former's track; would the hound be able to distinguish between the innocent and the guilty, and with some subtle sense discover a difference in the odour of the two men's boots? We have in this locality some splendid specimens of the old southern hound bred by Squire Brook, the master of the Boxhill Harriers, as staunch as hounds can be, and yet I have even seen them change their hare. Might not a bloodhound be as liable to make the same mistake as regards his man, in a populous town?—*W. E. Windus, Boxhill.*

Gossip about Foraminifera.—The author of the above paper states that he is an "expounder of curious facts." He then informs us that the sponges form a group of animals in class Rhizopoda! The nomenclature is not reliable, as for instance, he quotes *Geoponus stella-borealis*, the name given by Ehrenberg in 1839 to the *Polystomella striatopunctatus* named in 1803 by Frihtel and Moll. The figure of *Entosolenia squamosa* is imaginary, the cavities depicted should be imbrications.—*Frederick Chatman.*

Earwigs.—The Rev. J. G. Wood, in his "Insects Abroad," says (page 277): "There is a great difficulty about their scientific name." He is writing about the earwigs. "By some they are called Dermaptera, i.e. 'skin winged,' because their elytra are soft and leathery. . . . By others they are termed Euplexoptera, or 'beautifully-folded wings,' . . . as if to add to the perplexity, some entomologists have given the name of Dermaptera to the grasshoppers, cockroaches, crickets, and other insects which are known under the title of Orthoptera. I cannot bring myself to acknowledge that this last-mentioned arrangement can be correct." Now let me cite out of Cuvier's "Animal Kingdom," edition 1834, vol. iii., p. 344: "In the sixth or the Orthoptera, there are six legs." As a footnote is added on the same page, "De Gerr established this order under the name of Dermaptera, improperly changed by Olivier to that of Orthoptera; we preserve the latter, however, as naturalists have generally adopted it." And again in vol. iv. of the same edition, as a footnote, "M. Kirby had previously established under the denomination of Dermaptera," talking of Euplexoptera, but De Gerr's title has a seniority of some fifty years to Kirby's. Therefore ought not naturalists to call the Orthoptera, "Dermaptera," and the earwigs "Euplexoptera"? But then the "Ulonata" of Fabricius have still older seniority. I have not yet seen a collection of grasshoppers, &c., labelled "Dermaptera," or "Ulonata." I should be very glad if some one would inform me on this subject.—*Geo. W. Kirkaldy.*

Nomenclature.—I have been rather puzzled about certain generic names, particularly in zoology. I have always read that two generic names, spelt the same, cannot be allowed, even though one be the title of a bird and the other a shell. The satin moth is called Liparis, and a shell fish is called Liparis. Echidna is the generic name both for the porcupine ant-eater, and for a Peruvian viper; Acanthopus (Meg.) belongs to the heteromerous coleoptera; Acanthopus (Klüg) belongs to the fam. Apidæ. Again, I always thought seniority had priority, but ornithorhynchus (Blumenbach) is the generic name in use for the duck-billed platypus; although platypus (Shaw) has seniority; while platypus (Herbst.) is used for the coleopterous xylophagi. Herbst lived from 1743 to about 1800; Shaw lived from about 1760 to 1815; Blumenbach from about 1760 to 1830. I should also be obliged if some reader could inform me of a book (not more that 7*s.* 6*d.*) about the comparative anatomy of the vertebrates, particularly the dentition.—*G. W. Kirkaldy.*

Bearded Tit.—Whilst collecting mosses on the banks of the Ouse, near York, in November this year, I had the pleasure of watching the movements of one of these birds, a very rare species here. I had clambered along the trunk of an overhanging willow, when the bird alighted amongst the branches. I watched it hopping from twig to twig for some moments, within a few feet of my head, and have no doubt whatever of its identity.—*J. A. Wheldon.*

The Great Sea Serpent.—I have just accomplished the task of analysing and collecting over one hundred notices ancient and modern, true and fictitious, relating to the great sea-serpent. Balancing impartially the resulting evidence, I am driven to the conclusion that it is a venerable sailor's yarn derived from ocular impression, while, quite apart from all other considerations, it is mainly impossible that a species of air-breathing serpent of such extensive distribution should lie at the bottom of the ocean and be so seldom seen; and its most ardent champions have never fully, I think, realised this circumstance. Giant squids or calamars, distinguished from our better known cuttle fish by their cylindrical bodies, have existed from all antiquity on the ocean beds all over the world where the fish on which they prey abound. The tentacular arms of these squids attain an enormous length, and hence has originated a story of the great sea serpent. American naturalists have but quite lately given their attention to the giant squids of the Newfoundland banks and secured specimens for their museums; they have come to be known generally as Architeuthis, but as regards the species and general classification of their kind we have probably everything to learn. When it is considered how poorly represented great oceanic monsters are in museums everywhere, our ignorance is not to be marvelled at; the arch of heaven has been their home, and we have possessed no house wherewithal to compose a walhalla for their skin and bones.—*A. H. Swinton.*

A CURIOUS tale comes from Wellington, New Zealand. Alexander McGowan, a man engaged in the harbour improvement works, was under the water setting some blocks, into which some piles had been driven. Whilst doing so he was seized by an immense octopus, which at the same time fastened on to one of the piles. The man attempted to free himself, but finding that the more he struggled the tighter the octopus gripped, he desisted. The creature immediately let go of the pile. In response to his signals McGowan was quickly drawn up still in the tight embrace of the monster, which was at once killed. Its limbs were measured and found to be about nine feet long. These monsters are said to be common in the harbour.

PRACTICAL NATURALISTS' SOCIETY. — This society recently held a conversazione in Essex Hall. The musical programme was successfully carried out, and numerous lantern transparencies sent by Mr. Riley Fortune, from Harrogate, were displayed during the evening, but the chief feature was the exhibition of Natural History objects. Fourteen microscopes occupied a large table in the centre of the room. Conspicuous in this department was Mr. Fred Enock, F.E.S., who exhibited beautifully-mounted slides, including specimens of the Hessian Fly, the life history was minutely explained by his "sketches." Extensive collections of skins, nests, and eggs of British birds and British land and freshwater shells, sent by Mr. F. R. Fitzgerald, covered the greater part of the tables. Miss Fisher Brown contributed marine shells and seaweeds from the Bahamas, and nest of trap-door spiders from Jamaica. There were also foreign and British coleoptera, shown by Mr. A. J. Field; Lepidoptera, shown by Mr. R. Oakeshott; dried plants, diagrams, and a further collection of British land and freshwater shells, shown by Mr. J. K. Gude. Mr. R. B. Postans, of Eastbourne, sent a collection of flint implements from the Sussex Downs; Mr. W. Allen, flakes from Kent, and Mr. A. Ramsay specimens of *Eozoon canadense.* One of the most conspicuous objects in the room was a Neptune-cup, two feet high, sent by Mrs. Dyer, of Swansea. Live salamanders and cray-fish were shown by Mr. C. H. Whitlow, who also contributed vipers, grass-snakes and slow-worm in spirits. Water-colour drawings of animalcula, by Mr. Jno. Eyre, were admired. An address was delivered by Mr. A. Ramsay.

THE RAMSGATE WELL. — There are a few ephemeral wonders at Ramsgate. A strange fish, the Squatina or Angel fish, I believe, is paraded in a barrow, now and again; a hen lays a large egg somewhere on the coast, or a more or less striped donkey puts in an appearance, and Ramsgate milk resembling chalk and water is at least singular, a standing marvel. But the excursionists to Ramsgate mostly overlook a curiosity remote but a few yards from the station of the South-Eastern Railway, whose origin clouded in mystery, might afford them something horrid to dream about. I allude to an antique well, over one hundred and thirty feet deep, which has been laid bare in section during the excavation of a huge square chalk pit from whence colliers trading to the port are ballasted. The bore of the well is smooth and ovate-oblong, two feet nine across the greater axis, and notches are cut from its top to its bottom at intervals of a foot, by which a sailor or monkey might make the perilous descent; which has doubtless often terminated fatally, since some baskets full of bones have been gathered at its bottom, where is a step or ledge, doubtless often reached sooner than anticipated. The covering stone to the well mouth may yet be seen, it is a perforated piece of sand-stone from the neighbouring greensand formation, and a similar, shallower well, has been exposed in section in the same quarry. If more recent than the golden hours when Cuthbert, Farley, and Elgar Farless hurdled their nibbling sheep among the thorns and maiden hollys, these wells in their singular Roman bore at the least claim a greater antiquity than the elegant Margate shell grotto which displays a damnable pointed arch.—*A. H. Swinton.*

A HARE AT SEA.—In "Nature" for January 17, 1889, is an account of a hare taking to sea, and the following will show how readily the hare will take to the water when in danger. On a small strip of land running some little distance into the sea on the Island of Cumbrae, I surprised a hare on the extreme point. The animal seeing that it could not pass me safely, plunged into the sea, which was calm at the time, and swam well till it reached the shore. It may be a question whether when hard-pressed it has not a suicidal propensity. A few years ago when at Stromness, I was informed by an old farmer that his dog started a hare which made all speed to a neighbouring loch, the loch was frozen over at the time, with the exception of one of those holes frequently met with to which the hare ran straight and plunged into it. The dog followed, and both were drowned. On another occasion, many years ago, a hare found its way into Glasgow Green, a dog soon got sight of it and was immediately in pursuit. The hare went bounding to the River Clyde, and sprang into the water and the dog plunged in after it. The hare swam better than the dog, and would have reached the other side safely, only for the people on the opposite bank who were looking at the chase. The hare, seeing its escape in that direction obstructed, turned down stream, this gave the dog some advantage, still the hare was more than a match for the dog. A young man, a little way down the river, seeing that the hare might have some chance of saving its life, plunged in before it; the poor animal seeing escape hopeless, dived under the water and was seen no more.—*David Robertson*, *Fernbank*, *Millport*, *Isle of Cumbrae.*

POISONOUS PLANTS.—A friend lately sent me a copy of the "Standard" newspaper, containing a paragraph headed as above, describing several cases of cattle poisoned in the South of England, by their browsing on the foliage of the lesser spearwort (*Ranunculus flammula*). On the margin of Duddingston Loch, near Edinburgh, this plant is growing in great abundance along with its relations, the great spearwort (*R. lingua*), celery-leaved crowfoot (*R. sceleratus*), upright crowfoot (*R. acris*), and creeping crowfoot (*R. repens*). In the same locality, we have among the Umbelliferæ, whose herbage is often poisonous, the water parsnip (*Sium angustifolium*), marshwort (*Helosciadium nodiflorum*), white-rot (*Hydrocotyle vulgaris*), and on the dry portion, fool's-parsley (*Æthusa cynapium*), and the hemlock (*Conium maculatum*). Now the margin of the loch has from time immemorial been used as a pasture for cows, and no case, such as noticed in the "Standard," has been observed. I would suggest that Ergot may be at the root of the mischief. It has been found by investigation where ergotised pastures abound the fatal disease among sheep called Loupin-ill is very prevalent. The exceptional humid summer we experienced conduced to the development of various parasitic fungi.—*M. King.*

Mildness of the Winter.—To show the mildness of the winter about Colchester, two specimens of *Bufo vulgaris*, which I kept last year with several other amphibians in an outdoor vivarium, came out of the heap of leaves and rubbish in which they had hybernated and moved about the place on the 31st December. The sun was shining, and the atmosphere was very warm, which I suppose was the cause of their appearing. They have, however, gone back again now that the weather has turned cold.—*Frederick S. Croydon.*

Pied Wagtail.—Whilst walking through a thickly populated part of the town yesterday morning, I noticed this bird picking amongst the snow in company with three sparrows; is it not unusual for this bird to be seen in towns?—*F. H. Thompson.*

The New Metal.—Concerning the new metal discovered by Dr. Kruss in Cobalt and Nickel little is known yet. It has not yet been named, but will probably soon be so. Particulars of it, as far as yet published, will be found in a paper read by Dr. Kruss before the Munich Chemical Society, and quoted in "Nature," January 31, 1889, p. 325. Also see "Pharmaceutical Journal," January 19, p. 576; "Chemist and Druggist," January 26, pp. 104, 126; Febuary 2, p. 168.—*P. H. Marsden.*

Acridia viridissima.—Is it an unusual thing for the great green grasshopper of the south of Europe (*A. viridissima*) to be taken in England? Several specimens of what I believe to be this insect have lately appeared in a conservatory at a florist's in this town; one was brought to me alive, but I failed to keep it so for more than a few days, the comparatively cold temperature of the dining-room, the warmest apartment in the house, killing it. When brought near the fire it became quite lively; but at other times it remained clinging to the side of its cage in a semi-torpid condition. I could not induce it to feed. Another specimen, a dead one, also came into my possession. The larger one measures upwards of three and a half inches from the head to the end of the ovipositor, and two inches from the head to the end of the closed wings. The ovipositor is about two inches in length. The insects are of a bright emerald green tint, with a whitish blotch at the base of the face.—*A. E. Gibbs, F.L.S., St. Albans.*

Beavers in Bute.—In 1872, the Marquis of Bute informed me that he wished to procure some beavers, &c. Frank Buckland, "Notes and Jottings of Animal Life," page 27.—*G. Worledge, Woodbridge.*

The Bute Beavery.—I note in replies to correspondents last month "B. B. Le T." wishes for information about the Bute beavery. There is a good account of it in the "Midland Naturalist," (pp. 100, 161), vol. v., by Mr. Egbert de Hamel; perhaps this will meet the requirements of your correspondent.—*G. Sheriff Tye.*

NOTICES TO CORRESPONDENTS.

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

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

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

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

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

A. T.—Mr. Abbot's paper is from the "Proceedings of the American Association for the Advancement of Science," and is printed at the Salem Press, Salem, Mass. You could most probably get Mr. Montague Browne's paper from the author, Town Museum, Leicester.

EXCHANGES.

Fine casts of two ammonites, in exchange for curios of foreign shells, either land or marine. Also curios to exchange. —Archibald Hy. McBean, S. Denys, Southampton.

Wanted, good wings of foreign lepidoptera; must be correctly named and localised. A large selection of unmounted material in exchange, or mounted objects. Send list to—R. M., 24 Park Road, Clapham, London, S.W.

Small duplicate collection of land and freshwater shells, and a number of British birds' skins, in exchange for magic lantern slides, or offers. Lists sent.—Jas. Ingleby, Eavestone, near Ripon.

Parasitic plants. Wanted, from all parts, Orobanchaceæ (broom-rapes) and other parasites attached to host plants; fresh, in spirit, or dry.—J. Guardia, F.R.M.S., Helston House, Rozel Road, Clapham, London.

Wanted, autograph letters of celebrated naturalists, in exchange for good botanical micro slides.—B. Piffard, Hill House, Hemel Hempstead.

Wanted, a few specimens of hydroida or polyzoa, living, or mounted with the tentacles extended. Will exchange, or purchase. Write to—Rev. A. C. Smith, 3 Park Crescent, Brighton.

Offered.—"Midland Naturalist," vols. vii. and viii. (1884, 1885), unbound, clean as new; "The Naturalists' World," vol. iv. (1887), unbound; "Knowledge," vol. iv. (1883), five numbers missing, and other periodicals. Wanted, a vol. of Jeffreys' "British Conchology," rare British land, freshwater and marine shells, or offers.—A. Marshall, care of W. Handley Kay, Gresham Chambers, Nottingham.

A hundred rare rough Devon corals and sponges, in exchange for the same number of good silurian or Yorkshire corals, to cut up for specimens. Also the following micro objects or British shells—*Polystomella crispa*, *Orbulites striata*, *Nummulites complanatus*, various spines of echinus, minute corals and shells, perfect and rare sorts. Wanted, *Pecten glaber*, var. *sulcata* (Adriatic Sea), *Anomia striata*, *Ianthina exigua*, *I. rotundata*, *Lima hians*, *Tellina balaustina*, *Pecten nivens*, *Trochus granulatus*, and *Emarginula fissura*.—A. J. R. Sclater, M.C.S., 23 Bank Street, Teignmouth.

Wanted, to exchange a few birds' eggs and Persian stamps for thoroughly good micro slides.—Miss Nicolson, 15 William Street, Albert Gate, S.W.

Science-Gossip, Feb. 1882 to June 1886; Owen's "Palæontology;" a collection of over 1000 fossils. Offers wanted.—J. A. Floyd, 5 Hospital Road, Bury St. Edmunds.

Offered.—Hudson and Gosse's "Rotifera" (perfectly clean copy, unbound), nine lantern slides, "Humorous Tale of a Cat," rock micro slide box, polished bay wood, to hold 144 slides. Wanted, lantern slides, Pen and Pencil series art journals.—J. E. Lord, 16 Mount Terrace, Rawtonstall.

Wanted, Bell's "British Quadrupeds," and any of the following of Reeve & Co.'s British Handbooks, viz.: "Butterflies and Moths," "Spiders," "Grasses," "Ferns," or other reference works on English natural history, in exchange for one or more of the following books, all in best condition, viz., vols. iv. and v. of "Science for All," "Scientific Recreations," "Midland Naturalist," 1883 and 1884 (2 vols.), Lubbock's "Ants, Bees, and Wasps" (uncut), "Contributions to Natural History by a Rural D.D.," and Slack's "Pond Life."—F. Hayward Parrott, Walton House, Aylesbury.

Very fine ⅛-inch, by Seibert, 30° angle; ditto by Swift, with short mount for binocular, and adapted for monocular, 70° angle, also good student's ¼-inch, about 90°, all corrected for photography.—Dr. Bousfield, 363 Old Kent Road, S.E.

Wanted, a good serviceable microscope, one suitable for petrological work preferred. Offered, Jervis' "Mineral Wealth of Central Italy;" "Curiosities of Animal Life;" Wood's "Common Objects of the Sea Shore;" Skertchly's "Physical

Geography;" "New Monthly Magazine," circa 1820, 2 vols.; G. P. R. James's "Attila" and "Richelieu;" "Japan, Past and Present;" Wolff's "Bokhara;" Staunton's "Embassy to China;" Bagster's "Greek Testament;" large quantity of magazines and other books; capital collection of foreign stamps; Steward's 21*s.* microscope; quantity of minerals, rocks and fossils, &c.—A. G. Hammond, 10 St. John's Hill, New Wandsworth, S.W.

OFFERED, back numbers of SCIENCE-GOSSIP, and Fowler's "British Coleoptera," part i., Adephaga-Hydrophilidæ, nearly new. Wanted British fossils from various formations.—A. E. Bradley, 11 Bleisho Road, Lavender Hill, London, S.W.

OFFERED, SCIENCE-GOSSIP from No. 1 to end of 1888. Wanted, Beck's star microscope, with or without accessories.—R. C. Pilling, The Robin's Nest, Blackburn.

TWELVE sections of wood, six long and six transverse, sent in exchange for two micro slides—acari or pathological preferred. Also duplicates for exchange.—E. Mosely, 16 Robertson Street, Hastings.

WILL exchange mummy cloth, sacred ibis, or crocodile bones, for mounted insect dissections, nervous system preferred.—Capt. S., The Hollies, Brasted, Kent.

OFFERED, five bound vols. of SCIENCE-GOSSIP, 1865–9, and Cuvier's "Animal Kingdom," with over 200 well-coloured plates (10 × 14 in.). Wanted, "Zoologist," before 1888. What offers?—J. H. K., 18 Church Street, Commercial Street, E.

WANTED, shells, chiefly foreign, in exchange for choice micro slides, anatomical, parasites, diatoms, &c.—R. Suter, 5 Highweek Road, Tottenham.

WILL exchange 4 vols. (unbound) of "Amateur Work," illustrating almost any kind of handicraft, for works on geology.—P. J. Roberts, 4 Shepherd Street, Bacup.

OFFERED, columnar coal. Wanted, avicula, acrodus, arcomya, conus, ceratodus, eozoon, hipoopodium, hybodus, isocardia, labyrinthodon, mitra, megalodon, oliva, perna, platystoma, ptychodus, sas, soa, unicardium, vicarya, waldheimea, zellania, &c.—J. Smith, Monkredding, Kilwinning.

WANTED, Macgillivray's "British Birds," vol. iii. Offered, the "Transactions of the Woolhope Naturalists' Field Club," for the years 1870–73, in two volumes.—Apply to Dr. Fraser, Wolverhampton.

FREDK. GLENNY, of The Orchard, Wisbech, wishes some correspondent to give him the address where he can procure an apparatus for preserving larvæ, and the price.

WANTED, SCIENCE-GOSSIP for May, 1869 (No. 53). Varieties of British shells offered, or Harting's "Rambles in Search of Shells."—W. Webster, Lofthouse, Wakefield.

WANTED, a Valentin's knife; will give a writing diamond and some slides, or writing diamond and "Common Objects of the Microscope," 3*s.* 6*d.* ed.—George T. Read, 87 Lordship Road, Stoke Newington, London, N.

GOOD diatom micro slides in exchange for other diatom or miscellaneous mounts, or clean material.—Rev. E. A. Hutton, Mottram, Manchester.

DUPLICATE eggs.—Willow wren, long-eared owl, woodchat, kestrel, sparrow hawk, lapwing, sandpiper, snipe, quail, moorhen, coot, carrion and hooded crows, swallow, sand-martin, martin, tree pipit, black, Arctic, common, and lesser terns, chaffinch, bullfinch, goldfinch, lesser redpoll, redstart, herring gull, B. H. gull, guillemot, razorbill, blue, cole, marsh, long-tailed, and crested tits, green woodpecker, redshank, ptarmigan, and many others. Desiderata.—Spotted woodpecker, plovers, bunting, kittiwake, teal, widgeon, sheldrake, cormorant, shag, stock and rock doves, ortolan, creeper, reed warbler, cuckoo, dipper, nightjar, and others. Lists to—Arthur Hollis, Norton Street, Grantham, Lincs.

WANTED, Newman's "Butterflies and Moths," also vols. of "Entomologist," in exchange.—A. Nott, 75 Waterloo Road, S.E.

WANTED, in exchange for Ahn's "German Method" (new), and "Grammaire des Grammaires" (nearly new), or fossils from silurian, trias, or carboniferous formations, Professor Clifford's "Common Sense of the Exact Sciences," or Sir John Lubbock's "Ants, Bees, and Wasps," both in the International Scientific Series. *Phacops caudatus*, from L. Ludlow, in exchange for trilobites from other formations.—James Marsden, Carlisle Street, Preston.

WHAT offers for aquarium or terrarium? It is also suitable for fern case well made of strong zinc throughout, outside case to imitate ebony, lined with gold bead; size, 30 in. long, 22 in. deep, and 15 in. wide.—J. J. Edwards, 43 Calvert Road, E. Greenwich.

WANTED, bees, wasps, sawflies, and other insects in spirit; micro slides in exchange.—Henry Ebbage, 344 Caledonian Road, London.

WILL exchange sooty terns for sets of eggs of any of the following species: kestrel, sparrow hawk, goldcrest, stormy petrels, nightjars, dippers, golden plover, eider duck, pintail duck, widgeon, raven, chough, common snipe, sandwich tern, common gull, and many other species.—Capt. Young, Radwell, Weymouth.

WHAT offers in exchange for a Dutch specimen of the barn owl, the first known to be got in Scotland? Can give date and where it was found. W. Mathers, 16 Constitution Street, Aberdeen.

OFFERED, instantograph camera, odd numbers of SCIENCE-GOSSIP, 200 moulds of great seals of England, thirty numbers of Cassell's "Sea," &c. Wanted, impressions from ancient seals, books about seals, and British lepidoptera in any stage.—Tunley, 131 Power court Road, Landport.

WHAT offers for herbarium, nearly 1000 specimens, beautifully preserved, many duplicates?—I. K., 7 Castle Terrace, Broughty Ferry.

WANTED, transverse section of earth worm (lumbricus), and redia and cercaria stages of liver fluke (*D. hepaticum*).—Chas. A. Whatmore, Much Marcle, Gloster.

WANTED, Grant Allen on "Colour of Flowers," Strasburger's "Practical Botany," Hermann Müller's "Fertilization of Flowers," or any good standard works on botany.—Chas. A. Whatmore, Much Marcle, Gloucester.

WANTED, foraminiferous material in exchange for other material or good micro slides. Also many duplicate slides to exchange for others. Send lists to—A. Earland, 3 Eton Grove, Dacre Park, Lee, S.E.

WHAT offers for sixty micro slides of silurian and carboniferous fossils, mounted and named.—Geo. E. East, jun., 241 Evering Road, Upper Clapton, N.E.

DUPLICATES.—*Sph. lacustre*, *P. contecta*, *glaber*, *dilatatus*, *spirorbis* and *albus*, *L. truncatula* and *glabra*, *Z. glaber*, *nitidus* and *nitidulus*, *H. nemoralis*, *hortensis*, *arbustorum*, *sericea*, *pisana* and *caperata*, *B. obscurus*, and *C. tridens*. I will give all the above shells, or "Naturalists' World" for 1886 and 1887, unbound, for a few specimens of *H. lamellata* or *Acme lineata*.—Francis C. Long, 8 Cog Lane, Burnley, Lancs.

FOR six slides, I will send about forty varieties of animal hairs, or will exchange for same number of unmounted objects.—Arthur H. Williams, Hythe.

WHAT offers for "A Ride Across a Continent," 2 vols. (Boyle); Page's "Camp and Cantonment," "Athens and the Morea," "China in 1857–58," "Campaigns in Afghanistan," "The Camicorn Mountains," "The Prairie Traveller," "Over the Sea," "Grammaire des Grammaires," "Eton Latin Grammar," "Children's Own French Book," "Boy's Own Paper" (vol. x.), Otto's "German Grammar," also Roger's fret-saw machine, and fretworked articles?—A. Ellis, Hull Road, Cottingham, Hull, Yorks.

FOR exchange, duplicate well-mounted slides of foraminifera from sponge-sand, for brilliant scaled, unmounted, exotic curculios, in good condition.—Edward H. Robertson, Woodville, Greenhouse Lane, Sheepscombe, near Stroud, Gloster.

BOOKS, ETC., RECEIVED.

"A Dictionary of Photography for the Amateur and Professional Photographer," by E. J. Wall (London: Hazell, Watson & Viney, Ld.).—"Transactions of Nottingham Naturalists' Society."—"The Naturalist in Siluria," by Capt. Maine Reid (London: Swan Sonnenschein & Co.).—"Vannin Sivar," published by the Isle of Man Natural History and Antiquarian Society.—"The Annals and Magazine of Natural History."—"The Garden."—"The Athenæum."—"The Gardener's Chronicle."—"The Asclepiad."—"Journal of the Royal Microscopical Society."—"Geological Magazine."—"Research."—"The Best Forage Plants," by Dr. F. G. Stebler and Dr. Schröter, translated by A. McAlpine (London: David Nutt).—"The Cruise of the Marchesa to Kamschatka and New Guinea," by F. H. H. Guillemard (London: John Murray, 1889).—"The Entomologist."—"Cryptogamic Botany," by A. W. Bennett, M.A., B.Sc., F.L.S., and George Murray, F.L.S. (London: Longmans, Green & Co.)—"Knowledge."—"Bibliography of the Geology and Palæontology of the North of England."—"The Century Magazine."—"The Amateur Photographer."—"The Garner."—"The Naturalist."—Cassell's "Technical Educator."—"The Botanical Gazette."—"Belgravia."—"The Gentleman's Magazine."—"American Monthly Microscopical Journal."—"Wesley Naturalist,"—"The Midland Naturalist."—"Feuilles des Jeunes Naturalistes."—"The American Naturalist," &c. &c.

COMMUNICATIONS RECEIVED UP TO THE 14TH ULT. FROM: E. H. R.—D. W. B.—E. G.—A. V.—W. W.—F. W. S.—C. P.—A. W.—J. W. D. K.—W. S. G.—R. C. P.—E. M.—C. E. L.—R. P.—A. P. C.—W. B. B.—T. D. A. C. (2).—J. T. H.—F. G.—J. W. W.—W. H.—A. C. S.—J. E. K.—A. F. R.—B. P.—J. I.—R. M.—B. T.—R. T. B.—A. M.—P. H. M.—C. F. G.—H. G.—A. J. R. S.—F. H. T.—A. C. G. C.—Miss N.—J. A. F.—W. M.—J. E. L.—F. H. P.—A. W. H.—A. S. H.—Dr. B.—P. J. R.—J. S.—A. E. B.—A. J. H. C.—J. G.—J. T.—F. B.—J. M.—R. S.—W. F. J.—E. A. H.—F. C. L.—G. E. E.—T. S.—A. E.—J. K.—S. G.—A. G. H.—C. A. W.—W. M.—T. D. A. C.—J. C.—W. H. S.—Capt. Y.—H. E.—H. W. M.—J. J. E.—A. W. N.—S. H.—A. H. W.—E. H. R.—J. P. G.—A. T.—A. E.—B. H. W.—A. H. S., &c. &c.

THE FLORA OF THE PAST.

No. II.

By Mrs. BODINGTON.

THE Huronian age, succeeding the Laurentian, seems to have been a disturbed and unquiet time, and gives no evidence of vegetation except in certain dark slates coloured with carbonaceous matter. In the Cambrian, a great subsidence of our continents began, which went on with local intermissions all through Siluro-Cambrian times. Certain impressions on old Cambrian rocks in Sweden, present very plant-like forms, and received from the Swedish geologist Linnarrson the name of Eophyton, or Dawn-plant. They are wanting, however, in any trace of carbonaceous matter, and Sir J. W. Dawson thinks they seem to be rather the grooves or marks cut in clay by the limbs or tails of some aquatic animal, and afterwards filled up and preserved by succeeding deposits. The same remarks apply to many supposed traces of plants, which, under close examination, appear to be only the burrows or trails of worms and crustaceans. A frond of sea-weed is closely imitated by the trail of the modern king-crab. The oldest plant, of whose genuine vegetable nature Principal Dawson has no doubt, was presented to him by Dr. Alleyne Nicholson, of Aberdeen, and has been named Protannularia. It was found in the Skiddaw rocks of Cumberland, and shows traces of a graceful reed-like form with whorls of terminal leaves. It is allied to the modern Rhizopods, of which an account will be given further on. Only two other traces of genuine plants have been found in the Siluro-Cambrian. In the Upper Silurian strata, the evidences of land vegetation somewhat increase. Amongst these early plants is one of extraordinary interest, for it seems to be a survival of those Tree Sea-Weeds, whose remains may have contributed to form the Archæan beds of graphite. It appears to be one of the unvarying laws of evolution that the lower organisms tend, in the absence of competition with higher forms, to attain immense proportions. Such, for instance, were the Eurypterids, the giant crustaceans of Upper Silurian times, when fish were few and small; the huge newts of the coal forests, before the advent of reptiles; and the terrific reptiles of the Lias, which far exceeded in size any land animals that have existed since. So, too, we have the giant club-mosses and horse-tails of the coal-forests, before the appearance of the higher plants. We might therefore easily have imagined a sea-weed tree, before the days even of club-mosses and horse-tails, but it is infinitely more interesting to have the fossil remains of such a plant.

Sir J. W. Dawson has named this strange fossil Nematophyton. In 1870, he was shown some spore-cases or seeds from the Upper Ludlow beds (Silurian) of England, which Sir Joseph Hooker had described as Pachytheca. In the same slabs were found fragments of fossil wood, identical with a fossil tree from the Devonian or Lower Erian of Gaspé, New Brunswick, described by Sir J. W. Dawson as early as 1859. The wood of this singular tree shows a tissue of long cylindrical tubes, like slender hair-like worms in vertical section, and traversed by a complex network of thinner-walled and smaller-sized tubes. The trees were of large size, with a coaly bark, and large spreading roots; the stem being smooth or irregularly ribbed, and having a jointed appearance. Professor Penhallow, of McGill University, was asked to examine Nematophyton, and part of his report is as follows:—"The structure of Nematophyton as a whole, is unique; there is no plant of modern type to which it is comparable. The primary structure consists of large tubular cells without apparent termination, and devoid of structural markings. The loose character of the entire structure, the interminable cells, their interlacing, and finally their branching into a secondary series of smaller filaments, point with considerable force to the true relationship of the stem, as being with Algæ or other Thallogens." Sir J. W. Dawson adds: "When we consider that Nematophyton was a large tree, sometimes attaining a diameter of two feet, and a stature of at least twenty before branching; that it had great roots, and gave off large branches, and that it was an aërial plant, probably flourishing in swampy flats; that its seeds are so large and complex, as hardly to be regarded as mere spores, we have evidence that there were, in this early Paleozoic period, plants scarcely dreamt of by modern botany."

Many other fossil impressions, some of doubtful origin, some of genuine Algæ, have been found belonging to this period, showing that the old Cambrian and Silurian seas were tenanted by seaweeds not very dissimilar to those of the present time; also we have traces of primæval Rhizocarps and Lycopods, which can be better treated of in describing the vegetation of the succeeding Devonian age.

In the Devonian age, or as Sir J. W. Dawson prefers to call it the Erian, great geological changes took place; vast foldings of the crust of the earth, and emissions of volcanic rock. In North America "while at one time, the whole interior area of the continent, as far north as the Great Lakes, was occupied by a vast inland sea studded with coral islands, the long Appalachian ridge and the old Laurentian land began later on to assume something of the form of the present continent. The America of this Erian age consisted during the greater part of the period of a more or less extensive belt of land in the north, with two long tongues descending from it, one along the Appalachian ridge in the east, and the other in the region west of what are now the Rocky Mountains. On the sea-ward sides of these there were low lands covered with vegetation; while on the inland side, the great interior sea, with its verdant and wooded islands, realised, though probably with shallower water, the condition of the modern Archipelagoes of the Pacific. The climate was mild, and admirably suited to nourish a luxuriant vegetation. New forms of plants seem to have been introduced from the North, where the long continuance of summer sunlight, along with great warmth, seem to have aided their early development and extension."

In Europe the conditions were somewhat similar, having in the earlier portions "great sea areas with insular patches of land, and later on wide tracks of shallow and partly enclosed water areas, swarming with fishes, and having an abundant vegetation on their shores." The Old Red Sandstone of Scotland, with its strange mailed and plated fishes, represents the former state of things; and the Devonian of England, the time of rapidly shallowing seas. The vegetation of this period bore a strong resemblance to that of the coal forests, though all the *species* were different. Ferns flourished with the utmost luxuriance, the oldest yet known being found in the Middle Erian. Some of these attained the dimensions of tree-ferns, and in the Upper Devonian of Gilboa, New York, the remains have been found of a forest of tree-ferns standing *in situ* with their great mass of aërial roots attached to the soil in which they grew. These aërial roots introduce us "to a new contrivance for strengthening the stems of plants by sending out into the soil multitudes of cord-like cylindrical roots from various heights on the stem, and which form a series of stays like the cordage of a ship. This method of support still continues in the modern tree-ferns of the tropics." But other tree-ferns of this age show near approaches to the mode of development of exogenous stems, and for a proper description of the modifications of these transitionary stems, we must wait for an evolutionary botanist. Two types of Gymnosperms (pines and yews) now make their appearance; the Taxineæ or yews, and an extinct family, the Cordaites, with leaves like those of broad-leaved grasses or irises. The yews, though belonging to the so-called "naked seeded" plants, protect their seeds by a succulent cup-like receptacle, outwardly resembling a true berry. No fruit has however as yet been found of these Erian Taxineæ, and it is doubtful if even the leaf is known. Leaves possibly belonging to them, resemble the modern Gingko of China. The Taxineæ are chiefly known by their mineralised trunks, which are "often found, like drift-wood on modern sandbanks, in the Erian sandstones and limestones. They often show their structure in the most perfect manner in specimens penetrated by calcite or silica, and in which the original woody matter has been changed into anthracite and even graphite. These trees have true woody tissues, with that beautiful arrangement of pores or thin parts enclosed in cup-like discs, characteristic of the coniferous trees." They flourished, to all appearance, simultaneously in various parts of Germany, Scotland, and America. Indeed one realises in reading of the progress of plant life through all geological time up to the glacial period, that the northern parts of Europe, Asia, and America, constituted one vast continent, where plants, possibly originating in those regions now occupied only by thick-ribbed ice, spread south and east. The heat of the entire year, the long summer sunlight, the complete rest of the dark season, all seem to have contributed to make the Arctic regions of the earth (notably Greenland), a most successful hot-house for plants, and there we have every reason to suppose the highest of all plants, the deciduous exogens, were first developed.

In marshy places in England still grow curious little plants known as Rhizocarps, or Pepperworts, which are usually placed near the Ferns, but which in many respects have affinities with higher forms. A typical species of Pepperwort (*Marsilea fabri*) has a creeping stem sending rootlets downwards, and long stems bearing clover-shaped leaves upwards. The fructification is at the base of the leaves in the shape of ovoid sacs called sporocarps, and in each sporocarp microsporangia and macrosporangia are formed. [Microsporangia are now considered as the homologues of the pollen, and macrosporangia as the homologues of the ovules of higher plants.] The Rhizocarps of Devonian times have a history almost as curious as that of the Foraminifera of the Chalk. There is every reason to suppose that their spore cases, known as sporangites, form the chief source of the abundant reservoirs of petroleum and natural gas in the United States and elsewhere. The sporangites are highly bituminous, and contain, like the spores of Lycopods, nearly twice as much carbon as cellulose, or the ordinary tissue of plants :—

Cellulose, C 24, H 20, O 20.

Lycopodium, C 42, H 19 $\frac{4}{12}$ NO 5 $\frac{6}{10}$.

Their distribution over the earth's surface is immense ; they are found in North America, in Brazil, in Germany, in England, and in the "white coal" of Australia and Tasmania.

The oldest bed of spore-cases examined by Sir J. W. Dawson, is at Kettle Point, Lake Huron. It is a "bed of brown bituminous shale, burning with much flame, and under a lens is seen to be studded with flattened disc-like bodies, scarcely more than a hundredth of an inch in diameter, which under the microscope are found to be spore-cases (or macrospores), and in the same shale are found vast numbers of rounded, translucent granules, which may be escaped spores (microspores)."

In comparing these fossil spore-cases with those of modern Rhizocarps, they are found to be perfectly analogous with the spore-cases of *Salvinia natans*, a modern European species. In the bed at Kettle Point are found fossil Calamites and Lepidodendra, whose spores are, however, totally different to those of the Rhizocarps. These plants probably drifted to the spot where they are found imbedded, as the bed itself is marine, containing the graceful sea-weed Spirophyton and shells of Lingula. Some years after the discovery of the Kettle Point beds, immense deposits were found extending throughout the black shales of Ohio, from the Huron River on the shore of Lake Erie, to the Ohio Valley, a distance of nearly two hundred miles.

The beds are from ten to twenty miles in breadth, and estimated to be three hundred and fifty feet in thickness, and in some parts at least three times that amount. These vast deposits are replete with these little vegetable discs, usually converted into a highly bituminous, amber-like substance.

Sporangites of similar microscopical character have been found, by Professor Huxley in the Better-bed Coal of the Forest of Dean ; by Professor Newton in the Tasmanian and Australian White Coal, and by Mr. Orville Derby in the Erian strata of Brazil. In Brazil the sporangites are often found still enclosed in their original ovoid sporocarps in "every respect resembling the sporocarps of *Salvinia natans*."

Many other curious Rhizocarps are found in the Erian shales, some having affinities with Lycopods, some with graceful fern-like fronds, others with bare poverty-stricken looking stems (Psilophyton) with rudimentary, or short and rigid leaves.

"If," says Sir J. W. Dawson, "we compare the vegetation of these ancient plants (which played so great a rôle in the Paleozoic world) with that of modern Rhizocarps, we shall find that the latter still present, though in a depauperated and diminished form, some of the characteristics of their predecessors. Some, like Pilularia, have simple linear leaves," resembling Psilophyton ; others, like Marsilea, have leaves in verticils, or whorls, and wedge-like in form, resembling the graceful fossil Sphenophyllum ; while others, like Marsilea, have frond-like leaves comparable to the Erian Ptilophyton.

(*To be continued.*)

THE MELBOURNE BOTANIC GARDENS.

THE Melbourne Gardens lie about a mile from the centre of the city, and when the splendid bridge across the Yarra is finished, the approach to Government House, the Observatory, and the Botanic Gardens will be pleasant and convenient. The gardens cover more than one hundred acres, reclaimed from an absolute waste, and now rendered attractive both scientifically and from the landscape gardener's point of view. Due advantage has been taken of the undulating character of the enclosure ; a few indigenous Eucalypti and other trees remain *in statu quo*, lending an additional interest to the surroundings.

In one part especially, the retention of the original conditions is particularly happy, harmonising with the more recent additions of the gardener's art, yet retaining the primitive wildness. The swampy ground referred to lies low, dark peaty water with an islet filling a hollow in a far extremity of the Gardens. Clumps of she-oak (*Casuarina quadrivalvis*) stand here and there, with the Hakea and Banksia forming the lower scrub. There is an air of wildness suggestive of unoccupied lands ; as a matter of fact, the spot has remained untouched since we first occupied Port Phillip. The Casuarina has no affinity to the oak ; the popular name is a corruption of native words. At the first glance the tree might well be a species of pine. A closer examination, however, shows the dark green cylindrical spines to be jointed in segments like an equisetum ; they might well belong to a calamite of the coal-measures. In fact, as I stood for a few moments in this swampy glade, surrounded by strange reeds, rank grasses and unfamiliar vegetation, shut out from the busy world it would hardly have surprised me if some monster saurian had snapped his jaws above the murky waters. As a man, I felt it geologically wrong to be there at all; the genus homo did not exist in the epoch here indicated. This glade is a typical feature in the Gardens.

a constant supply of water trickles over the ferns and plants. The interesting epiphytical stag's-horn and elk-horn ferns flourish on many of the trees, occasionally attaining to the weights of several cwt.*

The lake is eight acres in extent. I was struck with the graceful Egyptian papyrus (*Cyperus papyrus*), with waving, feathery heads, growing side by side with the English water-lily, and a near Australian relative with blue flowers (*N. gigantea*). The flocks

Fig. 75.—Plan of Melbourne Botanic Gardens.

Another pleasant spot is in the miniature tree-fern gully, where the gigantic fronds meet overhead, and a very labyrinth of paths twist and turn in all directions. With the thermometer standing at 82° Fah. in the shade, this forms an agreeable resort and shelter from the sun's rays. The peat soil has been carefully made, and here the Dicksonia, Alsophila, etc., can be seen in full vigour, brought probably from the Dandenong gullies. By ingenious and hidden devices,

of teal previously mentioned migrate annually to and from the Gippsland lakes.

The method of grouping certain of the natural orders in separate beds on the different lawns is so attractive that I venture to give a rough plan of the western lawn from the authorised catalogue of the Gardens. The singular elasticity of the turf beneath

* Those of great size are in the Sydney Gardens.

the foot at once strikes a stranger; it is characteristic of the buffalo grass (*Stenotaphrum glabrum*) of which all the lawns are composed.

WESTERN LAWN.

Thus, as I enter from Mr. Guilfoyle's office, I can compare the allied magnolias, teas and camellias. Passing on to the Cupuliferæ, I find more than forty species of oak flourishing. The English oak (*Q. robur*) grows in Australia, but too often pipe-stemmed to produce thoroughly sound timber. At the Antipodes it will probably have to learn Australian habits, and somewhat modify its deciduous propensities. All the brilliant polygaleæ come from the Cape of Good Hope. The same applies to most of the true ericaceæ, whose place in the Australian flora is worthily filled by the varied epacrideæ. Around the two beds with typical Australian proteaceæ, I am again carried back to the remote past in the study of grevillias, hakeas, banksias and many a strange plant. I might pause for hours to observe the finely-coloured honey-eaters, with long bills extracting nectar from the corolla tubes. Among the nettle tribe is a rugged tree with coarse leaves of great size. It is a powerful and dangerous irritant, the bark of the same plant, it is said, supplying an antidote. I did not test the point.

Among the eucalypti, the splendid scarlet-flowered species (*E. ficifolia*) undoubtedly bears the palm; it is a handsome tree from Western Australia, with more graceful and delicate foliage than many of the commoner perplexing varieties. My favourite trees of the order myrtaceæ are the rose-apples (*Eugenia*), hardy evergreen shrubs with rosy fruit in strong contrast to the dark green leaves, and most effective in gardens. Nothing can exceed the beauty of the Norfolk Island pine (*Araucaria excelsa*); but they thrive better in New South Wales than in Victoria. The bunya-bunya tree (*Araucaria Bidwillii*) more like the "monkey puzzle" pine, on the other hand, flourishes better in Melbourne. The Moreton Bay fig grows everywhere; but the most beautiful species in the Gardens is the sacred fig (*Ficus religiosa*). There are palms growing in the open air from all tropical parts of the world. I found the round orange-coloured fruit of one species (I forget the name, but it was nearly allied to the wine palm), pleasant to eat; the hard seed I have brought home to grow in a hot-house. The distribution of palmaceæ in Australasia and the Pacific Islands is curious; each island has its own special group. New Zealand has but one, or at the most, two species. One of these is familiarly known as the "lawyer's tree." It has long prickly trailers, which lacerate the flesh and are most difficult to get free from. Like lawyers, if you once become entangled with them, they hold fast. The other, I think, is an Areca. Norfolk Island has one palm; Lord Howe's Island, four species all to itself; New South Wales, with eight hundred miles of coast, but four. In one spot in Victoria, called Cabbage Tree Creek, a solitary colony of palms is found. In tropical Queensland the variety is more than in all the other parts put together.

It is strange to find flower-beds, gay with plants in England, confined to warm houses, such as abutilon, datura, plumbago, scarlet euphorbia, gardenia, Bougainvillea, etc. etc.

The brilliant canna, crimson, orange or yellow, blooms with endless persistence. The hibiscus is gorgeous. Each and every season has a wealth of blossom.

Of all the natural orders, I think the euphorbiaceæ are one of the most singular and interesting. From the humble wood spurge of English hedge-rows we traverse a wide field, embracing cactiform plants, brilliant flowers, forest trees, deadly poisons, such as the South Sea Islanders use for their weapons, and plants of economic value like tapioca, to the variegated crotons and poinsettia, with scarlet caliciform bracts. Euphorbia splendens with crimson involucrum is common in English greenhouses. Many species closely resemble cacti. The candlenut tree, (*Aleurites*) has pleasant hanging foliage. One species produces a kind of gutta-percha, and nearly all have the milky fluid within the stem.

Submerged in a tank I saw the peculiar lace plant of Madagascar (*Ouvirandra fenestralis*), having all the veins of a perfect leaf with perforated interstices. The ordinary tissue and stomata of leaves I suppose are no longer necessary for plants growing beneath the surface of the water. The filamentary leaflets of the British water crowfoot exhibit similar modifications.

But half the flora of the world is represented in these Gardens. I can but convey a few impressions of their rich and varied contents. Something new crops up at every turn; to convey a distinct idea even of what my mind retains is well-nigh hopeless. Those who can visit the tropical houses at Kew will realise what I endeavour to describe at Melbourne.

C. P.

ROSE PESTS.

[*Continued from No. 285, p. 196.*]

HYMENOPTERA.

OF Hymenopterous insects which attack rose-bushes to such an extent as to become injurious, the larvæ of the various species of sawfly are undoubtedly of the most importance. There are many species belonging to different genera which attack the plants in different ways. Some feed on the pith, but fortunately these are not numerous in this country. Others, and the great majority, feed on the leaves, often, especially when young, feeding in company, and eating away the cuticle. About a a dozen different species of leaf-feeders are known as British, and about half that number are sufficiently common to do considerable damage, some seasons, to the rose leaves. Some of these sawfly larvæ are slug-like in shape, and somewhat slimy, while others are more like caterpillars, but with a larger number of legs. Generally they feed exposed, eating the cuticle of the leaf, or holes quite through, but a few kinds conceal themselves by curling over the edge of a leaf, and living in the fold. These two different modes of feeding will require two separate kinds of treatment. Those which feed exposed may be dealt with by dusting the bushes with powdered hellebore, Paris green, or sulphur; but this is best done in a morning when the leaves are wet with dew, which causes the powder to adhere. Any distasteful powder which will not injure the foliage, even riddled ashes will, to some extent, answer the same purpose, but for those which feed under the folds of the leaves, looking for the infested leaflets and picking them off is the surest way, taking care to destroy the inmates.

It is important that gardeners should know something of the life-history of insects, otherwise they seldom think of applying a remedy, except when they see the damage being done, but in the case of many insects, and especially with sawflies, a winter remedy is very practicable. Most of the sawfly grubs descend in the autumn among the withered leaves on the ground, or just beneath the surface of the soil, and there spin cocoons in which they remain through the winter months, changing to chrysalids in spring. Now after a bad attack of sawfly, if the withered leaves and about two inches of surface soil be raked away from under the trees and burnt, or a hole dug and buried deep, many of the grubs will be destroyed or buried so far down that they cannot emerge, and much future damage thereby prevented; and if the new soil, dry from the hole, be mixed with lime or some fertiliser, and spread under the trees, they will greatly benefit thereby.

Many of the wild roses are subject to berry-like galls, and especially to the mossy or bedeguar gall, which grow on the stems or leaves, but as these seldom, and some never grow on the cultivated roses, it will not be necessary to enumerate them here. A list of all rose-insects will be given at the end of this article.

Lepidoptera.

Of moths which do injury to garden-roses the principal are the several species of Tortricina, whose larvæ eat their way into the unopened bud or feed in the curled leaves. One of these (*Pardia tripunctana*), a small moth, with the basal portion of the front wings sooty and the outer half whitish, and with two yellow feelers (palpi) sticking out in front of the face, is a general pest, and several similar ones, as *Spilonota roborana* and *S. rosæcolana*, are only too widely distributed. *Cræsia Bergmanniana* is an exceedingly pretty moth, the front wings, yellow marked with orange. It is abundant everywhere where roses grow, on which the larvæ feed in May. The best way of dealing with these little pests is to look for the caterpillars when at work, pick off the infested leaves or buds and destroy them, keeping a look-out at the proper time for any moths whose larvæ have escaped treatment. Shaking a tree will sometimes cause the caterpillars to leave their domiciles and hang down by a silken thread, when they may the more readily be perceived and destroyed. The moths should be looked for, at the proper season, towards evening, when they begin to fly, or they may be dislodged during the day by shaking the bushes. The larvæ of several species of very minute moths (Tineina) may often be found mining in the leaves, but these very seldom occur in such quantities as to be injurious, and when they do, hand-picking is the surest remedy.

Coleoptera.

The only beetles I know of as doing damage to roses are the rosechafer (*Cetonia aurata*), a pretty large glossy-green insect which injures the flowers by eating the petals, and the lesser may-bug (*Phyllopertha horticola*), which is also guilty of the same offence. When such attacks occur, shake the beetles into inverted umbrellas, or upon tarred boards and destroy them. The first is more frequently met with in the south, and the latter in the north of England.

Mildews.

These are very small parasitic fungi which grow upon the leaves of different kinds of plants, and are sometimes quite as troublesome as the insects. Roses are not exempt from their attacks, and some half-dozen kinds are known as frequenting these plants. Flowers of sulphur seem to be the easiest-applied and most effectual remedy, and it is alike destructive to fungi and insects. It may be dusted over the plants while the dew is on, or mixed with the water with which they are syringed. Some gardeners prefer a mixture made by boiling one part of sulphur and one of quicklime in five parts of soft water, diluting this with 100 times its bulk of water when required for use.

It is only necessary for the gardener to make himself acquainted with a few of the common insects, to enable him to apply remedies against many other kinds which from time to time may attack his plant: if, for instance, he knows the life-history of one of the rose tortrices, he will have a clue to the whole group, for to him, except in a little variation in the time of appearance, they may all be treated as one. But the naturalist should delve deeper into the subject, and should be able to discriminate between closely allied species, and should be able to advise when species which are not habitually injurious become so, as they do sometimes in certain years. With a view of furnishing a guide to a proper understanding of this subject, I append—

A Descriptive List of Insects which feed on Rose.

COLEOPTERA OR BEETLES.

Cetonia aurata.—A large brassy-green beetle, which appears through the summer and eats the petals.

Phyllopertha horticola.—A small chafer, green and brown; eats the petals.

DIPTERA.

Cecidomyia rosarum.—A small midge: the larvæ of which cause the leaflets to become thick and fleshy galls.

HYMENOPTERA.

SAWFLIES.

Blennocampa pusilla.—Larvæ, June and July; green, with brown head, causing the leaves of *Rosa canina* to curl, inside of which the grub lives: fly, May and June; black; legs partly yellow.

Cladius padi.—A small green larva, darker on the back, and yellow head; eats holes in the leaves of various roses and other trees; fly, black; legs whitish, wings smoky. Broods all summer.

C. pectinicornis.—Larva in May and August; flat green, with hairy tubercules: feeds on the under side of leaves of various roses; fly in April and July; shining black, with grey hairs and yellow joints and feet.

Emphytus cinctus.—Larva, July to October; green, with brown head; feeds on the edges of leaves of various roses, curling its tail: fly, June; shining black; legs partly white; wings clear; the female with a white band on the body.

E. melanarius.—Larva little known: fly, shining black; thighs red, black at base; rare.

E. rufocinctus.—Larva, Aug. and Sept.; green, sides white, head pale orange: fly, black; body long, with red bands; thighs black, white at base.

Eriocampa rosæ.—Larva, June; slug-shaped; greenish yellow with brown head; eats the upper skin of the leaf: fly, May; black; legs partly white; wings smoky, darkest at base.

Hylotoma rosæ.—Larva, July and Sept.; greenish with yellow and black spots and brown head, and feeds on the edges of the leaf; fly, June and August; has the horns of three joints only; head and thorax black; body and legs yellow.

Lyda inanita.—Larva, yellow-green; red and black spots, living in a tube made of fragments of leaves: fly, black, and yellow legs, and line on body; horns red, yellow at base.

Pœcilosoma candidatum.—Larva in May and June; whitish; bores into the pith: fly, black; white and yellowish spots; rare. The presence may be known by the drooping state of the foliage.

Rhodites eglanteriæ.—Round pea-like galls on leaves of *R. canina* and sweet-brier.

R. rosarium.—Similar gall to last, but with spines.

R. rosæ.—The ordinary moss-gall, common on stems of wild rose.

R. spinosissima.—Red, irregular galls on leaves and shoots of *Rosa spinosissima.*

S. Mosley.

Beaumont Park Museum, Huddersfield.

(*To be continued.*)

ASTRONOMY.

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

The death is announced of M. Tempel, who is well known as the discoverer of many planets and comets. M. Tempel succeeded Donati in 1873 as director of the new observatory at Florence. Lusatia was the birthplace of Tempel in 1821. He first gave his attention to astronomy at Venice in 1859, and in that year he discovered a comet on the 2nd of April. At Marseilles, where he removed in 1860, he discovered five small planets and several comets; of these comets two were found to be of short period. M. Tempel being expelled as a German from France in 1870, went to Milan to the Brera Observatory, under Schiaparelli, and at this observatory he discovered some more comets, one of which was of very short period, making a complete revolution round the sun in five years.

The Rev. T. E. Espin states that the spectra of R. Leonis and R. Hydræ were observed on the 25th of February to contain bright lines, and that this

Rising, Southing, and Setting of the Principal Planets in May.

	D.	Rises. h. m.	Souths. h. m.	Sets. h. m.
Mercury ☿	7	4 44M	0 51A	8 58A
	14	4 51M	1 17A	9 43A
	21	5 0M	1 32A	10 4A
	28	5 5M	1 33A	10 1A
Venus ♀	7	3 36M	11 12M	6 48A
	14	3 14M	10 35M	5 56A
	21	2 54M	10 4M	5 14A
	28	2 37M	9 41M	4 45A
Mars ♂	7	4 48M	0 42A	8 36A
	14	4 34M	0 35A	8 36A
	21	4 20M	0 28A	8 36A
	28	4 8M	0 21A	8 34A
Jupiter ♃	7	11 34A	3 34M	7 30M
	14	11 5A	3 5M	7 1M
	21	10 35A	2 36M	6 32M
	28	10 5A	2 6M	6 2M
Saturn ♄	7	10 24M	6 4A	1 48M
	14	9 59M	5 38A	1 20M
	21	9 34M	5 12A	0 53M
	28	9 9M	4 46A	0 27M

was afterwards confirmed by Mr. Taylor at Ealing, who saw two bright lines in the spectrum of R. Leonis and one bright line in that of R. Hydræ.

In May, Mercury is a morning star, and will be in a good position for observation after sunset towards the end of the month.

Venus is a morning star during the whole of the month.

Mars is an evening star near Aldebaran in the middle of the month.

Jupiter is not well situated for observation.

Saturn is in Leo, and may be observed after sunset.

There will be no celestial phenomena of unusual interest this month.

Fig. 76.

Fig. 77.

Fig. 78.

Fig. 79.—Front view.

Fig. 80.—Side view.

SOME LITTLE-KNOWN ROTIFERS.

No. 1.—Pterodina truncata.

By W. Barnett Burn, M.D.

IN the autumn of 1850, in some water from the Black Sea at Wandsworth (as a piece of water on the Common is called), Mr. Gosse found a single specimen of a rotifer, which he called *Pterodina truncata*. While looking at it, and as he says, "before my observation had proceeded far," he was called away; on his return it was retracted, and it soon died. He never saw it again, and, I believe, it has not been again recognised till I found it in November, 1888, in a shallow pool on Tooting Common, which is about three-quarters of a mile from where it was originally discovered.

The reason of it so seldom coming to notice is probably due to its habitat. It appears to live in a semi-parasitic state on the water wood-louse (*Asellus vulgaris*). Four of these rotifers I found just in the central line, between the legs of the asellus, arranged in order, the front of each one to the head of the animal, and overlapping like scales. These never quitted their situation, and, what made it certain that they were in permanent quarters on their host, among the feet of the rotifers, but not attached in any way, there were three eggs, glued on to the body of the asellus. One rotifer was on the side of the animal, and three others were swimming in the water, which they did in a graceful manner, not very quickly, but with ease, turning the foot from side to side, then coming to anchor and making their sucker a pivot, swimming round and round, but soon moving off again, as if they had not "brought up" in the place they desired. On being frightened, foot and head disappeared with great rapidity. Tapping on the side of the stage was sufficient to effect this. The way in which the long foot shot up through the opening in the lorica was very striking. This rotifer is the most like a Brachionus in the genus Pterodina, being much thicker than the others, as the side view will show. Moreover, the organs go more to the edges, as there is greater room there than in the other species, and, partly in consequence, it is not so transparent.

Mr. Gosse says the eyes are small and transparent, but he figures them of a moderate size and red, and such I find them. In the animal when closed the edge is not everted as in Mr. Gosse's figure, but as in Fig. 79. The occipital margin is thrown into a fold, and the pectoral has a slit. When the head protrudes, the fold is pulled out, the slit opens to a V-shaped aperture, and the edge becomes everted. The lorica in this genus seems more flexible than in others; as in *Pterodina valvata* the sides fold down like the "flaps of a Pembroke table." The foot protrudes through an opening like Fig. 76, almost at the extremity of the lorica, quite different to the other species, in which it comes out near the middle.

AN APRIL RAMBLE THROUGH SURREY.

By Wm. J. V. Vandebergh, F.R.A.S., &c.

"Jog on, jog on, the footpath-way,
And merrily hent the stile-a:
A merry heart goes all the day,
Your sad tires in a mile-a."
—*Shakespeare's* "*Winter's Tale.*"

VERY few people would imagine that an entomologist would select the month of April for an extended walk through a county like Surrey. It is, however, a much better month for walking than are the hotter ones which follow it, and having arrived at this conclusion a friend and I determined to make a pedestrian excursion through the wildest and most picturesque parts of the county, which most of my readers are no doubt aware, are to be found in the south-west portion. Although we were both entomologists, we did not by any means undertake the journey for the sake of the specimens we were likely to obtain, and although we carried with us most of our usual entomological paraphernalia with a view to secure stray specimens, we were neither of us over sanguine as to the result.

Starting from London, early on the morning of the 23rd April, 1886, we went by train from the London Bridge Station of the London, Brighton, and South Coast Railway, to Epsom, and from thence commenced our journey on foot.

Nothing can be more delightfully invigorating than pedestrian exercise, in fine bracing weather, and during the whole of our short excursion we certainly had nothing to complain of in that respect, for four finer consecutive days I never remember in the month of April.

Having reached Epsom we struck across the Downs and Race-course to Langley Bottom, taking the road, or rather lane, leading towards Mickleham Downs, over which we passed, thence over Juniper Hill into the main Dorking road, and on to Dorking. During this time, particularly at Langley Bottom, we observed a number of *Gonepteryx rhamni*, and although we took one or two, we released them again, finding that they were not in sufficiently good condition for cabinet specimens. These butterflies had of course hibernated through the winter, as had also specimens of *Vanessa urticæ* and *V. Io* which we saw in some numbers here, and at other places on our journey. I noticed that the specimens of *V. urticæ* were exceedingly bright and in very fair condition, and both it and its relative *V. Io* must be exceedingly careful in selecting its hibernaculum.

Having left Dorking behind, we took to the lane leading to the village of Cold Harbour. The ascent, though not particularly abrupt, except at a few points, is a long one to Leith Hill, which belongs to a range quite isolated from the long chain of hills which extend nearly across the county of Surrey, and include the renowned Hog's Back to the west of Guildford. The weather which had been bright and singularly clear in the early part of the day, became, unfortunately for as, decidedly dull, before we reached Leith Hill, which we did about six o'clock in the evening.

Notwithstanding the long ascent necessary to reach the spot, no one should visit the southern portion of Surrey, without climbing to the summit of Leith Hill, and ascending the tower which has been built there for the purpose of affording visitors a better view of the surrounding country.

The view to be obtained from this building on a fine day, is indeed worthy of all the trouble of reaching it. As far as the eye can reach, on all sides, the country consists of hills and valleys, woodlands, heaths, and hedges.

The little book which may be purchased at the tower, gives some account of its history, and states that it is nearly 1000 feet above the level of the sea, and is the highest point on the south-east of England. In this pamphlet is a translation of the Latin inscription on the west side of the tower which is as follows:—

"Traveller, this very conspicuous tower was erected by Richard Hull, Esq., Leith Hill Place, in the reign of George the Third, 1766, that you might obtain an extensive prospect over a beautiful country; not solely for his own pleasure, but for the accommodation of his neighbours and all men."

The little book referred to, also gives an account of the most consummate pieces of local impudence that I have recently noticed:—

"For many years after the building of the tower, it was open to the public, in accordance with the intention of Mr. Hull. The privilege, however, was thought to be abused, and it was said that the tower had become a harbour for vagrants and smugglers; so, about the year 1795 or 1800, a subscription was raised among the gentry, the entrance door was built up, and the whole interior of the tower filled up with stone and cement; and it was found in this state, when a few years ago the tower and land adjoining, were purchased by W. J. Evelyn, Esq., of Wotton House, the present Lord of the Manor. So solid was the cement that it was found impossible to reopen the old entrance and interior staircase, therefore a staircase-tower was built by the side of the old tower in 1864, in order to make the building available for its original purpose." One cannot help admiring the elegant and scientific method employed by the neighbouring gentry to get rid of the evil referred to, nor wondering why they did not pull down the tower and scatter the remains. Without doubt the latter would have been much the easier task, and would have had the effect of effectually destroying what was principally intended for the use of visitors to the neighbourhood. Quoting from "Tallis's Topographical Dictionary of England and Wales," the little book before mentioned states: "The Hill is crowned by a small structure traditionally said to mark the spot where an eccentric farmer of the neighbourhood was buried on horseback upside down, so that when the world was turned, as he believed it then soon would be, topsy-turvey, he might at last come up in the right position!"

The visitors' book kept at Leith Hill Tower, exhibits the usual amount of Cockney wit, or rather attempts at it, in the way of forged signatures of many peers, statesmen, and other persons of renown, and the absurd propensity of Englishmen of the lower class to cut their names or initials upon every object of curiosity or antiquity has been gratified to such an extent on the tower itself and its surroundings that initials cut with evident care, and no doubt much inconvenience, may be observed for a considerable distance up the inside of the leaden water-spout in the wall of the flagstaff tower. A few convictions for wilful damage might have a beneficial effect on some of these gentry, who are evidently fully alive to the fact, that the memorials they leave behind them in this way are likely to be the only ones which will carry their memory to posterity. Leith Hill is only about 25 miles from London, and should be visited by all Londoners who appreciate rural and picturesque scenery and fresh air. The nearest railway station is that at Holmwood, on the London, Brighton, and South Coast Railway, which is distant about three and a half miles.

We did not leave the hill until it was getting dark, so had little time to lose on making our way across country to the village at which we expected to lodge that night. Our intention had been to stop at Abinger, Gomshall, Shiere, or Albury in the evening, but having reached Abinger we found to our disappointment that the only inn in the village was full. With the assistance, however, of the graphic directions given by a friendly countryman, we found our way to Holmbury St. Mary, a little village not usually marked on maps, but near Holmbury Hill, and here after some difficulty and loss of time we succeeded in obtaining a very agreeable lodging for the night at a private house next to the inn. The latter had been entirely filled by visitors from London. The countryman before referred to explained to us that Holmbury St. Mary was not shown on maps owing to the fact, that the post office of the neighbourhood was at Pitland Street, and the neighbouring village at Holmbury St. Mary had consequently been left without a name by the Ordnance Survey authorities. This explanation, being highly satisfactory to all parties, we parted with our friend somewhat relieved from serious apprehensions of a night out, which alternative we had considered by no means improbable, having regard to the fact, that the village recommended was in no way shown on the map of the county which we carried with us. It may be useful to my readers who intend to go over the same ground to make a note of this fact, for as Holmbury St. Mary is but a short distance from Abinger, and the inn at the last-mentioned place appears to be extensively patronized by visitors from London, it is desirable to have a sort of relief station in the event of failure to get a lodging at Abinger.

The country which we passed through, on the first day of our walk, consisted chiefly of commons, woods, and heaths, the latter of which, notwithstanding the early date, were by no means monotonous, relieved as they were by occasional clumps of hollies, sallows, and other trees and shrubs.

The walk from Epsom to Abinger—taking Leith Hill upon the way—would be a delightful one in summer to any one who can find enjoyment in miles of purple heather, interspersed with woodlands of the most delightful description alive with the usual inhabitants of such localities. To the entomologist, the walk would, without doubt, in proper season, be productive of many specimens for the cabinet, and certainly ornithologists and botanists would have no cause to be dissatisfied.

On the 24th we continued our journey up Holmbury Hill and along the ridge of hills to which it belongs, Holmwood and Hurtwood Commons, and through woods and heaths to Farley Green and thence through Sheep Walks to Shamley, where we stopped some time for necessary refreshment. After leaving the last-mentioned place, we crossed a tributary of the river Wey and the branch of the London, Brighton, and South Coast Railway, which runs here parallel with the Surrey and Sussex Canal and proceeded by the main road to Bramley, and thence by country lanes and footpaths to Godalming. After leaving Bramley we met for the first time with some little difficulty, for it was dark, and there is no direct road from that place to Godalming. Owing to this fact, quantities of matches were used at every finger-post, and references to the county map were necessarily made by means of the same illumination. Owing to these delays, our progress was retarded to such an extent that we only succeeded in reaching Godalming shortly before eleven, and only just in time to obtain a lodging for the night. We had intended to visit Hambledon, a little village a few miles to the south of Godalming, celebrated as the birth-place of cricket, but as we were exceedingly doubtful as to whether we should obtain accommodation there for the night, we deemed it expedient to make for Godalming, where there was little doubt of obtaining comfortable quarters. We saw several hibernated specimens of *V. urticæ*, *V. Io*, and *G. rhamni*, during the day, and I took a number of specimens of Hymenoptera and Diptera at Sallow catkins on Hurtwood Common in the morning. The country passed through during this day was fairly wooded after leaving Hurtwood Common, and presented features in every way as satisfactory to a naturalist as that traversed the day before.

We were up betimes next morning (the 25th), as our road that day lay through the wildest portion of the county, and there were no places of any considerable size at which we could stop the night nearer than Farnham, which was much further to the north than the places we wished to visit.

Directly we started away from the town my friend secured a hibernated specimen of *Vanessa polychloros*, the only one we saw during our journey.

If I remember rightly, Godalming was a favourite ornithological resort of the late Mr. Edward Newman, and certainly the country round about it would appear to be well stocked with his feathered friends. In many places, even at this early portion of the year, their incessant songs and chirping were the only sounds to be distinguished. We proceeded along the main Petersfield Road, through Witley Common, past the Hammer Ponds, through Shursley Common, to the huge and peculiar ravine known as the Devil's Punch Bowl, a most romantic spot, round the margin of which the Petersfield Road bends abruptly in dangerous proximity to a precipitous descent, and one shivers to think of the old stage-coach on a dark night careering gallantly along such a dangerous path. The scene from the higher ground, above the Bowl, is majestic in the extreme, and the view is only to be surpassed during our walk by that obtained from the summit of Leith Hill. The place gives one a sense of loneliness, which is not improved by coming suddenly across the stone described by Dickens in his "Nicholas Nickleby," and which so interested Poor Smike when journeying with Nicholas past the rim of the Devil's Punch Bowl on their way to Portsmouth. This stone is known to every pedestrian who has travelled this road, as it stands by the side of the roadway and cannot escape observation. On the side facing the road it bears the following inscription, which may be interesting to some readers who have no doubt heard of the incident referred to at some time or other.

ERECTED
In detestation of a barbarous murder
Committed here on an unknown sailor
On Sep. 24th, 1786,
By Edwd. Lonegon, Michl. Casey and Jas. Marshall,
who were all taken the same day
and hung in chains near this place.

"Whoso sheddeth man's blood by man shall his
Blood be shed."—Gen. chap. 9, ver. 6.
See the back of this stone.

On the back is the following:

This stone
was erected
by order and at
the cost of
James Stillwell, Esq.,
of
Cosford,
1786.

Cursed be the man who injureth
or removeth this stone.

The malediction at the end of the inscription appears to have had some little effect, but notwithstanding the dire consequences to be anticipated therefrom numbers of persons have more or less ornamentally executed their initials on the stone, the inclination to do so apparently being too strong to be overcome. One would have thought that every person who could read and write would have had some respect for a request so forcibly put, but it appears to be otherwise.

Leaving the Devil's Punch Bowl, we proceeded through Hind-head Common and Frensham Common, on the borders of Hampshire, to Frensham, the chief characteristics of which are total lack of accommodation for travellers, and three large ponds known respectively as Frensham Great Pond, Frensham Little Pond, and Abbot's Pond. The only one of these pieces of water which we closely inspected was Frensham Great Pond, the bottom of which appears to be wholly composed of silver sand. The water of this pond is very clear, and the only life we discovered therein was the wheel animalcule *Volvox globator*. This my friend subsequently discovered in a very lively condition in his brandy-flask, which he had filled with water from the pond in question.

Long before we arrived at this point, the provisions which we had brought with us had been wholly consumed. We had visited the "Royal Huts Hotel," about half a mile from the Devil's Punch Bowl, with a view to refresh the inner man, and after patiently waiting about twenty minutes, ultimately succeeded in obtaining some liquid refreshment, our request for a cold collation being responded to in a way which gave us a very shadowy idea as to how long we should have to wait for it. We were eventually forced by lapse of time to countermand our order and proceed on our way by no means rejoicing. Let the weary traveller not rely upon Frensham as a place of refreshment—we did, and were disappointed. After going considerably out of our way to the old village we discovered that although there was a large church and a number of houses there, no inn was at present in existence. We had to retrace our steps, and after proceeding some distance in the direction of Locks Hill at last reached a small inn known as the "Three Mariners," where the only eatables we could obtain were bread, cheese, and butter, to which in a half famished condition we did such ample justice, that the shades of night had fallen before we set out again on our ramble. We had intended to stay at Elstead this night, but as we were unacquainted with the size of the place, and it was marked on our maps in the same type as Frensham, we decided to make for Farnham, which place we reached viâ Farnham Common in time to secure a suitable lodging for the night.

Our journey that day had been chiefly through commons of the wildest possible description, covered with dry heather and gorse; and the only insects we had seen were a few hibernated specimens of *V. urticæ* and *Io*, *G. rhamni*, and a few hymenoptera and diptera and the tiger-beetle (*Cicindela campestris*) the latter very beautiful insect flying about in considerable numbers over the sandy heaths. On the morning of the 26th, we made for the well-known ridge of hills called the Hog's Back, and continued along it to the road which crosses it shortly after leaving Seale.

Continuing along this road past Ash railway station, we proceeded over Ash Common, the Fox Hills, Romping Downs, and Pirbright Common, to the village of Pirbright, where we obtained some refreshment, and striking out towards the east, passed through the London Necropolis, and having struck the Basingstoke Canal, continued along the towing-path as far as Woking, from whence we took train to London, arriving at Waterloo early in the evening. Although we had, of course, not made any captures of importance, we had seen enough of the country to induce us to visit it again during the summer months, when we have no doubt whatever that our sanguine anticipations as to the localities referred to will be abundantly verified. If the reader will take the trouble to trace out our course on the map of Surrey, he will find that we walked over the wildest and most thinly populated portions of the county, which obviously are the parts most likely to be productive of specimens for the naturalist, whatever branch of natural history he may study. Altogether I thoroughly enjoyed the excursion, as also did my companion, who had accompanied me on former and more extensive expeditions; and London naturalists desirous of taking a few days' walk, cannot do better than take the course we have indicated. It seems a great pity that more accurate county maps are not published for the use of pedestrians. As a rule second-rate roads and footpaths are wholly ignored on those at present in use, much to the annoyance and inconvenience of the traveller, who either has to use his own discretion and take the best roads leading in the direction he wishes to make for, or go miles out of his way in following the roads marked on his map. If less space were devoted to information respecting post towns, market days, boundaries of parliamentary boroughs, and matters of a similar nature, more space might be given to bye-lanes and footpaths which appear to be at present wholly unrepresented.

THE DEVELOPMENT OF THE COLOURS OF FLOWERS THROUGH INSECT SELECTION.

As doubtless do many of your readers, I welcome the reappearance in your pages of articles anent that most interesting subject, "The Development of the Colours of Flowers through Insect Selection."

Now fain am I to frankly admit that I am no advocate of the theory, believing it to be as utter a delusion as ever found acceptance with real or *quasi* scientists. Nevertheless 'twould be sheerest presumption on my part if I were to assert that the contention of its supporters could not be sustained by a single indisputable fact; I think, however, that I may venture to say thus much, viz., that it is sustained—if sustained at all—not so much by proved facts as by inferences and—possibilities. Now, superadded to these, those who hold views entirely at variance can produce a host of facts which directly tend to the very opposite conclusions to those arrived at by the selectionists; and believe that one might just as reasonably attempt to account for the various lovely amethystine, emeraldine, and rubescent tints of Orient gems by a process of insect selection, as hope to prove that the exquisite floral colours which garnish this world with beauty were once non-existent, and are mainly due to, or have been brought about by, the agency of insects—or have been "stereotyped and perpetuated" by them. Thus much may be fairly conceded, viz., that the colours of flowers may be, and probably have been, modified—greatly modified—through their agency, as they have been unquestionably both by climate and soil; beyond this it would, in the present state of our knowledge, be most unwise to go.

I fear, Mr. Editor, that the pages of SCIENCE-GOSSIP for twelve months to come would not suffice to exhaust the subject, and am therefore warned not to exhaust the patience of your readers by a long introduction. More immediately then to the point.

I am free to admit that I am staggered by Mr. A. G. Tansley's quotation from Hermann Müller, wherein it is asserted that "The most primitive flowers are . . . for the most part simple . . . devoid of honey, or with their honey unconcealed and easily accessible;" and yet it is added that "there arose others" (insects) "more skilful and intelligent, with longer tongues and acuter colour-sense, and they gradually caused the production of flowers with more varied colours, honey invisible to or beyond the reach of the less intelligent short-tongued guests, and various contrivances for lodging, protecting, and pointing out the honey." If this be Nature's method of working, then let us have as little of her as possible—the less the better. Now, let us briefly examine this statement. Here is something desirable and easily attainable, both by long- and short-tongued insects, and yet, as it is sought to make it appear, by some sort of collusion between the simple flowers and certain over-clever, *i.e.* more highly-developed, longer-tongued insects, the former by degrees developed complexity and difficulty out of simplicity and facility; and all, as it would appear, that the longer-tongued insects might be favoured—gain an advantage, to the detriment of the shorter-tongued. As the result of this immoral compact both flower and insect become —so it is asserted—simultaneously more highly-developed—specialised. Specialised for what? Can it be proved, or are there sound reasons for believing, that this specialisation would in anywise tend more to the perpetuation or preservation of the flower? might we not rather reasonably infer, that there were infinitely greater chances of its continuance when visited by one hundred long- and short-tongued insects than when visited by but ten long-tongued? What grounds, it may be pertinently asked, what grounds have we for assuming that of long- and short-tongued insects the former produced a greater number of intelligent individuals than did the latter? 'Tis as purely gratuitous an assumption as could possibly be met with, and even if it were actually proved, what special advantage would it be to them that what at one time was procured without difficulty must now be obtained only after greater trouble? Simply, in short, that they now acquire the whole of that once shared with their short-tongued congeners, and thus, it is assumed, gain an advantage at the expense of those less intelligent—which, I suppose, is just what the advocates of the theory contend. But their opponents argue, that we have no proof whatever that the long-tongued ever did produce more intelligent individuals than the short-tongued, and that, even if it were so, the honey being equally accessible to all, in the struggle for existence the superior intelligence of the former would in the long run certainly have given them a manifest advantage over the less intelligent, without it becoming necessary that the structure of the flower should undergo what practically amounts to complete, though gradual, transformation—metamorphosis.

Looked at from this point of view, the position becomes thoroughly untenable; nor does it appear a whit less so when viewed from any other standpoint.

Suppose it be assumed—and we have just as much right to assume this as the upholders of the theory have to assume the contrary—that the short-tongued produced a greater proportion of intelligent individuals than did the long-tongued. How would the case then stand?

But this is not all, for we have not only plants with verdant foliage and flowers of brilliant hues, but also many with richly-coloured foliage and flowers inconspicuous, both as regards colour and size. By what process of insect selection have these colours been evolved—can the selectionists tell us?

What of the thousand bright-hued fruits which appear when the flower has perished? the purple plum, the ruddy cherry, the golden orange. What, too, of such seeds as *Abrus precatorius*, and a hundred others? bear their colours any relation whatever to the colours of the flowers producing them? What again of those humble members of the vegetable kingdom ycleped "weeds," which garnish with beauty the profundities of ocean—the rich-hued Fuci? What, moreover, of the vividly-tinted pileus of the lowly Agaric? The hues of many of these fungi almost outrival the brightest-coloured flowers, and well has it been said that the effect of a sunbeam resting upon the vivid surface of *Agaricus muscarius* "might lower the pride of many a patrician vegetable." Nor is this all: what of yet humbler forms? What of the *Palmella nivalis*, which suffuses with crimson blush earth's snowy bosom in Arctic regions—and gelatinous masses which in a single night spring up—emeraldine, rubeous, golden? Yea, verily, upon the humblest forms hath been lavished a wealth of gorgeous hues. And can it be argued that the highest forms were created destitute of their most attractive features, until fortuitously visited by the wandering bee? Myth worthy of arm-chair theorists!

Nor can it be proved—nor indeed is there the vestige of plausibility in the statement—that bees prefer blue to other coloured flowers. I emphatically assert that—so far as my individual experience goes —such is not the case. If it be asked what proofs I can adduce in support of this sweeping assertion, I answer that, not only every observant bee-keeper has daily evidence of its truth, but that even my humble testimony is worth something; and that without usurping the distinction of being written down an authority on the subject, I venture to think that I may present my credentials with a very good grace, seeing that my observations, which have been made in the field, the orchard, and the garden, extend over half a century—that I have kept, probably, one of the largest apiaries ever managed by a single person—and that, lastly, for six years I literally lived in the midst of my pets, watching and tending them at all hours and in all seasons; and most unhesitatingly I repeat, that hive-bees make no choice of blue over other colours; that is to say, where honey is generally abundant. Of course, where within a certain radius of an apiary there are to be found a majority of blue honey-yielding flowers, there will bees most abound—not otherwise.

Indeed it may be asserted that, as a general rule, blue flowers contain less honey than others—a notable exception being Borage, which is greatly affected both by honey and humble-bees.

Quite recently, I read in a periodical the astounding statement, that there are a greater profusion of blue than other coloured flowers. The assertion perhaps scarcely needs refutation, nevertheless, as a matter of curiosity, I have gone very carefully over the seed lists of two of our largest floriculturists.

The columns are arranged so as to show the height, colour, and duration of every plant in each list; and as the lists include both exotic and native species, it will, I think, be a fair index to the actual proportion of the several colours to be found in the floral world.

The first list contains 733 different kinds of seeds. The colours I have arranged in descending sequence; they are as follows[1]:

129	red (crimson, scarlet, rose, &c.)
110	white
59	yellow
57	blue
56	purple
17	orange
15	blue and white
15	red and white
4	violet
461	
146	various
126	buff, maroon, mauve, spotted, striped, &c.
733	

It will here be seen that *red* predominates, *white* follows, whilst *yellow* and *blue* are on a nearly equal footing.* Now, if we arrange these in the order of primary and compound colours, it will at once be seen that *red* is still greatly in the ascendency.

Thus—

Blue (primary)	57
Purple (blue and red)	56
Red (primary)	129
Orange (red and yellow)	17
Yellow (primary)	59

That is to say that, purple being composed of blue and red, both these primaries are entitled to a moiety each of purple—the same with red and orange. Even if we add to each those flowers which have red or blue disposed with white, the proportions are not disturbed. In those plants classed under the head "maroon," &c. &c., it will be found that reds and yellows still more largely predominate.

My second list embraces no fewer than one thousand species; but the definitions of the colours therein are less amenable to classification than those in list No. 1, such terms as "reddish purple," "purplish red," "orange yellow," being freely used. However, upon carefully picking out such as are in no sense ambiguous, I find that the proportions approximate very closely to those in No. 1 list. For instance, by rule of three, No. 2 should have yielded 70 blue: it actually yielded 67; red should have produced 176: it actually produced 153; whilst the proportion of yellow again slightly increased, the actual number being 88. It will thus be seen that, of the primary colours, blue either comes third in the scale, or is closely run by yellow.

The hive bee, as is well known, gathers in its harvest in the early part of the year, and (except where heath abounds) the blossoming of the lime-tree marks the close of its short season. Particularly active is the busy creature when apple, pear, plum, cherry, &c. &c., are in full bloom. All *white* are these, most of them spotlessly so. Let Nature spread her seductive blue deceptions as she will, will the "azure-loving" worker forsake the sweets stored up in the receptacles of the white for those secreted in the blue? I trow not; far too wise is she to neglect what is within her reach to pursue a profitless quest, because, to our eyes, certain colours appear to be more attractive, gleam they with the effulgence of the setting sun, or the softly resplendent azure of the unclouded sky.

Nay, it *cannot* be proved that, as suggested by Mr. A. G. Tansley, bees "neglect the more primitive yellow or white forms" for those richly-coloured; or that—according to Müller—they "show a marked taste for blue, *because blue is the colour of the most advanced flowers!*"

Most assuredly not. Quite the reverse.

Now, of all flowers, hive bees most affect the following honey-producers—*All* large fruit trees, probably without a single exception, raspberries, strawberries, gooseberries, red and white currants, *Pyrus Japonica*, willow-herb (*Epilobium*), borage, sycamore, lime, snow-berry, mignonette, *Limnanthes Douglasii*, ivy, white clover, *Sedum spurium* (?) and many others. It will at once be seen that of this somewhat incomplete list—with the exception of the willow-herb (pink), sedum (pink), pyrus (crimson), and borage (blue), nearly the whole are *white*, or nearly so, some greenish, and very many inconspicuous; and there is but one *blue* flower in the whole series.

Now although the support of an apiary of fifty unusually strong stocks—consisting of probably not less, in the height of the season, than one and-a-half million bees—is very little helped by half an acre of honey-producing flowers, proximity to hives of even so limited a floricultural area is a wonderful advantage in uncongenial weather, since it tempts bees, afraid to venture to any great distance from the apiary, to work near home, and they will crowd upon plants but a short distance off. I therefore invariably cultivated extensive beds of willow-herb, borage, mignonette, and the abundant honey-yielding sedum, with the result that, weather permitting, those beds were at all times crowded; nor amongst the tens of thousands that visited them could I ever distinguish any marked preference for *blue*. If it *ever* appeared that one plant was laid under heavier contribution than another, it was perhaps the sedum referred to, its rich stores inviting the visits not only of *Apis mellifica*, but also of innumerable butterflies and humble-bees.

Somewhat different is it in the case of humble-bees. In the spring, when fruit trees are in full bloom, their colonies are in their infancy, and very few are to be seen; but, as genial summer tardily

* If we could separate the several colours classed under the head "various," the result would almost certainly be the same.

advances, innumerable bright-hued flowers spread out their beauty to charm the eye—the mental eye of man—mayhap of bird and beast, although some *do* deny to these latter any appreciation of beauty. *Now* humble-bees abound. Far less choice are they in their selection: the poisonous monkshood and fox-glove are rifled of their stores; antirrhinums seem especial favourites; and a host of brightly-tinted flowers are visited, sometimes hours before the hive-bee is stirring; nor cease the active creature's labours until the latter has long since retired for the night. Like the hive-bee, however, they show no marked preference for *blue;* nor do they disdain to rifle of their nectar the blossoms of the sycamore, lime, snowberry, &c.; and it does not appear that in their case any more than in that of the hive-bees, there is a tittle of evidence to support the "taste for blue" theory, which seems to be founded upon a fallacy, and one possessing not even the equivocal merit of plausibility. Of course, as with the hive-bee, when blue honey-yielding flowers predominate, we may reasonably expect to find that *there* they most do congregate. 'Tis, too, evident that *all* bees must obtain honey *somewhere*, and during an unpropitious season, when honey is scarce, flowers almost unvisited when honey is abundant are again and again visited by roamers, and the whole floral world is ransacked in a bootless quest for sweets—bootless, for 'tis one thing to seek, quite another to find; and it is not because in such bad seasons bees visit in succession every flower, blue or otherwise, that, therefore, they are actually *collecting* stores; yet many observers (!) cannot even see a tired bee temporarily resting upon a leaf without too hastily assuming that it is gathering in a heavy harvest. They would probably arrive at the same conclusion if they saw it resting upon a cabbage.

Let us consider how the matter must of necessity stand if the long-tongued insect selection theory be admitted. One of three things must, inevitably, have happened. Either, firstly, vanquished in the struggle for existence, the short-tongued must have been extinguished—eliminated out of creation, and none would now survive; or, secondly, the process of specialisation must have been continued by the shorter-tongued bees, who would have a manifest advantage over *their* still shorter-tongued brethren, as their longer-tongued had had over *them*, the process being continued through the whole series of nectar-seekers until it reached its utmost limits, when none but the simplest forms of tongued insects would be found—these associated with the most primitive floral structures; or, thirdly, matters must have remained *in statu quo*—or nearly so—the balance being scarcely, if at all, disturbed.

Elect whichever we will of these three alternatives, we shall find it beset with difficulties. As regards the first, 'tis evident enough that the short-tongued insects have not been eliminated, since they yet abound, and probably they numerically far out-number the long-tongued.* This, however, is speculation. How is it that thus far such have contrived to survive in so one-sided a struggle for existence?

With respect to the second alternative. If the theory were true, not only might we reasonably expect to find a much larger proportion of specialised blue, or indeed of any rich-coloured flowers than are actually to be found, but, most assuredly, should oftener find particular species of bees frequenting certain specialised flowers—and no others—to which both by structure and habit they had become adapted.

Sir John Lubbock † mentions, on the authority of H. Müller, *six* species of insects which visit exclusively six species of plants. Small number indeed, and probably far below the actual number that will in time be recorded. It, however, helps to show upon how unsound a basis it is sought to found the theory. 'Tis plain that where certain flowers offer to certain species of bees, or other insects, greater inducements or facilities than are to be found in other flowers, these will be most frequently visited, and so through the whole range of insect economy; but this in no wise proves that there has been developed within the insects a preference for such particular flowers *on account of their colours*, nor does it prove that they have in any wise "stereotyped and perpetuated" these colours by in future selecting them to the neglect of those less vivid.

Of course there will ever be *accidental* adaptations of insects to plants—plants to insects. Our knowledge on the subject is, however, at present very limited, nor can we determine which are merely accidental and which designed; on the contrary, where there exist flowers of various colours, honey equally attainable, the inference would be just the other way: the result would be, not the "*perpetuation*" of certain intense colours, but rather the production of yet greater varieties, as in the case of flowers of some species, but of various colours, which bees visit indiscriminately, thereby producing endless varieties, the pale-coloured acquiring bright tints when fertilised by pollen of richer-coloured; the rich-coloured, on the other hand, becoming paler when fertilised by pollen from the pale-hued. There, also, it will be seen that variety—mutability—is the law; not perpetuation—permanence.

Every tyro is aware of the difficulties which beset the floriculturist in his endeavours to preserve in their purity the strains of richly-coloured flowers, his efforts in this direction being constantly rendered abortive owing to the visits of insects, which convey the pollen of the flower of one colour to that o

* By the way, these terms are remarkably vague and flexible, seeing that *relatively to their size* the tongue of a short-tongued bee may be much longer than that of a long-tongued.

† "British Wild Flowers in Relation to Insects," p. 21.

another, so that he is actually driven to the course of propagating by slips, rather than run the risk of producing a pale-coloured seedling. The weakness of the theory is particularly apparent when it is remembered that, in a vast proportion of plants cultivated by this same floriculturist, for either their beauty or utility, the flowers have not evolved their colours through any process of natural selection, but entirely through his artificial methods; and although many of these are now visited—eagerly sought—by both long- and short-tongued insects, they are many of them in their wild state visited seldom, or not at all, either yielding an infinitesimal quantity of honey, or offering insuperable obstacles to its extraction. Whether or not *on the whole* insects more frequently visit certain cultivated plants than they do the wild stocks from whence they have been produced, I am not competent to determine, but I incline to the opinion that they do, since the scent, or colour, or both, having been so greatly improved, it is but reasonable to suppose that so also has been the secretion of honey.

Nor must we lose sight of the fact, that a host of flowers of every colour yet secrete no honey, and are consequently not now visited by insects, and, we may fairly assume, never have been. To insects, therefore, can in no sense be due their often rich colours. There yet remains to be considered the third alternative, which had nearly been overlooked by me.

Now if it be argued that the short-tongued bees, &c., continue as they were from the beginning, the theory scarcely needs refutation, since it would be manifestly absurd to suppose that but a comparatively few flowers have been specialised for the benefit of a few long-tongued insects, and that there the process has ceased, that no other changes have been brought about. The least disturbance of Nature's scheme in one particular inevitably involves, in a greater or lesser degree, the disturbance of the whole. The omnivorous but sweet-loving wasps are perhaps the most active, hardy and intelligent of the whole order of Hymenoptera, and yet their lingual implement is of the shortest. Upon ivy blossoms we find myriads of these and other short-tongued flies, both hymenopterous and dipterous, feasting upon the honey which so temptingly lies spread over the whole unconcealed disc of the inconspicuous flower.

Why have both flower and short-tongued insects so long survived unchanged, unspecialised, when the process—so say the selectionists—has been and still is in operation?

Throughout the whole of this discussion, besides the "taste for blue" theory, the modification and the development of the colours of flowers have been strangely commingled. Consequently I, too, have been inadvertently drawn into the same somewhat desultory method—that is to say, want of method. I may remind the reader that there is not necessarily any connection between this modification and this development. The modification of already-existing colours in flowers may, in large measure, be due to the unconscious interposition of insects. The so-called development of colours in colourless flowers is practically their *creation*; after the initial stage their *development* follows, and is, according to the theory, dependent upon the intelligence of certain insects. The first is a fortuitous process; the second has nothing fortuitous about it, but is manifestly a process brought about through the intelligent exercise of the insect's mental faculties, and evidences will, choice, preference, selection.

So often do the disciples of modern theorists push their theories to conclusions that go far beyond the intention of the original promulgators.

EDWARD H. ROBERTSON.

RAVENS, PEREGRINE FALCONS, AND PUFFINS ON PORTLAND HEAD.

LAST year (1888) on a cold, snowing, and stormy 13th March, I took a raven's nest with six eggs from a large hole in the West Cliff, Portland; the eggs were highly incubated. The ravens set to work, and, selecting a new spot, built again. I discovered that another collector in Weymouth intended to try for them, by the assistance of some native cliff-men.

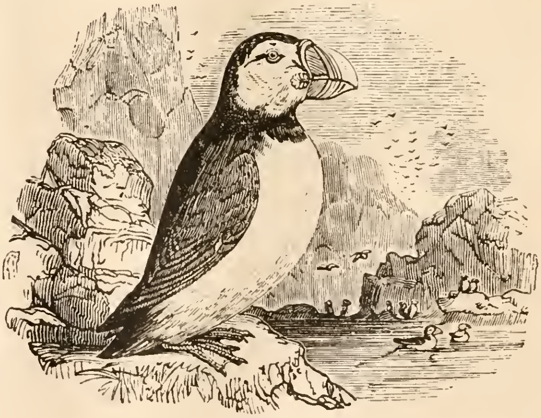

Fig. 81.—Puffin.

I tried to dissuade him, but, as he would not be persuaded, I determined to have a try for them myself again, though I should have preferred to let the birds hatch out a brood. On the afternoon of 29th March I went down to the new nest and saw six eggs again, but could not reach them, owing to the cliff overhanging. Whilst I was hanging in mid-air I heard voices above; the cliff-men had come, and they succeeded in getting the eggs by the help of a hook on the end of a pole, with which the man hauled himself in. They had been there in the forenoon, and only five eggs were then laid: but they had not the pole and hook and could not get the eggs.

These same men took two more eggs on 11th April from the first nest, making a total of fourteen eggs laid by the same pair of birds in one year.

This year I was too late, for on the 26th February I went down and found the nest had been robbed on the 20th by the cliff-men (five eggs). A second nest was made, and five eggs taken by the same men on the 13th March; and on the 28th March a third nest with five more eggs was taken. Three of the eggs, which I have seen, were light colour—a kind of slate colour—the other two normal. So in 1888 the same birds laid fourteen eggs, and in 1889, fifteen eggs. I have the first six eggs taken by self in 1888, and the two first clutches taken this year in my possession; in each clutch one is smaller and of a lighter colour than the others.

On the 10th April the cliff-men took a Peregrine falcon's with four eggs—there was hardly any pretence at a nest. The eggs were laid on a ledge of blue clay, and were covered with it. I have two of them now in my cabinet. The birds laid again, and, I believe, hatched out their young ones safely.

I don't think it is generally known that puffins breed on the Bill; I have not seen it mentioned by any Natural History book. Last year I saw six puffins' eggs taken 21st May, and an old bird was caught, and bit the man's hand when he thrust his arm into one of the holes. JAMES B. YOUNG.

Fig. 82.—Head and Foot of Raven.

Fig. 83.—Peregrine Falcon.

OUR SCIENTIFIC DIRECTORY.

[The Editor will be obliged, if, for the benefit of his numerous readers, secretaries of scientific societies will send notices like the following, also place and time of meeting.]

Bedford Amateur Natural History Society: President, Dr. Crick; Hon. Secretary, H. Darrington; place and time of meeting, 6, Gwyn St., Bedford, on Tuesday evenings at 8.15.

Wellington College Natural Science Society: President, S. A. Saunder, Esq.; Secretaries, H. A. Cruickshank, A. J. V. Durell.

North Staffordshire Naturalists' Field Club and Archæologicol Society: President, J. R. B. Masefield: Hon. Secretary, Rev. T. W. Daltry, Madeley Vicarage, Newcastle, Staff. Excursions monthly, April to September; evening meetings monthly, November, January, February, March.

Woolhope Naturalists' Field Club, Hereford: President, H. Southall; Hon. Secretary, H. C. Moore; Assistant Secretary., J. B. Pilley. Annual meeting early in April at the Woolhope Club Room, Free Library, Hereford.

Woolwich District Natural History Society: President, Rev. J. W. Horsley; Hon. Secretary and Treasurer, F. Barry, 11, Green's End, Woolwich. Meets (*pro tem.*) at Parish Room, Rectory, first Tuesday evening in each month. Rambles every Saturday afternoon,

St. Margaret's Natural History Society, Westminster: President, Ven. Archdeacon Farrar, D.D.; Chairman, Rev. R. Ashington Bullen, B.A.; Hon. Secretary, Mr. G. A. Freeman. Meetings, generally on the third Friday of each month in the St. Margaret's Boys' School, New Tothill Street, Westminster, at 7.30 P.M.

SCIENCE-GOSSIP.

THE Aberdeen Working Men's Natural History Society held their annual exhibition on the 22nd and 23rd March. Entomology was well represented by the collection of Messrs. Horne, Cowie, Terras, Duncan, Mearns and Rae; crustacea by Messrs. Murray, Duncan, and Rae; shells by Messrs. Simpson, Duncan, Rae, and Fraser; zoophytes by Mr. Simpson; spiders by Messrs. Mearns and Terras; birds by Messrs. Center, Beveridge, Mundie, Fraser, Sim, Duncan, Mitchell, Benzies, and Mathers; eighteen microscopes by Messrs. Gibb, Cowie, Mearns and Duncan; botany by Messrs. Duncan, Simpson, and Wallace; Mr. Wallace exhibited a fine collection of seaweeds; a capital collection of micro-fungi was exhibited by Prof. J. W. H. Trail.

THE Huddersfield Naturalists' Society has started a monthly circular, of which the first two numbers are before us. Besides the usual announcements, lists of meetings, &c., there are queries and answers, notes on what to observe and what to study, a natural history diary for January, February and March, exchanges, &c. Altogether the circular is a sign of the vitality of the society, and of the energy of its secretary.

ROYAL INSTITUTION.—The following are the lecture arrangements after Easter:—Dr. Jean Paul Richter, three lectures on the Italian Renaissance Painters: their associations, their education, and their employments (with illustrations); Professor E. Ray Lankester, four lectures on Some Recent Biological Discoveries; Mr. Eadweard Muybridge, of Pennsylvania, two lectures on the Science of Animal Locomotion in its relation to design in art (illustrated by the Zoopraxiscope); Professor Dewar, five experimental lectures on Chemical Affinity; Mr. Joseph Bennett, four lectures on the Origin and Development of Opera in England (with musical illustrations); Professor W. Knight, of St. Andrews, three lectures, on—I. The Classification of the Sciences Historical and Critical; II. Idealism and Experience, in Philosophy and Literature; III. Idealism and Experience, in Art and Life (the Tyndall lectures). The Friday evening meetings will be resumed on May 3rd, when a discourse will be given by Sir Henry Roscoe, M.P, on Aluminium; succeeding discourses will probably be given by Professor Dewar, Professor Silvanus P. Thompson, the Rev. S. J. Perry, Professor D. Mendeleef, Mr. A. Geikie, Mr. C. V. Boys, and other gentlemen.

IN connection with the recent Lantern Slide Competition, instituted by the Proprietors of "The Amateur Photographer," a Public Exhibition of the Slides entered for competition was given in the Theatre of the Crystal Palace, on Friday, April 5th, at 7.30 P.M. Mr. William Brooks had charge of the Lantern, and Mr. T. C. Hepworth, F.C.S., gave particulars of the pictures, which were all the work of amateurs, as they passed on to the screen. The work of amateur photographers has never before been shown under such favourable conditions.

MICROSCOPY.

NEW SLIDES.—We have received from Mr. A. J. Doherty, of Manchester, the following excellent slides:—Skin of car of rabbit (injected carmine); tongue of kitten, trans. sec. (injected carmine), a beautiful preparation; lip of cat, vert. sec. (injected carmine and stained blue); medulla oblongata of rabbit (stained hæmatoxylin), showing the fine nervous structure very beautifully; ankle of kitten, trans. sec. (injected carmine and stained blue), showing the ossifying cartilage, besides other interesting details; stomach of frog, trans. sec., pyloric end (stained carmine), showing the glands and columnar epithelium; apothecium of a lichen (*Solorina saccata*), vert. sec., showing the spores in asci; anther of *Lilium auratum*, trans. sec. (stained carmine), showing all the pollen *in situ;* fertile head of field horsetail (*Equisetum arvense*), trans. sec., showing the spores with their spiral elaters; ovary of foxglove (*Digitalis*), trans. sec. (stained carmine), showing all the ovules *in situ;* trans. sec. of the spine of *Acrocladia mamillata*, and echinoderm from the Indian Ocean; frog's blood (stained picro-carmine). The peri-nuclear portion of each corpuscle is coloured yellow, the nucleus itself red. With a good ¼-inch objective the "intra-nuclear plexus of fibrils" (Stirling) can be seen distinctly.

MR. HINTON'S SLIDES.—We have received from this well-known preparer the following slides, both of high interest to the young botanist: 1, an instructive preparation showing the curious mode of reproduction by the strawberry, where the carpels are placed outside the fleshy receptacle (the seed is seen inside the fruit); 2, the pollen of the hazel, showing development of the pollen-tubes.

FORAMINIFERA.—In the note of mine last month *re* "Gossip about Foraminifera," you printed "Frihtel and Moll," which should be *Fichtel* and *Moll*, and quoted my name as F. Chatman instead of F. Chapman. Perhaps the fault lay in my indistinct writing, and I apologise sincerely for the errors.—*F. Chapman.*

The April number of "The Journal of Microscopy" contains the following papers: "Romance of Geology in the North-West of Canada," by Mrs. Alice Bodington; "Freshwater Sponges," by Henry Mills; "How the Spider makes her Web," by H. M. J. Underhill; "On some Common Species of the Gamasidae," by Lieut.-Colonel L. Blathwayt; "Microscopical Imagery," by Dr. Royston-Pigott; "The Development of the Tadpole," by J. W. Gatehouse, &c.

THE QUEKETT MICROSCOPICAL SOCIETY.—The journal for April contains the following papers:—"Further Notes on Coccids from British Guiana," by S. J. McIntire; "On the Larval Forms of Ortonia and Icerya," by R. T. Lewis; "On Interference Phenomena," and "On Insect Anatomy," by Prof. B. T. Lowne; "On the Oamaru Diatom Papers of Messrs. Grove and Sturt," by A. Grunow.

ZOOLOGY.

GOULD'S FINCHES (*Porphila Gouldii*).—It may interest readers of SCIENCE-GOSSIP to know that I have succeeded in getting these brilliant birds safely to England from Queensland, their tropical home. They are vivacious and tame, feeding freely on canary seed from the hand. Twenty degrees of frost on the night of February 11th, tried them, but we kept the room heated, and the birds survived. The finch-like bill is white tipped with crimson; the head and throat are velvet black; the breast, a rich mauve or violet; the under parts golden-yellow; a ring of turquoise round the neck, and on the tail coverts; the back, bright green, and tail quills black, the female is altogether paler than the male bird. There is a variety in Queensland, which I saw in Sydney, with a crimson cap, and one bird developed a yellow cap. Further information can be given if required.—*C. Parkinson.*

AMERICAN SHELLS IN THE RIVER HUMBER.—The following interesting note is from the "Manchester City News" of March 23, 1889. "A fine series of *Venus mercenaria* has been dredged alive from the river Humber. It was observed in 1864, and again in 1868, and has steadily increased till the present time, and is now bidding fair to compete with the familiar cockle. This fine *Venus* is commonly known in America as the clam, and is of course an edible species. A number of shells dredged from the river were exhibited by Mr. J. R. Hardy at the Manchester monthly conchological meeting in March."—*Geo. Roberts.*

GOLDEN ORIOLE.—It may interest some of your readers to hear that, on Saturday last, March 2nd, a friend and myself saw a golden oriole in a pine wood near here. This bird is a very early arrival, as I believe that golden orioles, on the few occasions that they do visit us, do not arrive before the beginning of April.—*A. G. Hudson, Ashington, Pulborough, Sussex.*

Erratum.—p. 44, 2nd col., line 25 from top, for "1888" read "1886."

A RARE FISH.—Mr. Arthur Patterson, of Great Yarmouth (whose book on Monkeys was mentioned in last month's issue), has just added a very rare fish to the local fauna. He has already added about a dozen species to the previous lists of fishes, his latest being Müller's Scopelus, which he found amongst seaweed which had been left by some fishermen on the beach from their draw (seine) net. It was found on Sunday, the 31st March.

SOUTH DEVONSHIRE MOLLUSCA.—Looking over some old papers, I came across a list of shells found by Mr. E. D. Marquand in the Exeter district, which I received from him in 1887. It was proposed at the time to make a careful investigation of the South Devonshire Mollusca, and Mr. Marquand kindly sent me this list to show what he had obtained up to that date (May, 1887). Shortly after, I believe Mr. Marquand went abroad, and I also left England, so nothing more was done. But the list is too valuable to be lost, so, with the Editor's permission, I will present it to the readers of SCIENCE-GOSSIP. "List of Mollusca found in the Exeter District;" by E. D. Marquand. "*Sphærium corneum*, *S. lacustre*, *Pisidium amnicum*, *Ancylus lacustris*, *A. fluviatilis*, *Paludina vivipara*, *Vitrina pellucida* and var. *depressiuscula*, *Helix aspersa* and var. *minor*, *Helix nemoralis* and vars. *rubella*, *castanea*, *libellula*, *carnea*, *minor* and *bimarginata*, *H. hortensis*, and vars. *incarnata*, *lutea*, *olivacea*, *roseolabiata*, *arenicola*, and *lilacina*, *H. arbustorum*, and var. *major*, *H. cantiana*, and var. *alba*, *H. rotundata*, *H. virgata*, and var. *leucozona*, *H. caperata*, *H. concinna*, *H. fusca*, *H. aculeata*, *H. hispida*, *H. pygmæa*, *Zonites cellarius*, *Z. alliarius*, *Z. draparnaldi*, *Z. nitidulus*, *Z. fulvus*, *Z. purus*. *Z. crystallinus*, *Z. glaber*, *Limnæa peregra*, and vars. *ovata* and *labiosa*, *L. truncatula*, var. *minor*, and var. having purple bands, *L. palustris*, *Succinea putris*, *S. elegans*, *Planorbis marginatus*, *P. vortex*, *P. contortus*, *P. albus*, *Cochlicopa lubrica*, *Clausilia rugosa*, and var. *tumidula*, *Pupa umbilicata*, and var. *edentula*, *Balea perversa*, *Carychium minimum*, *Physa fontinalis*, *Bythinia tentaculata*." Mr. Marquand also adds the following forms found by him in South

Devon, but not in the Exeter district:—"*Helix aspersa*, *M. sinistrorsum*, and var. *exalbida*, and *H. lapicida*, Ashburton; *H. rufescens*, and *H. rupestris*, Torquay; *H. rufescens*, *H. rupestris*, *Zonites excavatus*, var. *vitrina*, and *Bulimus obscurus*, Ivybridge; *Bulimus acutus*, Thurlestone, near Kingsbridge. Mr. Marquand says of *H. rufescens*, "It is very curious that I have not yet seen a trace of this common species in this (Exeter) neighbourhood."—*T. D. A. Cockerell*, *West Cliff*, *Colorado*, Feb. 23, 1889.

PARASITES ON RATS AND MICE.—I have recently had the opportunity of examining several specimens of field mouse (*Mus sylvaticus*), and on some of them I found living specimens of a Lælaps, so closely resembling those found on the Vole that I think they must be considered as the same species. The chitinous plates were not quite so dark-coloured, and perhaps the abdominal plate is rather larger, and not quite so angular, as in the specimens from the Vole. I also found with them specimens without the chitinous dorsal plate, and these appeared to resemble Koch's *L. pachypus*, but were, I believe, only immature specimens. It would be very interesting to have the opportunity of examining specimens taken from the other rats and mice, to determine if possible whether there be but one species of Lælaps, or several.—*C. F. George.*

GEOLOGY, &c.

LEDGES ON BANKS OR HILL SLOPES.—There has been some discussion on this subject in "Nature" of February last and March 14th. In the first, Mr. Ernst adopts the idea of Mr. Darwin, that these ledges are due to the sliding down of the surface-soil; but "they will probably depend, first of all, on the conditions of the ground and its vegetation." Mr. E. J. Mills says, "These ledges owe their origin to rain-water," which entering the soil dissolves some of it, and the unsupported plot "would collapse to a lower level." The two then coincide partly, but what were the first conditions? On this depends the great problem of the "sea-level." On all sea shores of the present day where the angle is between 30° and 50°, we find the slope is irregular, that is, there are small ledges here and there formed by the irregular break of the wave, by the uncertain deposit of material, or by the uncertain slip of shingle. During neap tides the wind blows over these ledges and deposits drifts against them. If the spring tides do not cover the highest of these drifts, they assume some consistency, and vegetation grows upon them. These ridges or ledges are very similar in shape and general character to those we now find high above, or extending down to the level of the present sea, on to the level of the plain at the foot of the slope. In looking at some of these ledges in Dorsetshire and Scotland, I found some with and some without sand or shingle in their beds; where these were found, I supposed that ridge was formed by the wave *in situ*; where there was no sand or sea-deposit, I supposed the surface had slipped. In both cases another cause made these ledges more pronounced—vegetation grew freely on the wind-blown drift, and animals ate it as they walked along at the foot of the slope. They made that deeper—most ledges are steepest down hill—therefore, after actions have made these ledges into what we see, but wind or water began the drifts on which those ledges grew. Gravel beds are high on the hills, they have never been upheaved; therefore the sea has sunk, and our geological schools had better allow this as a fact.—*H. P. Malet.*

THE MAMMOTH IN BELFAST.—An interesting find is reported from Belfast. Dr. John Moran, of that town, has found a tooth of *Elephas primigenius* in the drift gravels at Larne Harbour. The following is the succession of beds in ascending order: 1, older boulder clay; 2, coarse gravel with rolled stones (3 to 4 ft. thick); 3, coarse gravel with rolled stones (6 to 10 ft. thick); 4, silt, or rather coarse laminated clay (3 to 5 in. thick); 5, a second layer of coarse gravel with rolled stones (18 in. to 2 ft. thick); 6, dark surface layer (18 in. thick) containing neolithic implements of a rude type. It was in bed No. 4, formed from the denudation of the newer boulder clay, that the tooth was found.

THE GEOLOGISTS' ASSOCIATION.—The February number of the Proceedings of this Association, besides the list of meetings, etc., contains the following papers: "On the Causes of Volcanic Action," by J. Logan Lobley; "On Some Bagshot Pebble-Beds and Pebble Gravel," by H. W. Monckton and R. S. Herries; "On the Palæontology of Sturgeons," by A. S. Woodward. The following is the list of excursions of the above Association for 1889: April 6, College of Surgeons; April 19, 20, Lyme Regis, 22, 23, Weymouth (Easter excursion); May 4, Boxmoor; May 25, Brentwood; June 1, Sevenoaks and Ightham; June 10, 11, Ipswich and Suffolk (Whitsuntide excursion); June 22, Horsham; June 29, Medway; July 13, Epsom; July 20, Wallingford; August, North Cumberland, Long excursion, date not decided.

NOTES AND QUERIES.

BUTEO LAGOPUS (Rough Legged Buzzard).—I wish to record the capture of a specimen of this bird at Guarlton, in November last. This bird is of so rare occurrence in this district, that the addition of this species to the local fauna will be a welcome one. The bird was captured by a game-keeper, who first observed it in a trap; on his approach the bird attempted to rise in the air, but was shot and secured by him, and has now been preserved. It is a very fine specimen, measuring over 4 ft. 6 inches across the wings. The only other records I can find of this species being taken about here are, one shot at Lobstock Flats, 1852, and another at Blackstone Edge, 1868.—*F. W. Paple*, 62 *Waterloo Street, Bolton.*

THE "WANDERING JEW."—In reply to your enquirer, Mr. John Christie, the above name is applied in this neighbourhood to *Linaria Cymbalaria*, Mill, but I have met with very few persons, not botanists, who are able to give any name at all to this plant.—*W. P. Hamilton, Shrewsbury.*

PLANTAGO LANCEOLATA.—F. H. Arnold's note on *P. maritima* calls to mind a curious freak of nature in the case of *P. lanceolata.* Last August I collected a specimen, one of the peduncles of which bore on its apex, in place of the usual flower-head, a complete plant in miniature, with leaves one to three inches long, and one or two small flower-heads on short pedicels arising from among them. The appearance resembled, at first sight, that of *Paris quadrifolia.*—*W. P. Hamilton, Shrewsbury.*

HAWFINCHES AND CROSSBILLS AT STAPLETON PARK.—The hawfinch nests annually at Stapleton Park, near Pontefract. Last year the nests and eggs were seen by the keepers there. A flock of crossbills appeared at this place in autumn, and were seen till December, or later. Out of six shot, two were males in fine crimson plumage.—*Geo. Roberts.*

NIGHTINGALE IN WALES.—In June of 1888, a corresponding friend, Miss Wordsworth, of New Brighton, near Liverpool, informed me that a nightingale had been heard singing at Bodrhyddan Park, near Rhyl, in North Wales. As this bird is so seldom heard in Wales, I should like to ask if any one living in the West of England, or Wales, could give any more information about it. During the last ten or twelve years the nightingale has been heard farther north than in previous years, and it may be extending westward.—*Geo. Roberts, Lofthouse.*

SHELL-CHANGING, AND FLUID MEMBRANES.—The following extract from Emerson's Essay on "Compensation," may interest, if not amuse, some of your readers: "The changes which break up at short intervals the prosperity of men are advertisements of a nature whose law is growth. Every soul is by this intrinsic necessity quitting its whole system of things, its friends, and home, and laws, and faith, as the shell-fish crawls out of its beautiful but strong case, because it no longer admits of its growth, and slowly forms a new house. In proportion to the vigour of the individual, these revolutions are frequent, until in some happier mind they are incessant; and all worldly relations hang very loosely about him, becoming, as it were, a transparent fluid membrane, through which the living form is seen, and not, as in most men, an indurated heterogeneous fabric of many dates, and of no settled character, in which the man is imprisoned. Then there can be enlargement, and the man of to-day scarcely recognises the man of yesterday."—*John Hawell, M.A., Ingleby, Greenhow Vicarage.*

"VANDAL NATURALISTS."—I was very pleased to see the remarks made by Mr. Williams, under this head, in the last number of SCIENCE-GOSSIP. There is, among naturalists, far too much of the collecting spirit, and too little of the searching out of new facts. The lepidopterist procures a cabinet, spaces the drawers off into a certain number of partitions, allotting a space to each of the British species; he gets the spaces filled up as quickly as he can, by capture, exchange, or by buying, if he can afford. As each space is filled up, the name of the insect is crossed off on his exchange list, and he has done with that particular kind—would not go twenty yards out of his way to take it again, unless he had some idea of exchanging it for others he had not got. Some collectors even go so far as to refuse an insect unless it be "bred," and pinned with a "black pin." I sometimes wonder whether such persons are making collections of insects or pins? Now I think this is vandal in the extreme—to pretend to be studying a science and refuse to look at specimens unless they are pinned in a certain way. The true student will be glad, even of a single wing, rather than be without. To allot a space for *Acronycta alni*, equal to that for *Apema oculea*, is unjust. If the space is short it is inadequate to show the variations of the latter, and if long it is unfair, even if one can, to fill it with such a rare thing as the former. Egg collectors, I am afraid, are also getting much into the "mere collector" style. The system of collecting clutches, seems to me to be one we should discourage. Generally the eggs in the same nest are very much alike, and, as each collector will probably want all the varieties he can get, he will require so many clutches; and if all the collectors went in for clutches, each one requiring say half-a-dozen nests of each kind, what would become of our rarer birds? There has been a great deal said and too much done about bird protection; but the persons who are to blame for the destruction of our rarer visitors are these wholesale destroyers, and those who offer premiums for the slaughtered victims. A person is so purely scientific that he will not have an imported skin in his collection; but if he hears of a land grouse having flown from Asia to Britain, he will give five pounds to the person who can slaughter it. An Act has been passed to protect this bird in Britain, such an Act is unjust! It is the whim of a few, carried out at the expense of the many. If land grouse do come, and persons who make their living by killing and stuffing birds, find customers ready to give five pounds each for the birds, such persons have a perfect moral right to kill them, as much as another has to make his living by killing herrings, shrimps, or oxen, unless it can be shown that in his doing so the country suffers, and only under these circumstances should the law interfere. I should very much like to see the land grouse settle here and breed, and would do everything I could to induce them to do so; but I have no right if I have the power, to force another person to conform to my thoughts, however much I would that he should do so.—*S. L. Mosley, Beaumont Park Museum, Huddersfield.*

THE HUDDERSFIELD NATURALISTS' SOCIETY has decided to publish the first part of a Flora of the district. It will contain the whole of the flowering plants, and will be sent to all societies which have favoured us with their publications. We send this notice because we have not published anything for the last two years, and have, therefore, not been able to make returns for favours received.—*S. L. Mosley, Hon. Sec., Beaumont Park Museum.*

BEAVERS OF BUTE.—In "Notes and Jottings of Animal Life," published by Smith, Elder, & Co., will be found not the least interesting of the late Frank Buckland's many interesting papers, called "Lord Bute's Beavers." I presume it is this your correspondent B. Le T. refers to.—*Walter H. Short.*

LOCALITIES.—Can any reader of SCIENCE-GOSSIP say what counties Cadnant and Newsham Loch are situated in? I suppose the first is in Wales and the second in Scotland.—*W. D. R.*

The Wood-Ant (*Formica rufa*).—I should like to offer a remark or two on Mr. Bowman's paper on the above subject, appearing in the recent number of Science-Gossip. Mr. Bowman says: "I have noticed too that their sense of hearing was very acute, and on the occasion of any uncommon noise in my room, they would, to an ant, rise on their two hind legs in a menacing attitude, as though awaiting the approach of an enemy." In a subsequent part of his paper, he again says the same thing, and he seems convinced the sense of hearing in ants is very acute. Now Sir John Lubbock, whom one must recognise as an authority on this subject, says, "I have never succeeded in satisfying myself that my ants, bees, or wasps heard any of the sounds with which I tried them;" but he very prudently adds, "I carefully avoided inferring from this that they are really deaf, though it certainly seems that their range of hearing is very different from ours." How then, are the statements of Sir John Lubbock and Mr. Bowman to be reconciled? For my own part, I think that their sense of touch must be very acute, and that they receive the impressions through the medium of the ground. The tremors of the earth would make the ant aware of any danger in close proximity. The human ear is only able to hear sounds that are caused by a number of vibrations per second between 16 and 38,000. It is quite possible not less than 16 or more than 38,000 may be required to excite hearing in the ant—most probably the latter.—*Chas. A. Whatmore.*

A Remarkable Egg.—A hen's egg, French, and a little over medium size, on being put into a saucepan of boiling water cracked, with a slight report, and some of the albumen appeared in the water—the egg itself floating. When the egg was removed from the water, a considerable quantity of the "white" was left, and a small yolk, perfectly whole. The egg itself showed no sign of being cracked at all; no one who had not witnessed the occurrence could have believed that the yolk and white had been expelled from that egg. Besides, the egg, on being opened, was found to contain another yolk, and sufficient white to half fill the shell. When the shell was quite empty, careful search disclosed a very small crack in it. This must have closed up perfectly as soon as half the contents had been expelled. Very little water had entered the egg. I suppose the air in the egg, which was quite fresh, expanding suddenly, caused the explosion, but why should it expel just half the egg? There was a thin membrane over the remaining egg-substance. I know that "double-yolked" eggs are not uncommon, but never knew one behave thus.—*M. E. Pope.*

The Tweezers of Ear-wigs.—Some while back, I think I remember reading that the use of the "tweezers," borne by the ear-wig at the end of the abdomen, was considered somewhat obscure. Last evening, however, I had an opportunity of witnessing the fact that, if these appendages are hardly strong enough for defence, they can be certainly employed for defiance and attack. I was reading by lamp-light, and, looking off my book for a moment, I detected a fine ear-wig advancing over the cover of a book on the table towards some fragments of what I knew to be cheese. When within two inches of these a house-fly alighted on its left and somewhat to its rear. Instantly round went the ear-wig's abdomen in the fly's direction, open flew the tweezers to an extent I never saw before, and with a half-sideway, half-retrograde movement the ear-wig "went for" that fly. The latter awaited not the attack, but on his adversary reaching the cheese morsels coveted by both, again descended, strangely enough, in the rear of the ear-wig; the next thing I saw was the fly held up aloft in the tweezers of the latter, a helpless prisoner. Its detention, however, was short, the tweezers soon re-opening, and it flew away, apparently none the worse; but it came not again, and the ear-wig had an undisturbed banquet.—*Windsor Hambrough.*

Sucking Eggs.—I see in your March number a method of keeping moths out of eggs by plastering the holes up. A better method—that of late Charles Waterton—consists in sucking up into the egg a solution of corrosive sublimate which will keep it longer than anything else, and from all other animal life.—*P. H. Marsden.*

Wood's Irish Half-pence.—Would some reader of Science-Gossip, interested in Numismatics, give me all information he can about "Wood's Irish Half-pence," as I have recently been presented with a good specimen for my collection. On the obverse is the dexter bust of George I. with the inscription Georgius Dei Gratia Rex. On the reverse, Britannia to the left, seated, and holding a branch in the uplifted right hand, and with the left arm leaning on a harp; the inscription being Hibernia, 1723.—*Henry George Inkes, Kirton-in-Lindsey.*

The Poisonous Nature of Yew-Trees.—Mr. Letts' notes (Science-Gossip, page 309) call to memory a similar case, illustrating the poisonous nature of yew-tree leaves. In Leicestershire, in the year 1882, during the night, eighteen head of cattle, out of a herd of forty, somehow managed to get into a spinney of yew-trees, and when a farm hand's attention was drawn by their agonised bellowing, nine were found to be already dead. The remainder, all, with the exception of two, died within the following fortnight. I believe the leaves act as a narcotic acrid, affecting the spinal cord more than the blood, and it is very evident that the nature of the case greatly depends on the quantity swallowed, for, if taken with, say, three times the quantity of their natural food, the leaves of the yew-trees are innoxious.—*C. E. Stott, Lostock, Bolton.*

Deilephila galli.—I have a specimen of this moth in my collection, which was caught in 1888, on the honeysuckle, with *S. ligustri* and *C. elpenor.*—*Frederick Glenny, Wisbech, Cambs.*

Life-History of Mosquitoes.—I would like to ask through your Notes and Queries, if the length of life of the mosquito (*Culex pipiens*) in the winged state is known, also if the males and females differ in this respect? I can find no statement as to their length of life, and individual opinions vary from five days to five months. A friend living on the Gulf coast of Florida, tells me that when fishing off that coast at night, if the wind is off shore, one can fish undisturbed by mosquitoes, at a distance of half a mile from shore; but if the wind is on shore, one must keep about a mile away to avoid them. He thinks this shows that their sense of smell is more acute than that of sight? Another query is, if bee-honey is chemically changed during its passage from the flower to the comb, while in the honey-bag of the bee?—*A. P. Case, Vernon, N. Y.*

Sagacity of a Cat.—One evening I placed before my Persian cat some hot milk, and was very much surprised to observe her behaviour towards the same. She walked round and round the dish, and occasionally put her mouth to the milk to see if it was the right temperature for drinking; at last she put her mouth too far in the dish and scalded her nose, but not to such an extent as to make her forsake all intention of drinking the same: she only altered her mode of taction by using her paw instead of her mouth. She put her paw in the dish with great hesitancy, and several times withdrew it in double-quick time, until at last she found that the milk was the right temperature. It seems to me that pussy must have reasoned the matter out somewhat in this manner: my paw is better protected from harm than my nose, therefore there is least chance of its being scalded.—*W. J. Scipio.*

Lobsters and Trout.—A friend of mine, a good observer, writes to me from Coll Island, Argyllshire, as follows: "I find, by inquiring of the fishermen if they have caught plenty of lobsters or not, I can tell whether to go trout-fishing or not. If the lobsters are moving, the trout are rising, and *vice versâ.*" I shall be glad to hear if any readers of Science-Gossip have observed or heard of the same thing. It seems to be almost impossible that lobsters in the sea, and trout in lochs and freshwater streams, can be influenced simultaneously by any known physical agency.—*Norris F. Davey, Abergavenny.*

Flow of Sap—Sunflowers.—I believe that the flow of sap depends chiefly on the degree of temperature, and little on light. Growth goes on in darkness as well as in light, so that sap must flow whether the moon is at full or not, to allow of organisation; the water of organisation is indispensable to growth. Of course, the moon's light would be an additional advantage, as assimilation would be induced, subdued light being most favourable to this process. Assimilation cannot go on in darkness nor in intense light. The position of sunflowers and other heads of flowers is governed by the above laws. The fact that growth is more rapid on the shaded side of the peduncle, or flower-stalk, tilts the disk over in such a position as to enable it to receive the light direct on the florets, whether north, south, east or west, and fixing it so after growth has ceased. The foxglove (digitalis) is a good example.—*Thos. Axon, Stockport.*

Hairs on Pupæ.—Will some one let me know on what pupa I shall find hairs. I have as yet only found them on the empty pupa skin of *Orgyia antiqua.* In this case the hairs were distributed over the skin in roughly circular patches of thirty and upwards. In shape they were flat, gradually tapering to a fine point, and so twisted as to have the appearance of a string of beads of gradually decreasing size. Each hair has a minute ball at its base; and the skin immediately surrounding it, and for about six times its diameter is much lighter in colour than the rest.—*A. W. Watson.*

Life-history of a Flea.—Fleas lay their eggs in cracks, in cushions, and in boards, or in the midst of dust, and their larvæ, which have no legs, and which therefore must live where they have been born, can only exist in consequence of the nourishment brought to them by the adults. Were they abandoned they would perish, but they have excellent mothers who never leave them; for after a flea, should it be a mother, has gorged itself with blood, it seeks its young and disgorges a small quantity, so as to keep them alive. The larvæ shut themselves up in silken cocoons when they have attained their full size and undergo their metamorphosis into the condition of nymphs.—"*Transformation of Insects,*" *by Professor Duncan, F.R.S.* (*p.* 419).

NOTICES TO CORRESPONDENTS.

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

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

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

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

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

EXCHANGES.

Helix nemoralis, reversed form (see par. in "Notes and Queries"). For specimen, send suitable box and label, and 6*d.* in stamps, to—Wm. Swanston, 4A Cliftonville Av., Belfast.

Wanted, a small secondhand compound microscope, in good condition, in exchange for vols. vii. and viii. of the "Boys' Own Paper," unbound, and a few books on chemistry, &c. Apply, stating particulars, to—W. G. Hanson, 5 Church Street, West Bromwich.

Conchology.—Offers wanted for a number of bivalves from the river Trent, including *Anodonta cygnea* and *anatina, Unio tumidus* and *pictorum,* and several varieties of same.—Geo. Roberts, Lofthouse, near Wakefield.

For exchange, a number of engravings of varieties of unio and anodon. Wanted, pamphlets on antiquarian subjects, or files of old Yorkshire newspapers.—Geo. Roberts, Lofthouse, near Wakefield.

Fossils from the oolites of Weymouth and Portland, in exchange for those of other formations. Send lists to—C. W. Freeman, 108 Harbut Road, New Wandsworth, London, S.W.

Wanted, a copy of the first edition of Bower and Vine's "Practical Botany." Will exchange micro or other objects.—F. Bewlay, 6 Vine Street, York.

"The World of Wonders Revealed by the Microscope" (illustrated), by the Hon. Mrs. Ward, and four vols. "Naturalists' World" (three bound), in exchange for good micro slides.—R. C. Chaytor, Scrafton Lodge, Middleham, Yorkshire.

Four insect cases, corked and glazed (imitation mahogany), containing about 100 specimens of lepidoptera, British and exotic, amongst them being machaon, edusa, sibylla, corydon, paphia, nerii (oleander hawk), foreign, very fine; fraxini (Clifton nonpareil), ditto atropos, ocellatus, bombyliformis, *Morpho menelaus* (large and magnificent exotic), *E. glycerion, E. brome,* heliconias, &c. What offers?—Joseph Anderson, jun., Alre Villa, Chichester, Sussex.

A few copies of "Mediæval Yorkshire" (new, 3*s.* 6*d.*), in exchange for portraits (Civil War and Commonwealth period), and Yorkshire views (towns, old castles, &c.) to illustrate with (Graingering). No photos.—E. Lamplough, 131 Spring Bank, Hull.

Skins of sparrow hawk, owl, guillemot, blackbird, redwing, song thrush, water-hen, water-rail, snow bunting, wryneck; the lot in exchange for four first issue Jubilee sixpences, or other exchange; will part.—H. Knight, St. George's Road, Great Yarmouth.

Barbadoes earth from Cambridge Estate (authentic), rich in polycystina and spicula; one ounce in exchange for six good balsam mounts.—Dr. Griffin, 66 Kingsdown Parade, Bristol.

London Catalogue, 8th ed. I have a good specimen or two of any of the following, which I should like to exchange for other rare plants, viz.: 159, 181*b*, 369, 370, 586, 588, 604, 620, 725, 736, 743, 760, 819, 1052, 1053, 1333, 1348, 1379, 1394, 1408, 1491, 1558, 1627, 1629, 1645, 1661, 1662, 1665, 1669, 1690. Offers to—W. W. Reeves, 32 Geneva Road, Brixton, S.W.

Offered, good violin in case complete, with tutor; cost £2 15*s.* Wanted, Wood's "Insects at Home," and "Insects Abroad," and good turntable.—Thos. Postgate, 17 Lowther Street, Carlisle.

Foreign marine and land shells (various localities) offered for other foreign species not in collection. Also a few of the rarer varieties of British. List sent. F. W. Wotton, Adamsdown, Cardiff.

Tubes of living marine diatomaceæ. Desiderata, miscellaneous mounts.—C. H. H. Walker, Mossy Bank, Egremont, Cheshire.

American freshwater sponges. Any readers of Science-Gossip living in America who are interested in above, would greatly oblige the writer if, during the summer or autumn months, they would procure and send to him fresh specimens of spongilla with gemmules, preserved in spirits; small portions in bottles two inches long by three-quarters wide are sufficient.

—Joseph Clark, F.R.M.S., Hind Hayes Street, Somerset, England.

WANTED, a secondhand microscope. Will give "Journal of the Royal Geographical Society" (1877), "Proceedings of the Royal Geographical Society" (1879), &c. Particulars to—Geo. Parish, 124 Kingston Road, Oxford.

OFFERED, *Unio margaritifer*—in quantities if desired. Wanted, land, freshwater and marine shells, minerals or fossils. James Simpson, 51 Lock Street, Aberdeen, N.B.

WILL oologists who are forming collections of both British and foreign birds' eggs kindly send lists of duplicates and desiderata to me. I have many desirable species, side-blown with full data, in duplicate. Foreign correspondence cordially invited.—H. B. Booth, Parkfield Terrace, Frizinghall, Shipley, Yorkshire.

WANTED, foraminiferous material in exchange for good micro slides of foraminifera.—W. G. Hutchinson, Church Bank, Bolton.

WANTED, mammalian remains, also fossils from lower London tertiary beds, in exchange for other fossils, rock specimens, &c. Send lists; also a good geological cabinet. Send measurements.—Geo. E. East, jun., 10 Basinghall Street, London, E.C.

WANTED, insects and entomological apparatus, in exchange for ova dispar, birds' eggs, including buzzard, snipe, curlew and others, coins, and small vertical engine.—J. H. Duckworth, 3 Mount Street, Blackburn.

Clausilia rugosa. Lymnea peregra, L. truncatula, Physa hypnorum, Planorbis corneus, P. glaber, P. spirorbis, and *Valvata piscinalis,* in exchange for natural history objects and curiosities.—Robert Walton, 44 Canning Street, Burnley, Lancashire.

OFFERED, twenty slides of carboniferous microzoa. Wanted, Woodward's "Manual of the Mollusca."—J. Smith, Monkredding, Kilwinning.

WANTED, parasites from mammals or birds, or any other kind. Will give insects, birds' eggs, land and freshwater or marine shells, or other micro objects in return.—S. L. Mosley, Beaumont Park Museum, Huddersfield.

WANTED, good foreign stamps, in exchange for vols. of SCIENCE-GOSSIP, British shells, or other stamps.—A. G. A., 1 South Villas, Kensington Road, Redland, Bristol.

A SERIES of British marine mollusca, mounted and named, with localities (for reference purposes), on small tablets, offered for a series of named species of the British polyzoa, hydrozoa, spongida, and entomostraca.—B. Sturges Dodd, 67 Beech Avenue, New Basford, Nottingham.

WANTED, seaweeds, fresh or dried, especially specimens of *Padina pavonia, Zonaria collaris, Taonia atomaria.* Good exchanges in micro slides, marine algæ, micro fungi, &c.—H. Hawkes, 300 Bridge Street, West Birmingham.

WANTED, Hooker's "Student's Flora," also Babington's and other standard botanical works.—J. H. King, The Infirmary, Southampton.

FOR exchange.—*Helix majuscula, H. Macgregori, H. Mackenzii, H. Louisiadensis, H. Xanthocheila, Bulimus de Burghiæ, B. piperatus,* and few species of streptaxis, bithynia, hydrobia, pupina, hylocystis, &c. Desiderata, recent land, freshwater or marine shells not in collection, or fossils from the miocene of the Continent.—Miss Linter, Arragon Close, Twickenham.

Productus semireticulatus given in exchange for any other species; or *Spirifera striatus* and *S. glabra* given in exchange for any other species of spirifera, or a *Terebratula hastata.*—P. J. Roberts, 4 Shepherd Street, Bacup.

WANTED, good butterfly net and setting boards in exchange for "Animal Life," &c.—W. J. Weston, Beckley, Sussex.

Ananchytes ovatus (in any quantity), belemnites, micraster, galerites from chalk, also marine, land and freshwater shells, in exchange for fossils from any formation, foreign echini, and starfish, or native weapons.—F. Stanley, Margate, Kent.

OFFERED.—Ross's F eye-piece, Collins' ½-in. objective, first-class lens, and 12 parts "Postal Micro. Journal" (1882–85). Wanted, F. W. Leidy's "Rhizopods," F. W. Allman's "Polyzoa," and Smith's "British Diatoms," vol. 2.—J. E. Lord, 16 Mount Terrace, Rawtenstall.

DUPLICATES.—*R. rhamni, C. edusa, V. urticæ, V. io, P. atalanta, P. cardui, A. cardamines* (male), *A. caja, B. quercus,* also a few specimens *Trichiosoma lucorum* (bred). Desiderata, British lepidoptera, coleoptera, and shells not in collection, also foreign stamps.—Mrs. Smith, Jessamine Cottage, Lower Shapter Street, Topsham, Devon.

OFFERED, SCIENCE-GOSSIP for 1872 (unbound), clean, but without covers. Wanted, Ordnance map of Kent.—E. H., 22 Whitstable Road, Canterbury.

ANNE PRATT'S "Flowering Plants and Ferns." Vol. i. of this splendid work, containing full description and 212 coloured illustrations of British plants, gilt edges, and Glossary of Botanical Terms; will exchange the above vol. for a small printing press with type, &c., or offers.—J. B. Beckett, Trinity Place, Friar's Lane, Great Yarmouth.

LEPIDOPTERA.—Duplicates: Io, *S. lingustri* (1), tipuliformis, sambucata, tiliaria, iota, phragmitidis, crocealis, chrysitis, lariciana, occultana, umbratica, ruberata (2), inquinatellus.—George Balding, Ruby Street, Wisbech.

WANTED, a secondhand Merrin's "Lepidopterist's Calendar," in good condition, cheap.—George Balding, Ruby Street, Wisbech.

TWELVE sections of wood, six long and six transverse, sent in exchange for two micro slides—acari or pathological preferred. Also duplicates for exchange.—E. Mosley, 36 Robertson Street, Hastings.

WANTED, Ross's best 1, 1½, or 2-inch object glass, with liberkuhn. State requirements.—Joseph Wray, Everton Brow, Liverpool.

FIRST-CLASS micro mounts for selected diatoms, forams, seaweeds or books.—J. H. Lewis, 145 Windsor Street, Liverpool, S.

SPECIMENS of the ordeal bean of Old Calabar, on receipt of stamped directed envelope.—Tunley, Powerscourt Road, Landport.

WANTED, conchological specimens and books, also naturalistic magazines, in exchange for choice micro slides, parasites, diatoms, double-stained botanical, &c.—R. Suter, 5 Highweek Road, Tottenham.

VIOLIN wanted, in exchange for first quality micro slides, consisting of anatomical, pathological, and botanical subjects, injections from monkey, rabbit, cat, &c., or good French triplet. Will give a good exchange in microscopic slides, for a few good pullets.

TWENTY miscellaneous micro slides, well mounted, small telescope, three specimens silver ore from American mines. Would exchange lot for two first issue Jubilee sixpences.—W. Mathie, 10 Queen Mary Avenue, Crosshill, Glasgow.

SMALL white marble statue of Venus, a beautiful work of art from Rome, bought in Glasgow Exhibition. Would exchange for Jubilee first issue sixpences. What offers?—W. Mathie, 10 Queen Mary Avenue, Crosshill, Glasgow.

OFFERED, seven varieties of spicules from decomposed limestone, all named and unmounted, also spherulite and *Pyroxene andesite,* which makes lovely micro sections, in exchange for slides of diatomaceæ and rock. Also the following objects, which, when mounted, make beautiful slides for the micro: rolled lenticulina, club-shaped spirolina, trochus-shape rotulites, *Polystomella crispa,* orbulites, *Placentula asterisans,* nummulites, various echini spines, minute corals and shells, very perfect and rare sorts, in exchange for *Lutraria oblonga, Lyonsia Norvegica, Diodonta fragilis, Donax politus, Isocardia cor, Diplodonta rotundata, Arca tetragona, Avicula tarentina, A. hirundo, Pinna rudis, Pecten nivea.*—A. J. R. Sclater, M.C.S., Bank Street, Teignmouth.

UNMOUNTED specimens (in glycerine) of the peculiar hermaphrodite nematode parasite, *Angiostomum nigrovenosum* (= *Ascaris* or *Leptodera nigrovenosa*), from the lung of rana, in exchange. Also a few unmounted specimens in the same medium of the trematode parasite, *Polystomum integerrimum,* from the bladder of rana. Wanted, well-mounted slides of proglottis of taenia, showing internal structure; cross section of earth-worm, showing typhlosole; amphioxus, whole; or any well-mounted and good histological (not human) or pathological (human) slides, or good type specimens of the following, with localities: *Acme lineata, Helix lamellata, H. obvoluta, H. revelata, Vertigo lilljeborgi, V. moulinsiana, V. alpestris, V. substriata, V. pusilla, V. tumida, V. angustior, Limnæa glutinosa, L. involuta, Succinea virescens, S. oblonga, Hyalina* (lonites) *pura, H. radiatula, H. excavata, Testacella haliotidea* (shell), *T. scutulum* (shell), or mounted and good slides of the following crystals: hæmoglobin, hæmatin, urea, oxalate of urea, uric acid, kreatinin, oxalate of lime, hippuric acid, ammonio-magnesic phosphate, leucin, tyrosin, inosite, cystin.—J. W. Williams, Mitton, Stourport, Worcestershire.

BOOKS, ETC., RECEIVED.

"The Probable Cause of the Displacement of Beach Lines" (second additional note) by A. Blytt.—"Nineteenth Annual Report of the Wellington College Natural Science Society."—"The Microscope."—"British Dogs," Nos. 27, 28, 29.—"Gardeners' Chronicle."—"The Century Magazine."—"Cosmic Evolution," by E. A. Ridsdale (London: H. K. Lewis, 136, Gower Street, W.C.)—"Canadian Entomologist."—"Wesley Naturalist."—"On the Anatomy and Life History of Mollusca Peculiar to Australia," by Rev. J. E. Tenison Woods, F.L.S., F.G.S.—"The Selbourne Magazine."—"The Entomologist."—"The Century."—"Book Chat."—"Feuilles du Jeune Naturaliste."—"Journal of Microscopy."—"Greeley."—"Journal of the Quekett Microscopical Club," &c. &c.

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

THE FLORA OF THE PAST.

No. III.

By Mrs. BODINGTON.

THE Lycopods, resembling giant club-mosses ("ground-pines" of Canada), make their first appearance in the Devonian forests. In structure they much resembled the modern Lycopods, except that the contrivances resorted to for supporting a club-moss of tree-like size, approximate in "structure to the stems of exogenous trees of modern times. The plan is, in short, the same, except that the tissues employed are less complicated." Another link for the evolutionist! These Lycopods can only be compared in their curious stiffness to the trees found in Noah's arks, whilst they decidedly exceed Noah's ark trees in clumsiness, as may specially be seen in any representation of *Sigillaria Brownii*, a carboniferous species.

We now pass on to what is probably to most people the most interesting period in the history of fossil plants, the Carboniferous age, when our greatest accumulations of coal were formed. The wide inland seas of the Devonian and Lower Carboniferous Period in America and Europe, were replaced by vast swampy flats, moist and warm, swarming with insects, millipedes and scorpions, and tenanted by the first air-breathing vertebrates, the Labrinthodonts, animals having affinities with both frogs and newts, but now entirely extinct. In the Carboniferous strata of the Rocky Mountains deep-sea conditions still persisted; a few leaves seem to have floated out to sea, but there is not a vestige of coal.

The trees which above all others seem to have been the most valuable in the production of coal were the Sigillariæ and the Calamites; the former related to the Lepidodendra of the Erian and the modern club-mosses, and the latter to our horse-tails. The Sigillariæ exhibit the enormous variety of species in Carboniferous times, more than eighty species having already been counted. So much do they "grade" towards other forms, that they seem to make even Sir J. W. Dawson's anti-evolutionary convictions totter. He goes so far as to say that he believes "there were three lines of connection between the higher cryptogams and the phænogams (flowering plants); one leading from the Lycopods by the Sigillariæ; another leading by the Cordaites, and the third leading from the Equisetums by the Calamites. Still further back the Rhizocarps united the characters afterwards separated into club-mosses, horse-tails and ferns." He hastens to say that he "does not make these remarks in a Darwinian sense;" but methinks I see the last stronghold of "special creation" tottering to its fall.

The Sigillariæ have "tall pillar-like trunks, often several feet in diameter, ribbed like fluted columns, and spreading at the top into a few thick branches clothed with long scale-like leaves. They resemble the Lepidodendra of the Erian age, but are more massive, with ribbed instead of scaly trunks, and longer leaves." These giant Lycopods derived their distinguishing name from the rows of scars of fallen leaves making seal-like impressions on their stems. The wood is of a very low type of structure, although the trunks are sometimes five feet in diameter, and consists "principally of cellular and bast fibres with very little true woody matter." To support a thick trunk of so primitive a character, very complicated roots were necessary; and these, under the name of Stigmaria, were long considered as the stems of some aquatic plant. They usually start from the trunk in four main branches, then regularly bifurcate several times, and then run out into great cylindrical cables running for a long distance, evidently intended to anchor the plant firmly in a soft and oozy soil. They had long cylindrical rootlets so articulated that when they dropped off they left regular rounded scars. Under every bed of coal is found a bed of clay filled with these singular roots, shewing that the first step towards the accumulation of a bed of coal was the growth of a forest of Sigillariæ. Indeed, in some of the coarser and more impure coals we can see that the mass of coal is made up of flattened Sigillariæ, mixed with vegetable *débris* of all kinds, from the undergrowth of ferns and other plants which grew beneath their shade, and often vast quantities of Lepidodendroid spores. These forests gradually sank down in the marshy soil, some of the trees still remaining erect; other forests grew above them, so that in the course of ages as many as seven or eight forests grew one above the other, and all sank at last and were buried. This growth of successive forests took place in the Lignite Tertiary as well as in the Carboniferous period, and gives us the impression of a vast lapse of time.

Sir J. W. Dawson believes that amongst the eighty species of Sigillariæ, a "great range of organisation must have been found, some of which will eventually be classed with the Lepidodendra as Lycopods, while others will be found to be naked-seeded phænogams, like the pines and cycads." This statement must also doubtless be received not in a Darwinian, but, so to speak, in a "Pickwickian sense."

We now come to the important group of Calamites; these are tall, cylindrical branchless stems, with whorls of branchlets bearing needle-like leaves, which spreading from the base form dense thickets, like southern cane-brakes. In their mode of growth and fructification they resemble gigantic horse-tails, but the manner by which their stems are strengthened resembles that of exogenous woods. It would seem from the way in which dense brakes of these Calamites have been preserved, that they spread over low and inundated flats, and formed fringes on the sides of the great Sigillaria forests. Many beautiful plants intermediate between Calamites and Rhizocarps grew in these brakes, bearing whorls of graceful leaves of various shapes. The Lycopods and Calamites have been familiar to us from our childhood, there being something in their resemblance to our familiar club-mosses and horse-tails which impressed them on the memory. But the strange family of Cordaites are by no means so well known; they are unlike anything we are accustomed to, and belong to one of those intermediate groups, or connecting links, which remind a zoologist strongly of those generalised forms of mammals of the Eocene, where the characteristics of orders now distinct are inextricably combined. The Cordaites "approach closely on the one hand to the broader leaved yews, like the Gingko of China, and on the other hand have affinities with Cycads, and even with the Sigillariæ." In the formation of their wood they show transitions from the imperfectly formed stems of Sigillariæ to the more highly organised trunks of modern conifers, and in the young twigs of the balsam-fir the ordinary Cordaite formation of wood may still be seen. This consists of a "large cellular pith, divided by horizontal partitions into flat chambers; this pith was surrounded by a thick ring of barred or scalariform tissue, and as the stem grew in size a regular ring of woody wedges was formed, with disc-bearing tissue like that of pines." They were beautiful trees, with their leaves in some species growing in thickly-set spikes, but perhaps oftener developed on each set of the branches, in a manner very unlike any modern plant that I am acquainted with. These many-nerved leaves had rows of stomata or breathing pores, and attached by somewhat broad bases to the leaves and branches; the fruit consisted of "clusters of nutlets, often provided with broad lateral wings for flotation in the air, sometimes covered only with a pulpy envelope." These trees had great reproductive powers, producing numerous seeds in long spikes or catkins.

Many Conifers are found in the Carboniferous period; none as yet bearing cones, but all apparently related to the modern yews and spruces. Some slightly resembled the modern Araucarias, others had broad fern-like leaves like those of the Gingko. Probably they were in the main "inland and upland trees, mostly known to us by drifted trunks borne by river inundations into the seas and estuaries."

Last and not least, where beauty is concerned, there was a wealth of exquisite ferns in these old coal-forests, and noble tree-ferns such as tropical forests alone possess now. Of the "eight families into which modern ferns are divided, four at least go back to the coal period." Their spore cases show the usual series of transitional forms, from a low to a high type, and those with the simplest spore cases, without a jointed elastic ring, are most commonly found in the Devonian and Lower Carboniferous.

The succeeding Mesozoic age as far as the Upper Cretaceous period, presents fewer points of interest in its fossil botany. The Triassic and Permian formations show a time of "great physical disturbance, more especially by great volcanic eruptions discharging vast beds and dykes of lava and layers of volcanic ash and agglomerate. The thick beds of sediment that had been accumulating in long lines along the primitive continents had weighed down the earth's crust. Hence in the Appalachian region of America we have the Carboniferous beds thrown into abrupt folds, their shales converted into hard slates, their sandstones into quartzite, and their coals into anthracite," and similar treatment befel the coal fields of Wales and of Western Europe. The flora and fauna of Paleozoic times gradually die out, to be replaced by other species of our old friends the Calamites, by enormous numbers of conifers resembling the yews and spruces, and at last in the Lower Cretaceous by cone-bearing pines; whilst in the animal world the giant newts pass away, leaving only small and humble representatives, and the great reign of reptiles sets in, reptiles which exceeded in size any other animal before or since; carnivorous reptiles, flying reptiles, and reptiles which by almost imperceptible transitions became the ancestors of birds. These uncanny, hot and fiery times seem to have suited these cold-blooded creatures, but the puzzle remains why they should have died out whilst climatic conditions remained to all appearance the same. Mammals too first become known to us in this age; feeble creatures giving little promise of future greatness, but even in the Jurassic age with jaws and teeth sharply differentiated into the placental and implacental types of dentition. No such appalling break occurs in the world of plants, where transitional forms abound at every stage. We have *no* direct link between the earliest placental and implacental mammals, and their common ancestor, if indeed they had one, and are not independently descended from amphibian or reptilian forms also unknown.

The only family which conspicuously distinguishes the Mesozoic age is that of the Cycads; the modern Cycads survive only in hot climates, though in such a manner as to show their original universal distribution; they are found in Africa, India, Japan, Mexico, and the West Indies. In Mesozoic times they flourished in Greenland and at Spitzbergen, and indeed vegetation seems to have flourished equally well from the Arctic Circle to the Equator, and to have been alike all over the known world from Siberia to India. The Cycads are well-known objects in our hothouses, with their short fat stems and crown of fern-like leaves. In the celebrated "dirt-beds" of Portland, the Cycads seem to have formed the undergrowth to the forest of pines, and their short thick stems are known to the quarrymen as "fossil birds' nests." Even the Cycads had their precursors in the fern-like leaved Noeggerathia of the Carboniferous, and are themselves related to the higher exogens by the structure of their stems. There is, however, no real advance in the type of vegetation till we reach the Lower Cretaceous deposits, when the genus Sequoia makes its appearance, and with it the true cone-bearing pines.

The history of the Sequoias is most interesting; the genus Sequoia is now only represented by two species, one the celebrated "Big-tree" of California, and the other the Redwood of the Pacific slopes in California and Oregon.

The Sequoias present a striking instance of apparently sudden development, analogous to the apparently equally sudden development of important orders of mammals in the Eocene. In the Cretaceous strata Sequoia appear with twenty-six species, fourteen of which are found in the Arctic zone. The genus was then, and is now, the grandest representative of the whole family of Conifers; the last remnant of *Sequoia gigantea* (Wellingtonia) contains some of the largest trees that have ever grown on earth, the tallest now standing measuring a height of 325 feet, and a girth of from 50 to 60 feet. In the case of one of the trees the number of rings of growth indicated an age of about 1300 years. The Redwood of California and Oregon (*Sequoia sempervirens*) is only second to *Sequoia gigantea* in height, some of the trees measuring 300 feet. The seeds of both these giant pines have been brought to Europe, and now flourish there. In Tertiary times, however, the Sequoias required no importation, for their fossil remains have been found at Spitzbergen in 78° north latitude; at Atanekerdluk in Greenland, in 70° N.; in Devonshire at Bovey Tracey (a species resembling Wellingtonia); in the Hebrides; on the Rhone; in Italy and Germany; and in Asia can be traced along the Siberian steppes to Possiet, to the coast of the Sea of Japan, and across to Alaska and Sitka. Their remains constitute the largest part of the great Lignite Tertiary deposits of the Canadian North-West.

In the Jurassic period the earliest known examples of endogenous plants are found, bamboo and screw-pine like forms. The screw-pine or pandanus is really a humble relation of the palms. Some species of pandanus have fragrant blossoms, and with the endogens must have come gradually a world with flowers. It is not therefore surprising to find that in the higher portion of the Jurassic series we have a true butterfly (allied to the tropical American genus Brassolis). Strangely enough in this same Upper Jurassic series are found the humble beginnings of several of the highest forms of life, the first butterfly, the first bird and the earliest mammals, all probably appearing to the last degree insignificant amid the teeming life around them.

The extraordinary development of the highest forms of plants and animals did not take place simultaneously. The dicotyledonous angiosperms (oaks, maples, beeches, &c.) which represent the highest possibilities of plant, as the placental mammals do of animal, life, appeared in the Upper Cretaceous.

(*To be continued.*)

TRICHODINA—A STUDY AMONG THE INFUSORIA.

THE Infusoria at one time included a large number of microscopic animals of varying degrees of organisation, and not only did it include animals, but also what we now believe to be plants. Since then the term has been restricted to a class of the Protozoa, the lowest of the great animal sub-kingdoms. No differentiation into cells exists in the members of this class; they are furnished with one or more vibratile cilia, and possess a nucleus; they reproduce themselves by division or, in some cases at least, sexually. Such, then, are the main characteristics of the Infusoria. With such a wide basis as this, the individuals are very varied. Even among unicellular organisms, however, there may be differentiation of parts, and we find some with a structure which is complex compared to the lower members of this class.

Nearly every amateur microscopist is familiar with the beautiful little bell animalcule (Vorticella), common in every brook. This represents one of the higher members of the class. Although it is spoken of as unicellular, yet the various regions of its substance have certain functions. The stalk, which attaches the bell to a weed, consists of a central contractile thread, surrounded by a delicate sheath. Around the summit of the bell a double row of cilia circulate, and these guide food into its mouth. The disc from which the inner row of cilia springs may be withdrawn inside the body, and this is effected by the contraction of a certain part of its substance. In the substance of the bell is a clear space, the walls of which contract and expand, apparently driving fluid contents to different regions of its body, like a small heart. Vorticella is a highly developed Infusorian; but, on the other hand, it may be mentioned in passing that certain of this class are much more primitive, such as those often called Monads. These are free swimming forms, furnished with one or two long cilia, not furnished with mouth, contractile disc or stalk.

There is an Infusorian closely related to Vorticella, found attached to aquatic animals, sometimes described as parasitic. It is called Trichodina, and one species (*T. mitra*) is found on the little black Planarian, common in every pond. It may be as well to briefly describe this latter organism, as, though so common, it attracts but little attention to the amateur. It is a little leech-like animal, black in colour, somewhat less than a quarter of an inch in length, which glides along the bottom of the pond. Its body is capable of considerable change in shape, now elongating, now shortening itself. Examined under the microscope, it is seen to have no suckers; cilia on the margin of its body are in constant motion; the dark alimentary canal may be seen branching through the semi-transparent walls; along the anterior margin is a row of little black eyes. Planaria sometimes presents a wasted appearance; minute transparent bodies cover its surface. These are not warts, but the little Trichodinæ, which attach themselves to its surface.

Trichodina may best be examined by placing the Planarian to which it is attached under a cover-slip, so as to limit the movements of the latter, which is restless, and will wander about the slide unless means be taken to prevent it. The Infusorian may now be examined with higher power (about a quarter of an inch). Like Vorticella, it possesses a disc which can be inverted, and most are seen in this condition as small, transparent, truncated elevations, seen best along the margin of the body of Planaria. At each side of the flattened summit there is a small depression which indicates the position where the disc is turned in. A row of fine long cilia lie closely applied to the body of its host, and every now and then a wave-like movement is seen to traverse through them. These long cilia are the active organs of locomotion, and when these animals swim freely, as sometimes they do, the cilia are seen to be in constant motion. If watched carefully, the creature will be seen to suddenly change its form, and appear somewhat lopsided; this is caused by the eversion of the disc. The disc, with a little care, is seen to be fringed with a row of cilia; it slopes downwards from above the mouth, which is situated on the upper free surface of the bell. The mouth is surrounded by a ciliated peristome or ring, which also surrounds the disc. Thus the arrangement is very similar to what we have in Vorticella. The mouth being situated on the free surface, it seems hardly possible that this creature feeds on the tissues of its host. This, then, is not a case of parasitism, but rather a case similar to that of the pea-crab, which lodges in the shell of the oyster. Trichodina is benefited because of the support, and also perhaps the activity of its "host";* while Planaria is little the worse.

The stalk on which the bell of Vorticella is borne is contractile, and functions as a muscle. We may compare it to a long muscle in the human body. Its origin or fixed attachment is the plant or weed to which Vorticella is attached; its insertion, or attachment to the movable portion, is into the bell. Contraction draws the bell nearer to the stem to which Vorticella is attached; or, speaking anatomically, the place of insertion nearer the place of origin. To carry out the analogy further, I may say that, just as a muscle may exchange its attachment to a fixed part for its attachment to a movable part, so in Vorticella, when it uses its stalk for a locomotive organ, the attachments of insertion and origin are constantly changing.† But to return to Trichodina: we here find a further differentiation. Some of the little organisms become detached from their host in the course of examination, and can be observed with the under-surface upwards. They then appear circular, fringed with the basal row of cilia which, it is most likely, are actively working, and which have been previously described. In the centre there is a circular hole, and round this a ring of protoplasm. External to this again, short bars of protoplasm radiate, which mark off small areas fading gradually into the general hyaline protoplasm as they pass

* I believe the terms "guest" and "host" are applied in biology to the parasite and the animal or plant it feeds on. I use the terms here because I can find no others convenient to replace them.

† I have never seen mentioned in any book the fact that Vorticella can walk in this manner; but that it can and does do so, I can vouch for, having seen one progressing in this singular manner along the cover-glass of a slide.

towards the circumference. The similarity of this arrangement to the muscles in the iris of the eye is very suggestive. The inner ring contracting would close the orifice, the short bars contracting would dilate it. This arrangement of fibres acts here as a sucker by which Trichodina attaches itself to its host, and by which it can detach itself. We understand how it is that the little guest keeps its hold in spite of the movements of its host.

Trichodina, then, is an example of one of the higher Infusoria, and, although belonging to the lowest sub-kingdoms, it still is developed perhaps as

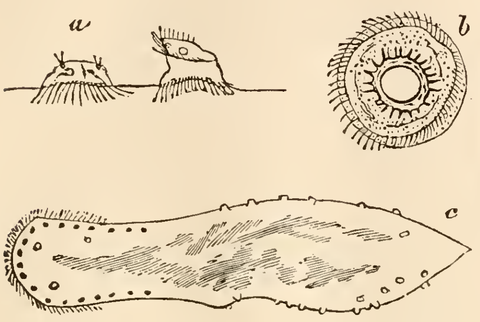

Fig. 84.—*Trichodina mitra*. *a*, side view; *b*, underview; *c*, Planaria covered with trichodina.

highly as a single cell can be. We must, however, bear in mind that differentiation in function is not the same as differentiation in structure, and that, although certain parts of the protoplasm of Trichodina have certain functions, the structure may be microscopically the same. One part, indeed, may have a mixed function; thus, although one part is "muscular," it may also, to some extent, be "nervous" as regards function. It is of course understood that here in a unicellular organism, muscular structure or nervous structure is an impossibility.

In conclusion: the little organism that is the subject of this paper is only one of the many interesting members of this group. It has some near relatives which attach themslves to other organisms; some to other species of Planaria, and one, I believe, to Hydra. Its more distant relatives are numerous, and include Vorticella and its allies.

BERNARD THOMAS.

SOLWAY DUNES IN APRIL.

By the REV. HILDERIC FRIEND, F.L.S., Carlisle.

AT the embouchure of the river Eden, some twenty miles west of Carlisle, situate on the Solway Coast, is the quiet little watering-place known as Silloth. The air is remarkably charged with ozone, and as the soil is composed of sand, the heaviest rainfall does not make the air damp for any lengthy period. During the summer months Silloth is a favourite resort for the quiet-seekers and health-seekers of Carlisle, and even in the early months of the year a few invalids, who cannot get farther south, find the place congenial if the east wind is not blowing. Naturalists are not superabundant here, and we never hear of their quarrelling because they are so numerous that there is not prey enough for each to share in Nature's spoils. Were they plentiful, it is certain that the banks of the Solway would soon have little that is new to reward them for their pains, but a solitary worker, to whom nothing comes amiss, may find even in this barren spot enough to occupy all the little time he can snatch for a holiday during the sunny days of April. It may interest some of the readers of this journal if I put together a few notes which I have made here between April 5th and 12th, and which fairly represent the work to be done by the naturalist, unless he be sportsman or fisherman as well. Of ornithology and of dredging I have nothing now to say.

Landing at the station, the stranger finds himself surrounded by sand-dunes. In front of the little town much of the sand has been levelled down, and is now bound together by the roots of the common sand-sedge (*C. arenaria*, L.), which is the only carex to be found in any quantity here. Farther away the sand is kept together by quantities of sand-grass or marram, and these two plants are predominant features in the flora. Just now we may find the following plants in bloom on the dunes or in the damp ditches close by:—The celandine (with its cluster-cup, *Æcidium ficariæ*), ladies'-smock (*C. pratensis*, L.), with the hirsute and flexuous species of bitter-cress, the tiny whitlow grass, flowering by the thousand on the short turf, the whole plant not an inch high, the common chickweed, red dead nettle, gorse, thale-cress (*S. Thalianum*), daisy, colt's-foot, scurvy-grass (*C. danica*), and a few other common forms. Plunging through the sand we hope to find something on the water-mark, and at once begin to turn over the materials left by the receding tide. Among the algæ we find nothing rare. Long lines of brownish-green or greenish-brown matter tell us of the fate of hundreds of plants of serrate and common bladder-wrack (*Fucus serratus* and *F. vesiculosus*), which are intermixed with the fronds of Halidrys, whose air-bladders are so attractive a feature in this form of seaweed. When you have mentioned Laminaria and Corda, the green *Ulva latissima*, a couple of the florideæ and the pretty coralline, the list of marine algæ found on the Solway is nearly exhausted. Other stragglers of course are found now and again, but as they are all dead or dying, they can seldom be obtained in a good state for preservation. Most of those which I have mentioned, however, may be found growing near the harbour.

Somewhat disappointed, we turn our attention next to the minuter forms of life around us, and soon discover that there is a good deal to interest us here.

Euglena abounds in many of the ditches, and is always a popular subject with the microscopist, but just here on this slimy bank we have a greater treasure still. When exploring this region last summer, we discovered a patch of something which seemed to present an unusual appearance, and found it to be a fruiting mass of *Cylindrospermum macrospermum*, Ktz. If we examine it now, however, we shall find it is not in fruit, and it will be interesting to observe the process of cell division, and search for the cilia on the heterocysts. In Bennett & Murray's new and valuable work on "Cryptogamic Botany," we find the plant arranged under the Nostocaceæ, and an illustration given after Cooke. This is the best indigenous "find" we have yet made at Silloth. Of the other algæ (including Ulothrix, Conferva, and other large forms) I will not speak at present, as some of the forms, as well as the diatoms, need a little more attention under the microscope before they can be arranged and named. The desmids are of special interest, and even at this early date are becoming plentiful. The conchologist will be sorely disappointed if he hopes to make a collection of shells during his stay here—either of land or marine species. I have seen an occasional dead shell of *Helix nemoralis*, with *H. caperata*, and even now a slug or two may be seen on the move, while the pools a little inland will yield some species of Planorbis and a few other common forms, but on the coast the work is very unattractive. The little rissoas, hydrobias, and other molluscs found so plentifully at Cleethorpes, Cardross, or elsewhere, are apparently unknown, as are also the larger forms of venus, mya, scrobicularia, nassa, natica, aporrhais, solen, and others. When you have written mussel, cockle, tellina, periwinkle (both flat and pointed species), and added an occasional pecten and top-shell (*T. zizyphinus*), your list is well-nigh exhausted. Anemones and their allies are not to be found on the shores; but if you turn over the heaps of seaweed, thousands of sand-hoppers (*Talitrus locusta*) will bound in all directions, and a peculiar fly of a dirty hue, covered with hairs, will allow itself to be entrapped and preserved in spirits till you can examine it. The diptera, by the way, are interesting just now, and I have about half-a-dozen species awaiting identification. The larva of a beetle (*Cillenum laterale*) is busy at present, and later on the imago will be slaughtering the sand-hoppers.

The most profitable of all work, however, is that of the bryologist. I am not aware that the mosses of the Solway have yet been worked systematically, but I am sure from my own casual gleanings on three or four days in April that the list is a fairly good one. Many of the forms are of course exceedingly common, and the rarer species would take a little time to discover, but then the common things of life are not without their interest, and we perhaps ought to be more grateful than we are for those humble creatures which have no fads or fancies of their own, but will grow wherever they can find a home, and do their best to brighten the world and make it attractive and gay. Thanks then to the common Polytrichum, whose pretty capsules and prettier male flowers help to make our dunes look gladsome, and thanks again to the tufts of Ceratodon whose purple stems tend so much to relieve large tracks of sandy waste. The hypnums and bryums too are in fairly good force; ubiquitous Funaria, though not very abundant, is here. *Barbula subulata* mixes with *Bryum cæspiticium* and the feathery fronds of *Hypnum velutinum* and allied forms. Some mosses which are common a few miles away, appear to be rare here—hence we have not yet seen the beautiful *Dicranum scoparium*; and while a few tufts of *Tortula muralis* have been observed, *Grimmia pulvinata* has so far eluded our search. Bartramia and Atrichum grow with other pretty plants around Skinburness.

These few jottings may serve to show what is the character of the minuter fauna and flora of the Solway during April, and it is perhaps by such records as these that we shall be able in the course of time to gather where we can best find the special kind of objects for which we may be seeking, as well as get together an exact account of the natural products of various localities for the use of future workers. I present these few notes to the Johnstone who shall in future write "The Natural History of the Western Border."

A VENERABLE NATURALIST: MR. JOHN RALFS.

By WILLIAM ROBERTS,

Author of "The Earlier History of Bookselling."

THE lowest forms of vegetable and animal life, the links, in fact, between the two great kingdoms, afford beauties of a very striking and multifarious character. There is scarcely any form or colour which we do not here find. Living in seas, rivers and pools, on rocks, trees and herbs, these minute organisms are endowed with a vitality as perfect and potent as their more conspicuous congeners. They are essentially a class that appeals only to the painstaking naturalist who has worked his way into the field of microscopic wonderland.

The two distinct, but in many respects analogous, divisions, desmidiæ and diatomaceæ, are peculiarly rich in diversity of form and variety of colouring. These two primary sections now include several hundred distinct species, regularly classified into divisions, and again arranged into genera. Less than fifty years ago, there were only about eight distinct species of desmidiæ known to science; and probably there is no more remarkable incident in the annals of botany than the rapidity with which this class of study has developed. The most careful and painstaking, if not actually the only, English student of these lower forms of life in the "forties," was Mr. John Ralfs, who, in spite of his eighty-two years and the infirmities of old age, still possesses a keen and strong interest in all botanical matters.

To the Edinburgh Botanical Society, at that time the most important body of its kind in the world, belongs the honour of having had read at its meetings a series of unusually interesting and original papers on Desmids and Diatoms. These papers, contributed at the suggestion of the Rev. M. J. Berkeley, contained the results of Mr. Ralfs' painstaking and minute enquiry into the nature and attributes of these two orders. From the almost entire absence of any systematic arrangement, they were naturally in a most chaotic state of nomenclature. The difficulties, therefore, with which Mr. Ralfs had to contend were of an exceptional character. In addition to this, the desmidiæ had been for some time a common territory, claimed both by zoologist and botanist. When in the elementary stage of his studies, Mr. Ralfs considered that the desmids properly belonged to the animal, and diatoms to the vegetable, kingdom. Careful observation alone caused him to reverse his opinion, and to regard the position of diatoms as doubtful, having, as they had, as much right in the one kingdom as in the other.

Edinburgh in particular, but Scotland generally, possessed during the "forties" a botanical constellation, which, whether for fame or ability, has probably never been eclipsed. There were, for example, Hooker the elder, Walker Arnott, Balfour, Leighton, Dickie, Graham, and many others with a universal fame. They were, moreover, men who heartily appreciated Mr. Ralfs' labours, and it is due to their memories to state that the courtesy with which they received some of his startling, and at that time revolutionary, theories in reference to these organisms, was only rivalled by the unanimous approval that scientific men at home and abroad welcomed the result of his labours, even where his theories were not immediately accepted. Mr. Ralfs' first paper was read at the Edinburgh Botanical Society on February 10th, 1842, Professor Graham in the chair. It was entitled "A Paper on four new Species of Desmids."

It may be here pointed out that Mr. Ralfs was born at Millbrook, Southampton, September 13th, 1807, and that he studied medicine, walked the hospitals, and in due course became a properly certificated surgeon. Possessing, however, a competency, which would have been very considerable but for the scandalous betrayal of a trust by a near relative, Mr. Ralfs does not appear to have ever regarded his profession as a primary means of livelihood. Botany, forming an essential part of his medical curriculum, soon developed into a speciality with him. And it was the thoroughness with which he had entered into the subject that caused one of his examiners in surgery—noted for his severity and "flooring" proclivities—to not only compliment the young student, but to predict that some day he would be known as an eminent botanist. It is almost needless to say that this prediction has been verified. Even at the present moment Mr. Ralfs has an abundant store of anecdotes relating to his student-days—of times, in fact, which carry us back to the stirring period which preceded the great Reform Bill.

Mr. Ralfs' first literary work of importance was published, by subscription, in 1839, by Longmans. It is an analysis, after the method of Lamarck, of the "British Phænogamous Plants and Ferns;" and from the list of subscribers it will be inferred that Balfour, Graham, Hooker, and other eminent Scottish botanists knew of his abilities: Hooker's name is down in the list for two copies. This little analysis was favourably received, and although it is based on the essentially artificial system of Linnæus, the writer of this paper can testify, after several years' usage, as to its accuracy, conciseness, and perspicacity.

That Mr. Ralfs was regarded as a botanist of considerable promise may be inferred from the following facts. In 1841 the Professorship of Botany at Glasgow became vacant through the resignation of Dr. W. J. Hooker. Among the candidates were Dr. J. H. Balfour and Dr. G. A. Walker Arnott, equally able and competent men. Both were correspondents of Mr. Ralfs, and each applied to him for a "testimonial." Balfour's application arrived first, and it was, of course, promptly answered. When Arnott's came, the only thing which Mr. Ralfs could do was to give him a similar recommendation, stating, however, that Mr. Balfour had previously requested such, but that as the attainments of each were very high he could not refuse the one at the expense of the other. Balfour secured the appointment, and retained it until 1845, when, succeeding to the vacancy caused by the death of Graham at Edinburgh, his former rival Arnott was elected to the Glasgow post. Arnott was an unquestionably clever botanist, but dogmatic obstinacy was his besetting sin. His controversial quarrels were not often dignified, and, when driven into a corner, he became abusive over very trifling matters.

Mr. Ralfs' contributions to the Edinburgh Botanical Society range over a period of rather more than ten years, *i.e.* from 1843 to 1854; and although these contributions are only about one dozen in number, it must be remembered that in some instances one paper was read in four or even more instalments. Abstracts of these papers were published at the time in the "Gardeners' Chronicle," and other scientific periodicals. Mr. Ralfs had no immediate or remote ideas of publishing a monograph on either the desmids or the diatoms. It became, however, *un fait accompli*, through the following circumstances.

Shortly after Mr. Ralfs commenced contributing to the Edinburgh Botanical Society, Mr. A. Hassall, upon the recommendation of Borrer and Jenner, opened up a correspondence with Mr. Ralfs, asking his assistance in naming or identifying specimens that he may at times find. It was agreed that the "Conjugatæ" should be the special study of Mr. Hassall, and that Mr. Ralfs should take up the desmids and diatoms. It was also agreed that neither should interfere with the other's work. Hassall's letters were constant and numerous, sometimes seven being received in as many days. The arrangement went on pleasantly for a considerable period, until Mr. Borrer, in the course of a letter, incidentally asked Mr. Ralfs if he had heard of Hassall's prospectus for a "History of the British Fresh-water Algæ, including Descriptions of the Desmids and Diatoms." A copy of the "prospectus" was not sent to Mr. Ralfs, with whom he had been corresponding, for some time after its appearance. Borrer's letter came as a thunder-clap upon Mr. Ralfs, who wrote to Hassall, and severed the epistolary connection. In answering Mr. Borrer's letter, Mr. Ralfs, in a moment of anger, declared, *inter alia*, that he had a good mind to write a book on the desmids. Borrer made no immediate reference to the "threat," and it had faded from Mr. Ralfs' thoughts when he received a remarkable "reminder." This was in the form of a letter from Borrer, not only urging him to prosecute the notion of writing an exhaustive history of the desmids, but enclosing a list of names of all the most eminent scientific men of the day, who had expressed, *una voce*, their willingness to support such a work from Mr. Ralfs' pen. Further than this, Mr. Borrer enclosed two £10 Bank of England notes to cover the initial expenses.

(*To be concluded.*)

ORGANISMS IN CHEMICAL SOLUTIONS.

IN the following paper is given a brief account, or, I should better say, a number of suggestions as to the nature of a few organisms, found in some chemical solutions :

1. Solution of Sodium-Hydrogen Tartrate in strong Nitric Acid.—Several bottles containing this solution had swimming in them, and partly also attached to the inner surface of the glass, a dark-brown fluffy mass. This turned out to consist of an entangled mass of septate hyphæ. They seem to be representatives of an arthrosporous bacteriad, of which Fig. 86 shows the zoogloea-stage. Fig. 85 shows a bit of the ordinary mucelium. In Fig. 87 spores are apparently being formed, whilst Fig. 88 shows the germination of spores or zoogloeæ, most likely of the latter.

2. Photographic Solution of 13 parts of Bromide of Ammonium in 63 of Water.—In this solution likewise an entangled mass of hyphæ was present. A number of the latter occasionally, for a good

Fig. 85. × 580.

Fig. 86. × 580.

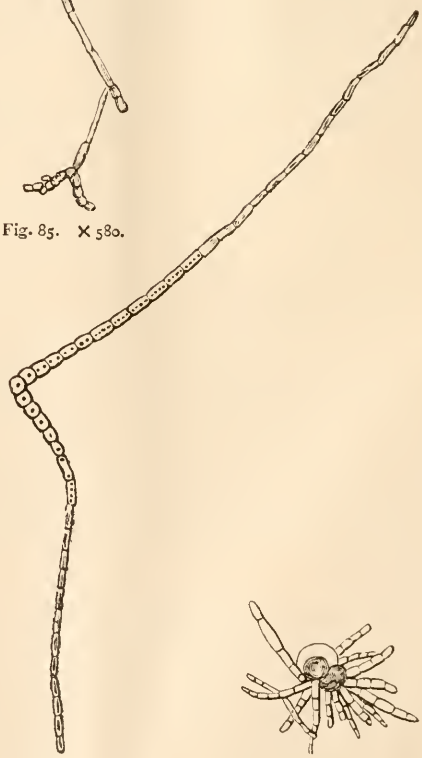

Fig. 87. × 580.

Fig. 88. × 580.

Figs. 85–88. Organisms in solution of sodium-hydrogen tartrate in strong nitric acid.

distance, run in the same direction, and thus form long strands, which again are entangled with each other to a greater or smaller extent (Fig. 92). Scattered in between the single hyphæ are numerous spherical bodies, varying very much in size (Fig. 91). They are occasionally aggregated together to form colonies (zooglœa-stage? Fig. 91). The hyphæ have no transverse partitions, but are filled with round, highly-refractive granules (spores? Fig. 91). With the unaided eye we can easily make out darker-brown portions in the mass of hyphæ (Fig. 89). They consist of darkly-coloured hyphæ (Fig. 90) which have very strongly-thickened cell-walls, and are closely entangled with the other colourless hyphæ.

3. Photographic (clearing) Solution of Ferrous Oxalate (made by adding Ferrous Sulphate to Potassium Oxalate, and diluting with Water).—In this solution there was also an entangled mass of hyphæ. It consisted of light and dark portions. The lighter portions were usually covered with a flat film on one side, on which were to be seen some dark spots (Fig. 95), consisting of numerous dark-brown spherical bodies (zooglœæ? Fig. 94). The colourless hyphæ were septate, and contained numerous round refractive granules (spores? Fig. 93 *b*). The darker hyphæ, likewise septate, but of a dark-brown

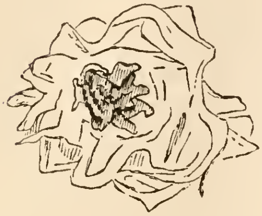

Fig. 89. Nat. size.

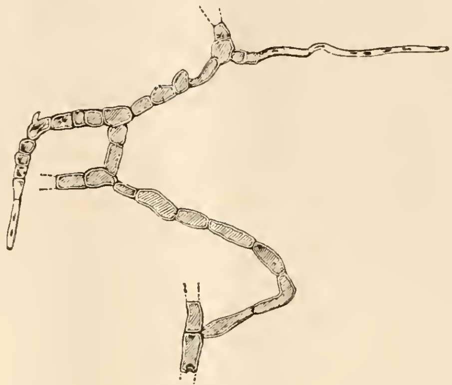

Fig. 90. × 580.

Fig. 91. × 580.

Fig. 92. × 230.

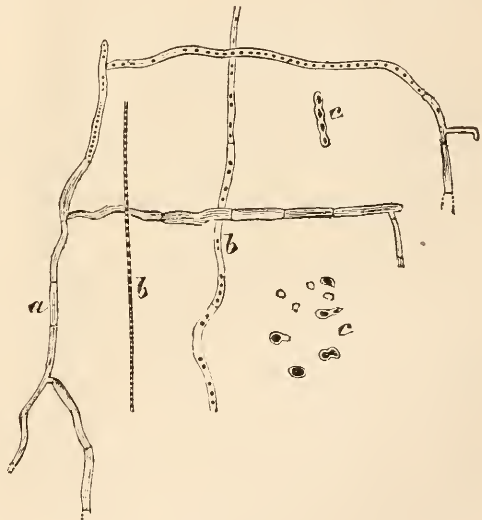

Fig. 93. × 580.

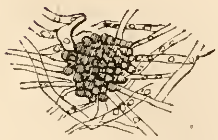

Fig. 94. × 580.

Fig. 95.—Nat. size. A, surface view; B, lateral view.

Figs. 89–92.—In solution of bromide of ammonium in water.

Figs. 93–95.—In solution of ferrous oxalate.

colour, contained such only in some portions, others being quite devoid of them (Fig. 93 *a*). Numerous round bodies were lying between the separate light and dark hyphæ, some with highly-refractive portions inside; occasionally four, or more or less, were attached to each other (Fig. 93 *c*, spores?).

To see whether the organisms were actually growing in their different solutions, and had not come in accidentally, small portions of each were put into well-stoppered bottles, and after six to eight weeks they had grown quite considerably.

These organisms all seem to belong to the class of the bacteria, but I have not been able to ascertain either their names or anything about their life-history. I would be very thankful for any suggestions on the subject.

I have got any amount of material, and I will be very glad to exchange some of the same with any of the readers of SCIENCE-GOSSIP.

OTTO V. DARBISHIRE.

Balliol College, Oxford.

THE BEE AND THE WILLOW.

By G. W. BULMAN, M.A.

THE willow-haunting propensities of bees are conspicuously displayed in the spring; they are probably familiar to many. It is Grant Allen who observes that "you hardly ever see a willow catkin in full bloom without a bevy of its attendant fertilising insects."

It is to the theory implied in this word "fertilising" that I wish to call attention; I cannot think that the willow depends chiefly on bees, or even that it is at all frequently fertilised by the same. It is rather to be believed that it is wind-fertilised, like the majority of diœcious plants.

I cannot bring forward conclusive evidence; but what I have, points emphatically in the above direction. While I set forth my small quantum of evidence —the fruits of a few moments' observation on a spring afternoon—let me call the attention of others to the matter as a question requiring solution.

In the first place, given a species bearing its stamens and pistils on separate plants, how is insect fertilisation to be accomplished? Obviously by the insects passing frequently from a plant with the one sort of flowers to a plant with the other. If we imagine them making alternate visits first to a male and then to a female flower in regular order, then each of the latter has a fair chance of fertilisation.

But if a bee visits say fifty male flowers, and then goes and pays the same number of visits to female flowers, only a few of the first visited of the latter will probably be fertilised. If a bee gets its fill on one sort of flower, it will accomplish no fertilisation at all.

We should be inclined to infer, *à priori*, from our general knowledge of the habits of bees, that one of these latter would happen.

Let us, however, see what the bees are really doing. Here by the river-side are the willows in full flower. Very large numbers of bees are buzzing about the male catkins of those large bushes; on the neighbouring ones with female catkins are considerable numbers, but not nearly so many as on the former.

In the first case they are gathering pollen; their thighs are laden with the golden grains: in the latter honey alone is presumably their object.

I do not know whether bees usually carry on these two operations at the same time or not; but in this particular case, since the bees on the female blossoms have no load of pollen, it may be presumed that they have not recently been on the male catkins, and are not therefore fertilising the former. I do not wish it to be inferred from this single observation of the bees' habits that bees with loads of pollen do not often fly to female catkins; it is rather brought forward as a point for further investigation.

Now both of the above facts—the difference in the number of bees on stameniferous and pistiliferous plants, and the absence of pollen loads on those visiting the latter—point to the conclusion that the willow is not as a rule fertilised by bees. And when we reflect that every passing breeze may carry clouds of the fertilising dust to the stigmas, the inference seems obvious that the willow is frequently wind-fertilised, and that it could get along very well without the bee. Yet we find Mr. Grant Allen asserting that "the willows depend entirely for the due setting of their seeds upon winged allies." * And if the willow is really wind-fertilised, the existence in its flowers of honey is—on the bee-selection theory—anomalous. Also, according to certain upholders of the same theory, insect visits are a disadvantage:

"The very same insect interference which proves so beneficial to insect-fertilised plants is the deadliest danger of their wind-fertilised allies, and is guarded against by a profusion of minute devices." †

As is well known by students of Virgil, the bees' frequent visits to the willow were noted some 1900 years ago; to-day, in spite of the insect's selection, its flowers are neither blue nor complex. What can we think of selective action applied perseveringly for some 2000 years without producing any effect? Upholders of natural selection consider—somewhat unreasonably, surely—such questions unfair; they are wont to answer that there has not been time; that your two thousand years is but a drop in the bucket required.

Such answers are most unsatisfactory. The geologist who tells us that rock-masses many miles in

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* "Knowledge," Feb. 23, 1883.
† Grant Allen. "Knowledge," June 8, 1883.

thickness have been piled up by the long-continued action of forces at present in operation is called upon to show the same producing like results at the present time. And he does so. He shows us how a continent is being lowered so many inches in a century, and at what rate a deposit is being formed; he points out evidence of the results produced by the action of his forces within historic times.

When we ask for evidence of the result of the bees' selection at the present time, or within two thousand years, the answer is, "More time is required." Is this fair? Has there not been time? If the changes are so minute, then an infinite length of time is required to produce any considerable change; it requires an infinite series of infinitesimals to make a finite quantity.

Another answer perhaps is that the variations have not been in the right direction. Such an assertion is, of course, unanswerable, and can be used on many occasions. Yet one upholder of the bee-selection theory requires nothing more for the development of blue than that the flowers should acquire a blue tinge, "as all the upper parts of highly-developed plants are apt to do." And it may be suggested as curious that bees should so perseveringly visit flowers not varying in the right direction, while others have —according to the theory—varied abundantly in the way of blueness and complexity.

The willow has likewise an important bearing on Mr. Henslow's theory of the development of flowers by the direct stimulus of insect action.* Mr. Henslow considers the willow an anemophilous plant; and he believes such to arise through the neglect of insects:

"With regard to the origin of anemophilous flowers, there is every reason to believe them to be due to the neglect or absence of insects; that as these have brought about brilliant colours or other kinds of conspicuousness, so their absence has allowed flowers to degenerate and become inconspicuous, the result being either self-fertilisation or anemophily." †

And yet it would be difficult perhaps to name a plant much more frequented by bees than the willow.

> "Behold! yon bordering fence of sallow trees
> Is fraught with flowers, the flowers fraught with bees."

* See "Floral Structures." International Scientific Series. vol. lxiv.

† "Floral Structures," p. 270.

THE CHINESE INSECT WHITE WAX.

INSECTS are important factors in natural economy. Every one has heard of the cochineal, so long utilised as crimson dye; and Mr. A. Hosie recently supplied another illustration of the commercial value of insects, in an interesting address on Chinese Insect White Wax. This is most extensively manufactured at Chien-Ch'ang, a province in Western China, which is the principal habitat of the insect-producing tree, known by the Chinese as "ch'ung-shu." In the east of the province, the tree, which is an evergreen, with opaque, glossy, dark-green leaves, of an ovated and pointed shape, springing from the branches in pairs, is known by the name of "pao-ke-tsao," or crackling tree, from the noise it makes when burning. Late in May, or at the beginning of June, the tree puts forth clusters of tiny white blossoms, which, later in the season, give place to dark, bluish seeds. The chief insect-producing country is Chien-Ch'ang Valley, but by cultivating the insect-tree, and placing upon them insect-galls, these curious wax-producers may be propagated in other districts, although they deteriorate in quality. In Chia-ting the insects are divided into two classes—"la-sha," wax-sand, reddish-white in colour, highly prized as wax-producers; and "huang-sha," yellow, or brown sand, considered useless.

As early as March, the galls, or insect-seed cases, brownish excrescences resembling peas in shape, may be seen, adhering to the twigs and bark of the tree. When opened, these cases are found to contain an aggregation of minute whitish-brown animalculæ, each possessing six legs, and a pair of club antennæ. Enclosed within most of the galls is a cocoon, containing a chrysalis, the movements of which are discernible through its delicate covering, whence emerges a tiny black beetle, having six legs, and being armed with a long proboscis, which terminates in a pair of pincers. This beetle, known by the Chinese as *niu-erh*, or "buffalo," is accused by them of devouring, or injuring, the wax-insects, but Mr. Hosie thinks this is open to doubt. He carried home with him several of the galls, containing minute cocoons; and as each, in the course of a few days, developed the maligned beetle, whose habits he carefully watched, he found that if left undisturbed within the gall the "buffalo"—probably so named on account of his ungainly "personality"—continued to burrow, by aid of his proboscis, into the inner lining of the seed-case, which he tore with his pincers, and from which he apparently derived sustenance, heedless of the hurrying crowd of busy insects, which travelled about in all directions, apparently unmolested. He believes that the "buffalo" effects a wise purpose in natural economy by boring an orifice in the case, and thus enabling his tiny companions to effect their escape on to the wax-tree.

When the galls are plucked, an orifice is disclosed, by which they are attached to the tree; and on a number of these cases being gathered and carefully examined, the pincers of the beetle were seen to pierce a circular hole, which gradually became sufficiently large to admit of his escape. He however did not emerge thence immediately, but continued to burrow in the inner lining of the case, and the wax insects instantaneously commenced to crawl out and investigate their environments. The buffalo disdained to consume any insects, even when forced upon him; he turned aside and resumed his burrowing operations, and when forcibly expelled from the gall, was evidently unable to fly, on account of the still imperfectly developed state of his wings. Whatever the purpose of this beetle, certain it is that the Chinese prefer his absence, and give the highest prices for those galls in which "buffaloes" are fewest.

There is a third insect, known by the Chinese as "*la-kou*," "wax dog;" thus contemptuously designated because it is supposed to prey upon the insects. This is a caterpillar, of brownish hue, something like a small bean in shape. About this creature there are one or two ingenious hypotheses. Does it possibly create the gall excrescences containing the insects? and is it the offspring of the beetle? which probably remains amongst the branches of the tree for some time, being unable to fly far, and may then propagate its species.

There is an annual exodus in the spring of insect-bearers, hurrying from the mountains of Chien-ch'ang to Chia-ting, laden with insect galls to place upon the wax-trees. These carriers usually travel by night, but those from the more remote districts journey day and night, bearing the galls, placed loosely on trays within long bamboo baskets, through which the air permeates freely. In Chien-ch'ang these insect galls are packed in paper parcels, usually containing about sixty packets to the load. At the halting stages the insect carriers open and spread the contents of their packets in the coolest places they can find, so that the insects may not be forced to escape from the galls, which, however, usually lose an ounce in weight before arrival at their destination.

The white wax-tree, known to the Chinese as "Pai-la-shu," has its habitat more especially within the districts of O-mei, To-shan, and Chien-wei, in the prefecture of Chia-ting; it will occasionally grow in the north of the province, but is not known in any other localities. This tree attains a height of about six feet, and its branches spring from the gnarled top of the thick, stump-like stem; the boughs rarely exceed six feet in length; they are extremely pliant, and, being thus much swayed by wind, are not found sufficiently strong for the reception of the insects, until the third year of their growth. The tree is deciduous, the foliage depends in pairs from the branches, and is light green in colour, serrated, ovate, and pointed in shape. The insect seed-cases having been conveyed into the wax-tree provinces, are assorted into little packets of twenty to thirty, and enclosed within a leaf of the wood-oil tree, the edges of which are secured together by tying them with rice-straw, and the packets are then suspended beneath the branches of the wax-tree, the leaves of which are roughly perforated with a coarse needle, to enable the insects to pass through them to the boughs. On quitting the seed-cases, the newly emancipated wax-makers crawl from the branches on to the leaves, where they pass a period of about thirteen days in acquiring vigour of limb and strength of growth. They then appear to moult, casting off a hairy covering which has enveloped them during this season, and thence descend to the younger branches, to which they attach themselves firmly by the mouth; later the upper portion of the branches are also laden with insects, which remain motionless where they first take up positions; and the wax secreted by them begins to encrust the boughs and twigs, like a coating of "sulphate of quinine;" these singular insects being found to construct a series of galleries extending from the bark of the tree to the outer surface of the wax, which gradually becomes thicker, for a period of about a hundred days, when it has attained a depth of a quarter of an inch. The Chien-wei insects manufacture wax in the space of seventy days, but the quality is inferior. In the evenings and mornings the insects appear less tenacious in their hold of the bark: but at noonday they adhere closely; and it is at this time that the owners beat the stumps of the trees with thick sticks to dislodge the caterpillars or "wax-dogs," which they assert are destructive to the wax-makers. When the branches become laden with wax, the caterpillar is unable to crawl to the insects, and the belabouring is discontinued. Variable weather, rain, or heavy wind, occasions great havoc amongst the insects; more especially in the earlier stages of their existence. When the wax is perfected the branches are cut off, and the wax carefully removed by hand, and placed in iron vessels; the wax, when at melting heat, rises to the surface, whence it is skimmed, and placed into circular moulds; when cool it is ready for market. Wax adhering too closely to the bark to be removed by hand, is prepared by a similar process, the boughs being immersed with the wax; but this is not so white as the first lot, nor so good in quality. The insects which have fallen to the bottom of the vessels are now placed in bags and pressed to extract any remaining wax; and as the Chinese are an economical people, the refuse is utilised as food for their pigs.

This white wax is used principally in the manufacture of candles.

Tallow is found to melt at a heat of 95°, whilst to dissolve the solid white wax a temperature of 160° Fahr. is required. Some of the wax is produced in the neighbourhood of Ch'ung-k'ing, where it is customary to mix a certain proportion of the wax with tallow, to give the latter consistency; these candles being afterwards dipped in melted wax to improve their appearance. As the wax-tree—which is said to become exhausted in about seven years—does not grow so far east as the province of Chung-k'ing, the wax-makers are removed from one insect-tree to another, and consequently their produce deteriorates in quantity and in quality.

E. GOATLEY.

ACCESSORIES TO THE MICROSCOPE.

A Growing Slide.

THERE are very few, if any, microscopists who have not at some time or another felt the need of a thoroughly reliable growing slide, one which would permit of an unintermittent and ample supply of aërated water being equally distributed around the objects under observation, and at the same time permit of its being placed upon the table of the microscope for observation, &c., for any period of time, without injury by exposure, or inconvenience. To the student working in algæ, and other microscopical plants, such a slide as here described is indispensable. I have therefore taken up my pen to afford such students the benefit of the description of one which I have made, and had in constant use for some months past, and which, being simplicity itself in structure, I can most confidently recommend as being perfectly satisfactory in its results, whilst affording the further advantage of accommodating any number of objects vegetating on the same slide, as the worker may desire.

To enable the reader to understand its structure, I would refer him to Fig. 97; and if he wish to make one for himself, he may readily do so, if he possess a sixpenny wheel glass cutter, or diamond, some sheet glass, and marine glue, mechanical skill being not an item for consideration.

Fig. 97.—A is a piece of ordinary glass, such as is used for common windows, 6 inches long by 2 inches in width, which constitutes the slide; B B are two slips of the same kind of glass, $4\frac{3}{4}$ inches long by $\frac{1}{4}$ inch in width, cemented edgeways unto A at about $\frac{1}{8}$ of an inch from the edge (the use of these will be explained hereafter); C is a piece of glass tubing about $2\frac{1}{2}$ inches long by about $1\frac{1}{2}$ inch in diameter—mine is a portion of an ordinary reading lamp chimney, and as I am writing principally for the benefit of amateurs, I will explain how to cut, or rather to break, the tubing where he desires. First file a clean cut around the tube, then apply a highly-heated iron

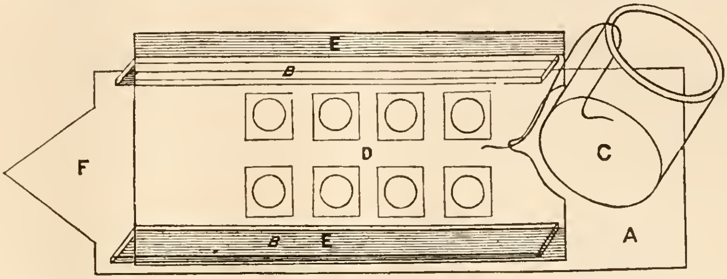


Fig. 96.—A, slide; B B, sides of slide; C, reservoir; D, cover to slide; E E, shoulders on cover; F, blotting-paper with cells and covers.

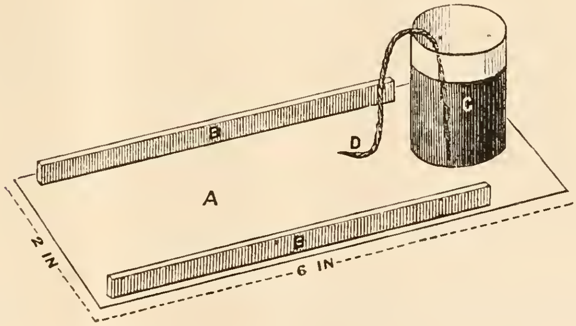


Fig. 97.

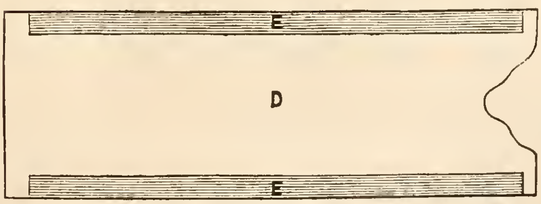


Fig. 98.

bar upon the file cut, and draw it slowly and evenly round the tube; by this means I have managed to get it to part so evenly as to require but little facing afterwards; cement the tubing to one end of the slide; this constitutes the reservoir. Next take a piece of the best blotting-paper, or filtering paper will do equally as well, cut it of such a width as will permit it to lie evenly between the sides B B on the plate A, and also allow of its expansion when saturated with water; if this be not particularly attended to the paper will rise up from the plate at the sides and distant from the sides of the slide, for convenience in making observations, as represented in Fig. 100.

For the sake of cleanliness, I have a lid or cover to my slide: see Fig. 98.

D is a piece of glass of the same kind as slide, 5 inches in length and $2\frac{1}{4}$ inches wide, hollowed out at the end so as to shut up close to the reservoir, and also to allow the syphon to pass on to blotting-paper. On the slide E E are two shoulders, consisting of glass about $\frac{3}{16}$ of an inch in width, cemented flatways on D, at such a distance as to permit of the sides B B in

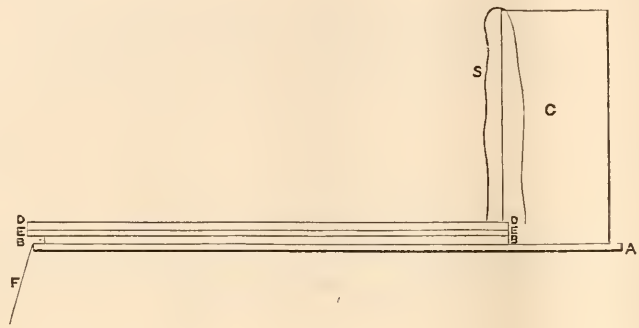


Fig. 99.

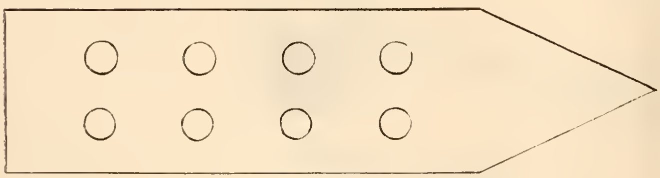


Fig. 100.

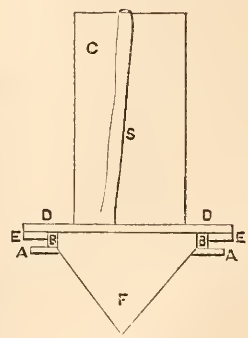


Fig. 101.

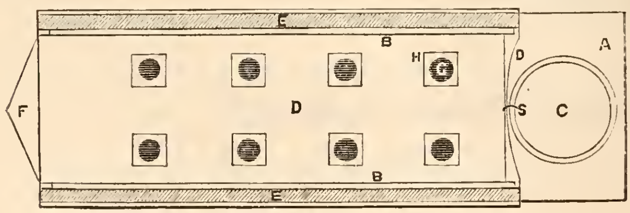


Fig. 102.

cause considerable inconvenience; let the paper be of such a length as when it is placed against the reservoir it will project one inch beyond the slide at the opposite end. This end of the paper should be cut to a point, so as to lead the water from the plate or slide into a receiving vessel; next cut the cells in the paper with a very keen steel punch such as is used for leather, the size depending on the use for which they may be required; for algæ I have two sizes, some one quarter and others three-eighths of an inch. The number I leave to the operator's decision, but if he has two rows on one slide, which he may without any inconvenience, be sure and have them in line, and equally Fig. 97 to come between them, so that the cover may slide easily backwards or forwards as required.

This completes our slide, with the exception of the syphon, which may consist of a single thread of wool or worsted. I use the latter.

I will now proceed to describe how to use it. First remove the cover; select your object, and have it in perfect readiness; remove the paper and well saturate it with water, and replace it evenly on the slide; then take a piece of glass about $\frac{1}{2}$ inch in width and lay it across the slide upon the paper at the end farthest from the reservoir to dam up the water, that the cells may be kept filled during the process of putting the objects into them; when you have charged the cells with the objects, float or rather slide your thin covers on them as fast as you charge them, supplying water to them with your pippet as required: by following these instructions the enclosure of air bubbles will be avoided; when completed, fill your reservoir; apply the syphon, and replace slide cover; then place the slide upon a stand of sufficient height to permit of a receiving vessel being placed under the paper as marked F in Fig. 96, and your work of setting up is completed.

I have a stand on which I keep two other slides, which are supplied from a reservoir which is unattached to either except by the syphons; the reservoir being supplied from an ordinary oil-flask, the neck of which is allowed to pass down into the reservoir, and which by a little arrangement supplies the water as fast as it is drawn off by the syphons. Here, perhaps, I had better explain the arrangement, which is as follows: I have a cork in which I have a very fine notch cut lengthways, running itself out as it reaches the largest end; then I have a piece of small glass tubing passing through the centre of the cork, and projecting from each end of it about $\frac{3}{4}$ of an inch at the end of the tube which enters the reservoir when the flask is inverted, at about $\frac{1}{4}$ of an inch from this end of the tube I have a notch filed into the tube which will admit the air when above the surface of the water, and thereby promote a down flow of water when required. This arrangement I find does very well.

In conclusion, I would suggest that on the cover of the slide a strip of paper should be pasted with the cells on slide definitely numbered; this is to facilitate the record in note-book of the transitional changes observed in each cell as they take place, for after all the most practical and efficient apparatus will be of little value unless such observations be registered for future reference.

The great inducement which has led me to bring this matter before your numerous readers is the fact that I am personally indebted for much pleasure and instruction to the self-sacrifice and disinterested labours of others, and I would like to emulate them, though it be in ever so small degree.

A. T. Dowell.

Stroud, Gloucestershire.

THE BEAVER PRESERVE IN THE ISLAND OF BUTE.

In December 1879, whilst staying at Rothesay, I paid a visit to the Beaver preserve belonging to the Marquis of Bute. The place selected for the experiment of beaver-breeding is a part of a narrow strip of fir plantation where it is crossed by a small burn, which rises in the moor above, and flows by Kingarth to Kilchattan Bay. When I reached the spot, I met "the keeper," an elderly working man, whom I found very obliging and intelligent, and agreeably communicative on the subject of his charge. He was a crofter as his father had been before him, living and labouring on the three acres of ground attached to his dwelling. He informed me that some years previously the Marquis had four beavers, and had them enclosed, but two of them died in confinement, and the others having found their way out of the enclosure were traced to some distance and at last found dead, one on the moor and the other near Mount Stewart House, about two miles off. The keeper, although he did not hold office at that time, had watched the animals when they were alive, and, being unable to work much on account of rheumatism, had given some attention to their habits. The Marquis afterwards suggested that he might act as keeper to a fresh lot; and this having been settled, another batch of eight beavers was ordered from America. Only four, however, survived the journey. This was in 1875.

When, in the company of my guide, I had reached the preserve, and had stepped over an iron railing two feet and a half high, which forms the enclosure fence, I was introduced to "Jack," a splendid specimen of the porcupine, who had a wooden kennel and a special iron railing to himself. By opening the roof of the kennel we roused up "Jack," and persuaded him to go out to his little courtyard for some exercise. Here he munched a potato or two with evident relish, and when touched or disturbed in any way, he raised his quills, as a turkey cock elevates his tail, and stalked about in a high state of excitement. He repeated this threatening manœuvre whenever I made any sudden movement, at the same time giving two or three "stamps" with one of his hind feet on the wooden floor. He seemed to be in a chronic state of irritability.

But to the beavers: commencing at the north or upper end of the burn and enclosed space, the first thing that attracted my attention was the great number of felled trees, which to all appearance had been cut by chopping with an axe. Every felled tree, too, was lying either across the burn or with its top pointing towards it. Along the course of the burn there were five or six small dams formed by weirs built apparently of branches and twigs, and so covered with sticks that it was not easy to see at first how the water was kept from running through instead of over them. Many of the felled trees were lying on the weirs or resting against them, forming supporting buttresses, and nearly all of them had been stripped of their bark, the inner part of which is used by the beavers for food. In most cases a foot or two of the lower part of the trunks had been left untouched, sometimes on account of its toughness, and occasionally because the lower end, having been tilted up in falling, could not be easily reached by the beavers. The lowest and principal dam is the *chef-*

d'œuvre. The weir is about forty feet in length, and has a beautiful S curve from the top of the boundary parapet wall at the east end to the opposite bank. The curve near the south-east end has its convex side facing up the stream, and it is at this point that the current is strongest during floods. The parapet boundary wall here has an iron railing along its top to prevent the animals from escaping. The weir is nine feet in height from the bed of the burn, and twenty feet broad at the bottom ; and its surface is so level that I could not point to one spot where more water was running over than at another. The framework is made up of branches and twigs and small logs, all mixed up in an apparently confused manner, but so effectually that no water escaped except over the top. The *modus operandi* was not at first apparent, but as we walked along the top of the weir, in crossing to the other side, the keeper pointed out that although we were treading on a lot of loosely piled sticks, yet, immediately below our feet, the interstices were completely closed up with mud and sods of grassy turf, the whole forming a very compact mass. There are two principal buttresses to this weir. One tree had been made to fall up stream and hit the weir about its centre, or near the centre, of the concave side of the upward curve, and the other had fallen from the western bank in an oblique but upward direction, and its top rested very near the first. The purpose was evident at a glance, and the supports could not have been better and more accurately placed by human hands.

In order to study the habits of the beavers, the keeper had watched them very often, in summer particularly, which is their working season, when the wind was favourable for concealment in some suitable spot—generally amongst the branches of a neighbouring fir-tree. The utmost caution was necessary, as they are so shy that they will not show themselves on any account, so long as they are aware that there is anybody near them. The working hours he found were from 7 P.M. till 7 A.M. In the evening they start from the house and burrows at the lower dam in a line, like a gang of labourers, swimming up the dams and climbing over the weirs, and every now and then two or three drop out of the line and remain at certain spots where work is to be done, till the whole gang is pretty equally distributed along the course of the burn. The keeper thinks they have a store of clayey mud collected at some part of the dam, and when they want a supply they swim to the place, take a piece in their fore-legs, and, holding it to the breast, swim back to the weir at which they are working. There they push it in between the sticks, and along with the mud, or before it, they stuff in pieces of grass sods. On the edge of the large weir I saw grassy sods that had been newly put in, and masses of mud that had been shoved in after them. The mud retained the shape so familiar to us in the thick mud of our country roads that has been pushed aside by the surface-man's "clawt," the curved wrinkles being quite distinct. There was nothing, however, to lead one to suppose that the tail had been used in the operation. A considerable number of stones of various sizes were placed at intervals amongst the sticks, to add, no doubt, to the solidity of the structure. The largest I noticed was about eight inches in diameter. For some time the beavers had been adding to the height of the weir at the rate of one foot per annum, and it had now got to the level of the copestone of the wall, which runs along the south side of the plantation, and if raised higher, the water would run over the top of the wall. As it is, little jets of water were coming through at one or two places where the lime had given way.

About half-way up the dam, and close to the west bank and out of the way of the current in floods, is the beavers' house. It is a rough-looking heap of mud and sticks, but principally mud, whereas in the weir the sticks are more prominent, probably in consequence of the mud having been washed away by the running water. The building, which is somewhat dome-shaped, rises about four feet above the surface of the water, which at this part is five feet deep. There are two entrances, one on the lower and the other on the upper side, but as they are some distance under the surface—in fact near the bottom—they could not be seen. On the top are a lot of loosely piled sticks, placed over the air-hole to keep the ventilation open. The interior communicates by a built passage with a burrow in the bank. There are also several burrows in the bank on the opposite side of the dam. The entrances to these are beneath the surface of the water, and they run up the bank for from six to ten feet. The position of the chamber of each burrow is marked by a few loose sticks on the surface of the ground, like a half-built crow's nest, which cover the air-hole as in the house. The keeper could not tell the use of these burrows. The house, he knew, was used principally for rearing the young, and he suggested that the burrows might be used by the males in the nursing season as places to which they retired to be out of the way. He also suggested that they might be used as places of refuge when the beavers were disturbed in their house. If so, they are little better than traps, for the animals could be dug out with spade and mattock in a few minutes.

Immediately above the house, but still in the large dam, is the store of food for the winter. It consists of a pile of sticks with the bark on, each from two to four feet long, and about three or four inches thick. They are mostly pieces of the branches of the trees that have been cut down, and are built apparently from the bottom of the water, which here is about four feet deep. A small tree lies across the pile in one direction, whilst another from lower down has been made to fall upwards, and a third obliquely downwards. These trees hold the bundle down and prevent the sticks from floating and being carried away by spates

When the animals wish to feed, they swim under water to the store, take a stick and strip it of its bark. The inner part of the bark is eaten, and the peeled sticks are used afterwards in the construction or repair of weirs.

Above the lowest and principal dam, and occupying the whole course of the burn within the enclosure, are the other smaller dams. At no point is the burn seen running in its own bed. The uses of these dams are various. They serve as canals for floating down logs and branches. They also help to break the force of a flood before it reaches the main dam, and they afford the beavers their natural and most convenient means of locomotion in passing up and down the stream, as well as more numerous places of refuge in case of attack.

I said that mud and clay were carried between the fore-legs and the throat or breast. When pieces of wood and stones are brought out of the water, they are carried in much the same way. The keeper has seen the beavers scrambling up the outside of the house with small logs in their "arms," and when one stumbled it fell forward on its breast and face, without letting go its hold of the log.

I visited the preserve again in January 1882. The number of beavers was now supposed to be over twenty. All the trees in the enclosure were cut down, and the keeper had a supply of logs and branches of willow trees, a portion of which he placed inside the enclosure at intervals as required. The place at which he deposited the logs is a considerable distance up the bank from the dam, perhaps fifty yards, and the animals had consequently to travel on land that distance to reach their supplies. Sometimes they cut pieces off, and carried them down to the store, and sometimes it was found that they fed on the bark where it lay.

Although the beaver is so shy, it uses its powerful teeth for defence when occasion requires. Some time ago, one escaped from the enclosure, and was caught in the plantation not far off. It showed fight, but was secured by throwing a sack over it, and lifting it over the railing. Whilst this was being done, it partly disengaged itself, and immediately fastened its teeth on everything that came within its reach, not excepting legs and arms. It even caught the iron railing and held to it most viciously till it was pulled off by sheer force.

I paid another visit to the preserve in April 1885. The keeper was still at his post, but things were somewhat altered. The marks of the beavers were so few, that it was supposed that the number was much reduced. Indeed, the keeper was not sure if there were half-a-dozen left, and for anything he knew they might be all males or all females. Foul play was suspected, but it may be more charitable to suppose that when the trees within the enclosure were all cut down, the beavers' chief occupation was gone, and that their mode of living afterwards, however well they were fed and attended to, was somewhat more artificial and unnatural. However the beavers may have fared, it was quite certain that some dastardly savage had put poor "Jack" to a cruel death, and his kennel was unoccupied.

W. STEUART.

GOSSIP ABOUT FORAMINIFERA.

ALTHOUGH I should be sorry to attribute intentional misrepresentation to Mr. F. Chapman, he undoubtedly lays himself open to the imputation when he so grossly misquotes me. If he will carefully read my paper on Foraminifera, he will see that I do *not* say that I am "an expounder of curious facts." Nor is he a whit more happy in quoting others. Dr. Carpenter states that, upon the Polystomella in question, Fichtel and Moll bestowed the name *Nautilus striato-punctatus*, and that in 1822 it was Lamarck who conferred upon it the generic distinction *Polystomella*. Subsequently, for some inscrutable reason, Ehrenberg abandoned both generic and specific names, changing them to *Geoponus stella-borealis*. That this latter commends itself to not a few, is proved by the fact that it so frequently occurs in books: as one example, the "Micrographic Dictionary."

As regards *Entosolenia squamosa*, var. *hexagona*, I am not desirous of emulating Mr. F. Chapman's aggressively dogmatical tone, but may nevertheless be allowed to say that I decline to endorse his dictum that the "cavities depicted should be imbrications." Except that, relatively to the raised ribs, the hexagonal cells are undoubtedly hollows, they are neither "cavities" nor "imbrications," but parts of the convex surface of a globular body.

Far sooner would I admit an error, and if possible rectify it, than seek to perpetuate it. I therefore gladly in part accept Mr. F. Chapman's correction. My association of the Porifera with kindred groups of lowly organisms arose from the fact that when I wrote my paper, several years since, they were generally so classed. I am, however, fully alive to the fact that more modern zoologists, not all, have long since adopted Dr. Grant's designation of *Porifera*. It is some thirty-three years since Dr. Carpenter wrote that Mr. Carter asserted that sponges "begin life as solitary amœbæ, and that it is only in the midst of aggregations formed by the multiplication of these, that the characteristic *sponge*-structure makes its appearance."

Now, surprising as it will doubtless appear to Mr. F. Chapman, many there are who to the present day hold this opinion, believing that in their organisation they so closely resemble the Amœbæ, that they actually hold them to be colonies of these organisms. Dr. H. Alleyne Nicholson, in his 1875 edition of "Zoology," says, "The last of the *Rhizopoda* which require notice are the sponges." Not having a later edition, I cannot say whether or not the Professor still holds to this classification; as a matter of fact, however, very many zoologists do.

EDWARD H. ROBERTSON.

ASTRONOMY.

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

THE astronomical world has suffered a severe loss by the death of Dr. Warren De la Rue, aged seventy-four. He was a notable instance of the men who being entirely occupied in a great business, yet do far more for science than most men who have their whole time at their disposal. His best known work was that of making himself a fine reflecting telescope, mounted equatorially with a clock motion, and applying this to celestial photography, particularly to taking photographs of the moon. He also succeeded in getting some valuable photographs of the eclipsed sun in Spain in 1860. He may therefore be considered the originator of the application of the system of astronomical observation by photography, which is now receiving such extensive application, and in which lies in all probability the future of astronomy.

Using the 36-inch aperture of the great achromatic at the Lick Observatory, Mr. Burnham has discovered a companion of the eleventh magnitude to α Ursæ Majoris.

At the meeting of the Royal Astronomical Society held on April 12th, a paper of Mr. Burnham's was read "On the Trapezium in Orion." In this he gives measures of the positions of the stars in the Trapezium, which appear to show that no appreciable change is taking place in their positions relatively to each other.

Mr. I. Roberts read a paper "On Photographs of the Nebulæ 81 and 82 Messier, and the Nebulous Star in Ursa Major." Copies of these photographs, but enlarged, were exhibited. The originals had three and a half hours' exposure. The 81 Messier nebula shows a spiral formation, with a central bright nucleus, and many bright starry or nebulous points on the spiral streams.

The nebula 82 Messier in the photographs is a number of masses of nebulous light connected by a slight envelope of nebulous matter. Mr. Roberts regards it as a spiral nebula seen in projection.

Mr. Knobel read a paper, by Professor Holden, "On the Photographs of the Corona of the Solar Eclipse of January 1889." A large drawing was sent with the paper. This showed very broad polar rifts full of narrow structures, curving away from the sun's axis of rotation.

Many other papers were taken as read.

On June 6th Venus will be at her greatest brilliancy.

On June 8th Mercury will be stationary at 8 aft.

Rising, Southing, and Setting of the Principal Planets in June.

	D.	Rises. h. m.	Souths. h. m.	Sets. h. m.
MERCURY ☿	4	5 1M	1 19A	9 37A
	11	4 45M	0 49A	8 53A
	18	4 15M	0 7A	7 59A
	25	3 39M	11 25M	7 11A
VENUS ♀	4	2 21M	9 24M	4 27A
	11	2 5M	9 11M	4 17A
	18	1 50M	9 1M	4 14A
	25	1 37M	8 56M	4 15A
MARS ♂	4	3 57M	0 14A	8 31A
	11	3 47M	0 7A	8 27A
	18	3 38M	0 0A	8 22A
	25	3 31M	11 53M	8 15A
JUPITER ♃	4	9 35A	1 35M	5 30M
	11	9 4A	1 4M	4 59M
	18	8 33A	0 33M	4 28M
	25	8 3A	0 1M	3 55M
SATURN ♄	4	8 45M	4 21A	11 57A
	11	8 20M	3 55A	11 30A
	18	7 57M	3 31A	11 5A
	25	7 53M	3 6A	10 39A

On June 26th Venus will be at the greatest distance from the sun at 7 hrs. morn.

There will be no occultations of interest in June.

During the first week of June Mercury will be an evening star, but afterwards will be too near the sun for observation.

Venus will be a morning star, and will be in Aries till about the 25th, when it will enter Taurus.

Mars will be too near the sun for observation in June.

Jupiter will be in a good position for observation during June, and will be in opposition to the sun on the 24th.

Saturn will be an evening star in Leo, not far from Regulus.

OUR SCIENTIFIC DIRECTORY.

[The Editor will be obliged, if, for the benefit of his numerous readers, secretaries of scientific societies will send notices like the following, also place and time of meeting.]

BRISTOL Microscopic Society: President, A. J. Harrison; Hon. Secretary, H. A. Francis, 14 York Place, Clifton, Bristol. Meetings on third Tuesday evening in each month.

Louth (Lincs.) Antiquarian and Naturalists' Society: President, Mr. Alderman Fowler, J.P.; Hon. Secretaries, B. Crow, Town Hall, and J. Larder, Mercer Row, Lowth.

Hampstead Science and Field Club: President, Mr. A. Clare Fryer; Hon. Sec. and Treasurer, Mr. C. H. Bensley, 127 Fellows Road, South Hampstead, N.W. Meets at 8 o'clock on Saturdays at the Hampstead Public Library and Literary Institute, Stansfield House, High Street, Hampstead.

Harrogate and District Naturalists' and Scientific Society: President, Riley Fortune; Hon. Secretaries, J. Naughton and A. Lambert. Meetings in the Society's Museum Free Library at 8 P.M. every Tuesday from April to September. Field days at intervals.

Lancaster Science Students' Association: President, H. Wright; Hon. Secretary, H. A. D. Jowett.

SCIENCE-GOSSIP.

An interesting paper by Mr. H. H. Anderson, of Calcutta, on "*Anoplophyra Æolosomatis*, a new Ciliate Infusorian Parasitic in the Alimentary Canal of *Æolosoma Chlorostriatum*," has been reprinted.

We have received a very comprehensive paper on the "*Spinose Rhynchonellæ* found in England," by S. S. Buckman and J. F. Walker.

Parts 4 and 5 of Mr. F. A. A. Skuse's useful and interesting papers on "Diptera of Australia" are to hand. Part 4 treats of the families Simulidæ and Bibionidæ; part 5 that of Calcidæ.

Mr. J. A. Wheldon sends us "The York Catalogue of British Mosses," compiled by himself, "chiefly to supply the place of the London Catalogue, now out of print." The Catalogue seems to be carefully compiled, and we can heartily recommend it to our muscological readers.

We have received the Fifth Annual Report of the Watson Botanical Exchange Club.

It is now four years since Mr. A. E. Shipley called attention in the "Nineteenth Century" to Professor Weismann's Essays on Heredity. In response to the interest which has been aroused, a collection of the Essays has been translated, under the care of Mr. E. B. Poulton, of Oxford, and will form the second volume of the Series of Translations of Foreign Biological Memoirs which the Clarendon Press are publishing. The volume is nearly ready, and may be expected shortly.

"Hampshire Well Sections" is the title of a paper by Mr. W. Whitaker, F.R.S., the President of the Hants Field Club. The article is full of interest, and gives one a good idea of underground Hampshire.

"On some Physical Changes in the Earth's Crust," by Charles Ricketts, M.D., is an elaborate and readable paper, reprinted from the "Geological Magazine."

Dr. Dallinger and John Mayall, jun., are the joint editors of the new edition of Carpenter's "Microscope." Dr. Dallinger is responsible for the biological, and John Mayall, jun., for the optical portions of the forthcoming new edition.

MICROSCOPY.

New Slides.—We have received from Mr. H. Mellis, of Manchester, two excellently prepared slides—one a transverse section of an embryo rat, illustrating development of bones, &c., and the other of a chick two days old, illustrating development of the eye and optic nerve.

Species of Pterodina.—I should like to take advantage of Dr. Barnett Burn's article on *Pterodina truncata*, to state that I have found during the last two years two other species of the same genus, both of which also were discovered by Mr. Gosse, *Pt. mucronata* and *Pt. reflexa* (for the latter see the "Journal of the Royal Microscopical Society," 1887, p. 3, pl. 1). These two species came from two ponds near Cheadle, Staffordshire. Of the former, I have seen one specimen only; of the latter, perhaps twenty on different occasions. The "mucro" is very conspicuous in the former when the head is withdrawn; but in rotation there is little to distinguish it from *Pt. patina*. Perhaps it is rather more transparent; if I may judge from my one example, it certainly is so. *Pt. reflexa* is readily distinguished by its elliptical outline and by its small size. The permanent bending upwards of the two halves of the lorica is conspicuous in a lateral or rear view, and makes this pretty little species very distinct. I may point out that Gosse did not describe the eyes of *Pt. truncata* as "small and transparent," but as "small, remote, and almost colourless." The eyes in his figure seem to me decidedly small. I may perhaps remark here that, unless I was much mistaken, I was more successful than Mr. Gosse in seeing the eyes of *Pt. mucronata*. I do not think Dr. Burn has really proved that his Pterodinæ were "in permanent quarters on" the asellus. Indeed, his own words seem to show that they were not. If three of his four examples were "swimming in the water," how could they be permanently attached to the Crustacean? Even if all four had been adhering by their feet, and all four had deposited eggs on the body of the asellus, that would not have proved that the adhesion of the animals was permanent. It is not at all uncommon for some Rotifera, particularly some of the Philodinadæ, to adhere for a time to larger animals, such as Crustaceæ and water-worms; but this adhesion is often temporary and accidental, and I know of no reason why a Rotifer adhering to a larger animal should not deposit an egg in a convenient spot on the animal's body, remain near the egg for a time (as *Philodina megalotrocha* often does), and then swim away.—*J. W. Blagg.*

ZOOLOGY.

The Bonnet Monkey as a Pet.—The illustrations of this article were from tracings of two special drawings made from the work published by Mr. L. Upcott Gill, entitled "Notes on Pet Monkeys." We were not aware of this at the time, or we should of course either have duly acknowledged the fact, or not have published them. We apologise to Mr. Gill for the error.

Struggle between Infusorians and Rotifers.—Perhaps the following may interest your readers, as the facts appear to prove "intelligence" in animals very low indeed in the scale of life. While examining a large collection of the fresh-water Rotifer (*Brachionus rubens*) I observed a lorica, the proper contents of which were replaced by an Infusorian which continually rotated. The Infusorian was ciliated all over, and had a contractile vesicle and nucleus. When swimming, which it did rapidly, with a circular movement, it was spindle-shaped, but capable of great change of form. The contents were clear for the most part, only a little granular at the rear end. A few days after, I found that most of the Rotifers contained one of these guests; some of the Rotifers being alive, although partly devoured. Very soon the attack was seen. It must be remembered that this Rotifer is a strong and active swimmer. The Infusorian began operations by turning slowly and gently round the Rotifer's foot for some time, and then more rapidly. This appeared to cement the Rotifer's foot to the glass. The Rotifer now lashed about with great vigour in its vain efforts to escape; but was not able to swim away. The enemy was repulsed many times, but returned to the attack. In about half an hour the Rotifer became exhausted, and the Infusorian got through the opening in the lorica, from which comes the Rotifer's foot. The Infusorian being much larger than the inlet, the following device was resorted to. The front part of the Infusorian was contracted to a mere ribbon, the contents of the animal being pressed into the back part, so forming a globe. The "ribbon" was now easily inserted into the lorica through the hole. Then the contents of the globular part, before outside the lorica, were injected into the "ribbon," making it globular, and thus reversing matters, the bulk of the Infusorian being now inside the Rotifer, the "ribbon" only outside, which was easily drawn in. The Infusorian now assumed a globular form, and rotated itself. The Rotifer's intestine first disappeared, the brain and eye last. The Rotifer's cilia moved rapidly for quite half an hour after the entrance of the enemy. Having devoured the Rotifer, the Infusorian divides into two or four new animals, which are exactly like the parent, and swim away swiftly to seek fresh victims. I have not seen these animals attack any other Rotifer, or feed in any other way. I have seen the above take place twenty or thirty times, the mode of attack and the result being nearly always the same; only once or twice did the Rotifer manage to break away. By the way, in the same collection were two forms of the rare Rotifer Notholca, viz. *N. acuminata*, and a form exactly like Hudson's *N. scapha*, which he considers to be a marine form only.—*R. P. Grace.*

Postscript to "Ravens, Peregrine Falcons, and Puffins at Portland."—Since writing the above I regret to say that the cliff men have taken a fourth nest of the same pair of ravens on 16th April; this time with three eggs, two of which were light-coloured.—*J. B. Young.*

The Darts of the Helicidæ.—On page 90 Mr. Collinge has a note on this subject, and in that note he recommends a correspondent to obtain his darts by boiling the dart-sacs in a solution of caustic potash. In writing this note, with great respect to my friend Mr. Collinge, I wish to protest against any such unscientific mode of obtaining darts, as liable to mislead an inexperienced hand. It also seems to me the wrong way to go about gaining an accurate anatomical knowledge, which every worker in zoological matters should strive to attain, as tending to make his work more reliable and sound. It is an easy matter to dissect out the darts from the dart-sac, and it is by dissecting alone that any true and accurate knowledge of these structures can be obtained. I well remember—it was only last Christmas—a conchological friend bringing me from Nottingham some things which he had obtained by the caustic potash process from *H. virgata* which he thought were darts; what they indeed were it was not possible to say. In my friend Mr. Heathcote's note (the one before Mr. Collinge's) the word sheet is misprinted for shell, and the word sheets for shells. In a recent number of "Life-Lore" there is a fairly good and accurate article on darts from the pen of Mr. Standen which I would advise C. A. W. to read. So far as I know, Mr. Standen's article is trustworthy, except when he goes a little away from his subject, and mentions that some "crystalline stylet" is found in the stomach of some snails. I am afraid that here Mr. Standen means *Anodonta cygnea*, and other lamellibranchs, which can scarcely be classified as snails. He seems to me here to be making a reference to the researches of Hazay and Krukenberg (Mal. Blätt. iii. 1881, p. 196, and Vergl. Physiol. Vorträge, ii. p. 63, 1882) on its being found in the Unionacea. And as this is a peculiarly interesting point, I ask Mr. Standen to definitely state his meaning through the medium of these pages. If a crystalline style has been found in any portion of the enteric tract in any Gastropod, I would be very much obliged to him for the reference or references, since I am ignorant of any such.—*J. W. Williams.*

NATURAL HISTORY TRANSACTIONS OF NORTHUMBERLAND, DURHAM, AND NEWCASTLE-ON-TYNE.—Part 1, vol. x. has just been issued to the members, and consists of 219 pages, of which 132 are occupied with a Catalogue of those Specimens of the Hutton Collection of Fossil Plants that have been presented to the Natural History Society by the Council of the Mining Institute, and are now exhibited in the Museum of Newcastle-upon-Tyne. The collection was commenced by Mr. Hutton about half a century ago, and previous to that time there was no public or even extensive private collection of these fossils in Newcastle. A large number of the specimens was obtained from the shale above the Bensham Colliery at Jarrow, which is exceedingly rich in fossil plants. The catalogue is enriched by extensive and valuable explanatory notes by Mr. Richard Howie, curator of the museum, who was entrusted with its preparation. A synopsis of the coal seams in the Newcastle district is also included, which gives the depth of the pits from the surface, and also the thickness of coal. The catalogue is illustrated with woodcuts and lithographic plates. This part also contains the Presidential Address to the Members of the Tyneside Naturalists Field Club for the year ending May 1887, giving the results of the various meetings during that year, and also the address of the president for the year ending May 1888.—*Dipton Burn.*

LLANDUDNO MOLLUSCA.—The following additions to the list of Llandudno Mollusca may not be uninteresting; for complete lists hitherto, see Q.G.C., vol. iv. page 206, and vol. v. No. 1. *Hyalina pura*, Alder, and its var. *margaritacea*, Jeff., not uncommon on the Great Orme. *Pupa marginata*,[1] Drap., plentiful on the coarse grass-stems of the Morfa. *Cochlicopa tridens*, Pult., abundant with *Hyalina pura*. This is not an actual addition to the list, as it is chronicled in Rimmer, page 179,[1] as a Llandudno shell. It seems, however, to have been a lost species there for many years, and I take this opportunity of recording its re-discovery. The occurrence of *C. tridens* in Wales was unknown to Jeffreys (at any rate when he wrote B. C. vol. i.), and Llandudno is, as far as I know, the only Welsh habitat on record at the present day. There also occurred in the same spot four adult specimens of *Coch. lubrica*, var. *hyalina*.—*Brockton Tomlin, Pembroke College, Cambridge.*

ARION ATER.—In the "Naturalist," 1888, p. 284, Mr. W. D. Roebuck has described a variety of *A. ater* from Nottingham as var. *cinerea* v. nov. This appears to be the same variety that I found at Bedford Park, and described in SCIENCE-GOSSIP, 1885, p. 224, as of a very dark slate colour, with a dark brown margin. But Westerlund has described a var. *cinerea* of *A. ater*, which, unless it is possibly really referable to *subfuscus*, will have priority; so I would suggest that *cinerea*, Roeb., be changed to *cinerascens*. Another variety, combining brown and black, is found at Chislehurst, and may be called *seminiger*. It has a very dark brown mantle and a black body.—*T. D. A. Cockerell, West Cliff, Colorado.*

CORONELLA LÆVIS IN HAMPSHIRE.—Mr. Field's note on page 91 rather surprised me, because *C. lævis* has long been known in Hampshire; and when I turn to back records, I find Mr. Field recorded it himself for that county in 1887. In the same year he recorded *Lacerta viridis* from Margate, which was more extraordinary, as it is quite incredible that that lizard is native there. I lived some years at Margate, and never saw any sign of it.—*T. D. A. Cockerell.*

BOTANY.

ŒDOGONIUM.—I beg to make the following corrections in my paper on Œdogonium (April number), which I got to hand very late, as I was away. In the explanation to the figures, "Androgonidia" has to stand for "Androgonia" (Fig. 72 : 8), and "Antherozoid" for "Anthrozoa" (Fig. 72 : 11).—*O. V. Darbishire.*

ALCHEMILLA VULGARIS IN THE SOUTH.—In the February number of this paper, Mr. Lamb seeks information of *Alchemilla vulgaris*, which he has found in Kent. In June 1887 I found this plant on the borders of the Broadhouth Woods, near Seal Chart, Kent, but did not notice the description in the third edition of the "Student's Flora," "absent in Kent," until last autumn, when upon searching the records I found it recorded only in a "Report of the Greenwich Natural History." If this ever reached the author of the "Topographical Botany," the evidence was considered insufficient, for it is not recorded in the last edition of that great work. Through the courtesy of the editor, my discovery was published in the October number of the "Journal of Botany." *Alchemilla vulgaris* is undoubtedly rare in the south-east of England. It has been found in a few localities in Surrey, mostly about Dorking; in Middlesex and Herts, also, in a few places. It is a common plant in the west of England, on limestone rocks and by streams.—*H. W. Monington.*

OPHRYS APIFERA.—Your correspondent refers to this plant as a "fast-becoming rarity" in Gloucestershire. If this plant is becoming rare owing to its being less prolific, it seems to be an interesting confirmation of Darwin's prophecy respecting it—on account of its habit of self-fertilisation. Professor Henslow, in his work on "Floral Structures," maintains that self-fertilisation is not generally injurious to plants.—*J. H. King.*

TUSSILAGO FARFARA (COLTSFOOT), &c.—This plant during March and April was profusely in bloom on a waste piece of ground, very grimy from soot and other refuse, not many yards from London Bridge, in Tooley Street. This is certainly remarkable considering the surroundings, as since the time of Gerarde not many wild flowers, I will vouchsafe, have found existence possible in this neighbourhood. Gerarde mentions the enchanter's nightshade as growing in a ditch side, against the Earl of Sussex's garden wall in Barnaby (Bermondsey Street), by London, "as you go from the court, which is full of trees, unto a farmhouse close unto." In this ditch likewise the water crowfoot (*Ranunculus aquatilis*), with its beautiful white flowers, and willow herb (epilobium) or cherry pie, as the country folks call it, and likewise the horsetail (equisetum) flourished. We cannot now boast of courts or farmhouses with trees in Tooley Street or neighbourhood, but we can certainly boast of an avenue of young planes leading from the top of Bermondsey Street to Dockhead. These trees are doing exceedingly well, and no doubt, judging from the care bestowed on them by the parochial authorities, will make fine specimens in a few years' time.—*John Waller, Brockley.*

NOTES AND QUERIES.

Helix nemoralis, Reversed Form.—For some years past I have received consignments of this remarkable shell from a poor family in County Donegal. The shells are found on the sand-hills in the neighbourhood of Ballyshannon. Jeffreys notes that "they sometimes occur, but are very rare." Though the normal form is in profusion, the result of an entire year's gathering of this family of sharp-eyed young people only amounts to about two dozen of the crooked shells, as they term them; and on the approach of spring I usually receive a small box by post containing the little horde, with the modest request that I will send what I can for them. Being overstocked, I would be glad to dispose of a few dozen for the benefit of the poor collectors, and doubtless many of your readers would be glad to avail themselves of the opportunity of thus securing specimens. I should note that, as the shells are collected in hollows among the sand-hills, they are "dead shells," and usually much bleached.—*Wm. Swanston,* 4A *Cliftonville Avenue, Belfast.*

Embedded Batrachians.—At the Paris Exhibition of 1878 I saw a toad which was supposed to have existed alive in a solid block of coal since, of course, the formation of the beds from which the block was obtained. By Mr. Gresley's interesting table we see that such tales are by no means rare. Only recently an article appeared in a London daily paper on a toad lately found in the boulder clay. Let us consider a well-known case:—Some years ago the manager of the Shielduir Pit, near Motherwell, Airdrie, N.B., "while superintending the driving of a mine through sandstone, was surprised to find from thirty to forty live frogs issue from the centre of a mass of stone that had been dislodged." The depth at which this frog-bearing block was found was 330 feet below the surface. Now, if this be a fact, we must conclude that these frogs were living in the water in which the sandstone was originally deposited (probably during the Carboniferous Period), and furthermore, that they were able effectually to survive the pressure and chemical changes which subsequently hardened the sediment into sandstone! Poor creatures! how unhappy they must have been for some thousands of years! It would be only reasonable of those who believe so far in the vitality of these batrachians to expect some day to unearth a living fossil in the shape of an Archegosaurus or other amphibian of the past! When frogs or toads are found "embedded" at great depths below the surface, there is little doubt but that they have either crept down, or been washed down, some fissure which may have been subsequently filled up, and, under certain conditions, its contents consolidated. In cold weather frogs and toads creep into holes and fissures to pass the winter in a benumbed state; in this condition they require little air and no food. Winter rains may then fill up the fissure, and at the same time wash the creatures lower down; here they might exist for a considerable time before being unearthed by miners or others.—*Cecil Carus-Wilson.*

Sheep Ticks.—Can you kindly inform me, through the medium of "our" paper, how the sheep tick multiplies in such numbers, as I find in Staveley's "British Insects," p. 372, as follows:—"An unusual circumstance occurs in this family, the female giving birth to but one individual, and that not until it has either already attained the last stage of larvahood, or has become a pupa." Of course, if they give birth to but one individual, the line would very soon die out from accident or natural causes.—*Alfred Draper.*

Hertfordshire Natural History Society.—I am anxious to form collections of Hertfordshire shells, insects, etc., for the museum of the above society. Can any reader of Science-Gossip help me? Specimens of even the commonest shells and insects will be welcomed, as at present the society does not possess either entomological or conchological collections, and an endeavour is being made to add these to the museum. We have a fine collection of county plants, the herbaria of Messrs. Webb, Coleman and Pryor, authors of the County Floras, being in possession of the society. I shall be pleased, however, to add to these, specimens of rare plants, both phænerogams and cryptogams. It is important that a note of the exact locality and date of collection should be attached to every object. Specimens should be sent to me at "The Hollies," S. Albans.—*A. E. Gibbs, Hon. Curator.*

Clutches of Bird's Eggs.—I was very much concerned to see in the exchange column of this month's Science-Gossip no fewer than three advertisements for entire clutches of birds' eggs. I hope you will not lend the pages of Science-Gossip to this nefarious business. Pray let these gentry know plainly that their business is too disreputable to find any encouragement from a journal which is devoted to and circulated amongst "Lovers of Nature," and not wholesale exterminators of her treasures.—*A Subscriber to* Science-Gossip *from the beginning.*

Vandal Naturalists.—As a collector of birds' eggs in clutch, I have no objection to being called a Vandal Naturalist. Nevertheless, I think the epithet more appropriate to those who get a miscellaneous lot of specimens together, and call them a collection. Such collections serve no purpose in showing what eggs really are, neither do they assist in any way in "searching out of new facts." From careful observation of birds for many years—nearly half a century—I believe a pair of birds can rear a full brood as easily as a part only, which they are obliged to do if orthodox collectors (*sic*) take a portion of the eggs from a full clutch. These collectors had far better procure a good set of plates representing the eggs of birds and leave the birds in possession of their jewels. Your correspondent Mr. Mosley is not very far wrong when he says, "Generally the eggs in the same nest are very much alike," but doubtless he is aware that in the nests of some birds, two and sometimes three types of egg are always found. It is to this fact I have more than once called the attention of zoologists. There is another fact which appears to have been overlooked, namely, the relationship which exists between the colour and the fertility of eggs. I have waded through volumes of ornithological literature, and fail to find a single paragraph devoted to it. I should exceedingly like to know if the three light-coloured raven eggs forming part of a clutch of five—which Commander J. B. Young mentions in his most interesting letter—were fertile or infertile, for I so often find when blowing a clutch of eggs, that an abnormally light-coloured egg is infertile. By the end of the present breeding season, I hope to be able to say more upon this subject. I believe it is generally supposed that the light-coloured eggs in a clutch are the last laid, but so far as I have at present been able to ascertain it is not the case. In defence of Vandalism, I am sure no true collector will take every clutch of eggs he can lay his hand upon.—*Joseph P. Nunn, Royston.*

Snow blinding Fish.—It is a common idea along this part of the south coast that a south snow blinds the fish, and that they may be had in large numbers in consequence. Can any of the readers of Science-Gossip inform me if this be really a fact?—*A. Vigar.*

White Moles, and Apple-trees.—In answer to N. P. Chrzastow, (1) White moles are by no means unknown, and the mole varies also to orange, brown, &c.: see "Zoologist," 1886, p. 332; "Nat. World," 1886, p. 40. It is always interesting to have records of such variations. (2) Apple-trees bear fruit and blossom at the same time in Madeira, but the fruit is of inferior quality.—*T. D. A. Cockerell.*

Sense of Smell.—Allow me to correct error in note under above heading. It should have been *Bex*hill Harriers, not *Box*hill. May I also ask why my communication forwarded to you three months ago did not—if published at all—appear in an earlier issue?—*W. E. Windus, Bexhill.*

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.

Hulwidgeon.—The best means of testing your knowledge on the subjects you mention would be to pass the South Kensington examinations in them. Write to the South Kensington Museum, enclosing 1*s.* 2*d.* in stamps for their directory, in which you will find the questions that have been put on the subjects for many years past.

J. E. Black.—We have no doubt the Rev. W. Fowler, author of the work on "British Coleoptera," now appearing, would assist you in naming your specimens.

Mrs. C.—No charge is made for naming objects in our columns, but it is always better students should try to name them for themselves.

A. F. Robin (Adelaide).—You will see in our Scientific Directory the names and addresses of the secretaries of our chief natural history, &c., societies, all of whom are interested in the preservation of plants and wild animals.

W. Mackie.—The "London Catalogue of Mosses" is out of print. Mr. J. A. Wheldon, of York, is publishing the "York Catalogue," to take its place.

K. E. Styan.—All the papers in S.-G. are contributed gratuitously.

E. Clifton.—The plant called the water soldier (*Stratioles aloides*) is very common in the rivers and broads of Norfolk. If you have any friends in Norwich, they could easily procure it for you.

H. C. B.—The "Journal of Microscopy" may be obtained of Mr. Alfred Allen, 1 Cambridge Terrace, Bath, and the "Journal of the Quekett Microscopical Club" of Williams and Norgate, Covent Garden, London.

P. Thompson.—*H. caperata* may be distinguished from *H. virgata* by the strong rib-like striæ with which its surface is covered, as well as by its more depressed spire and larger umbilicus; *A. anatina* from *A. cygnea* by its shell being smaller and longer in proportion, by the hinge line being raised instead of straight, and by the abrupt instead of gradual slope of the posterior side; and *U. pictorum* from *U. tumidus* by its oblong shape and thinner shell, by the straightness of the upper and lower margins, as well as by the beaks being less tumid and its hinge and teeth being more slender. See Rimmer's "Land and Freshwater Shells."

S. G.—The coco-de-mer (*Lodoicea sechellarum*) is found in Praslin and Curieuse, two of the Seychelles. The male tree when full grown, which is not before it has attained the age of 100 years, reaches the height of 100 feet. At the age of thirty it commences to blossom. It takes ten years for the fruit to mature. The nuts average a weight of about forty pounds each. For a fuller account, see "Treasury of Botany."

J. T. Johnston.—You may obtain the "Botanical Gazette" (American), and the "Journal of Botany," from Mr. W. P. Collins, 157 Great Portland Street, London, W. The "Popular Science Monthly" is, we believe, no longer circulating.

Z.—Get Rye's "British Beetles," price 10*s.* 6*d.*, coloured illustrations.

J. R. B. M. wishes to know if there are any natural history societies in Cheltenham or the neighbourhood. Perhaps some correspondent will kindly let us know.

J. M. D. K.—Jerdon's "Birds of British India" is the great book on the subject. The land and freshwater shells of that country have, we believe, been described in one of the British Museum Catalogues.

J. P. G.—(1) To calculate the rainfall of one inch it is necessary to know the area. (2) Snow is usually ten to twelve times more bulky than water. (3) If the sun's rays do put out a fire it is because of the rarefaction of the air by solar heat, and consequent scarcity of oxygen.

EXCHANGES.

Wanted, some living specimens of anemones and zoophytes, &c., for a marine aquarium; good exchange given.—H. Parritt, 103 Camden Street, London, N.W.

For slide of *Heliopelta metii* (selected), send other slide, preferably diatoms, spicules, or polariscopic.—G. H. Bryan, Thornlea, Cambridge.

What offers for "Leisure Hour" (1883), "Birds' Eggs and Nests," by Atkinson, and "Birds, their Nests and Eggs," by W. H. Bath? Will exchange for natural history books or apparatus.—Hodder, 40 Wimborne Road, Alfreton Road, Nottingham.

What offers for "Nature," vols. 28, 35, 36, 37, bound in cloth, vols. 38 and 39 unbound; Science-Gossip, 1884-7, bound in two vols., cloth, 1888 unbound; "Annals of Botany," vol. i. parts 1 and 2?—G. A. G., 1 Lansdowne Road, Sheffield.

Wanted, living examples of *Limax lævis* and *Limax tenellus.* British and foreign land and freshwater shells in exchange.—W. A. Gain, Tuxford, Newark.

Wanted, *Polydonta maculatus, Elenchus iriodon, Terebra* *rudis*, and *Nassa arcularia*, one good specimen of each. Will give a good exchange in other shells, or natural history literature.—W. Jones, 27 Mayton Street, Holloway, N.

Helix Hudsoni, phytostylus, capensis, and *Knysnænsis, Physa cornea* and *parietalis, Physopsis Africana, Limnæa Natalensis*, and other South African shells, offered for other foreign land and freshwater shells. Send lists.—Edward Collier, 74 Yerburgh Street, Moss Side, Manchester.

DUPLICATES.—*Sph. rivicola, lacustre* and *corneum*; *Pis. pusillum, D. polymorpha, Pal. contecta, V. piscinalis; P. albus, glaber, spirorbis, vortex, carinatus, complanatus, dilatatus*, and *contortus; P. hypnorum; L. peregra, stagnalis, palustris*, and *truncatula; Z. cellarius, glaber*, and *nitidus; Helix nemoralis, arbustorum*, and *sericea; B. obscurus; Pupa secale, umbilicata*, and *marginata, Coch. tridens* and *lubrica*, &c. Wanted, foreign shells, any kind.—F. C. Long, 8 Cog Lane, Burnley, Lancs.

EXCHANGE.—Wood's "Insects at Home" (new), Wood's "Insects Abroad," "Boy's Own Paper," vols. i. ii. iii. iv. (red cloth); "Boy's Own Paper," vol. ii. (unbound); Cassell's "Canaries and Cage Birds," parts 1 to 40; Routledge's "Every Boy's Annual," 1868 to 1871, and 1874. Wanted, second-hand microscope (good maker), or scientific books and periodicals, particularly Bell's "British Quadrupeds and Reptiles."—R. M. Skinner, The Hollies, 14 Thornden, St. Leonards-on-Sea.

WHAT offers for the following? "Zoology" (illustrated), by Andrew Wilson, Ph.D.; "On Amœba," &c.; "Half Hours with the Microscope," by Dr. Lankester, M.D., 14th edition, illustrated by Tuffen West, col. plates; Collection of marine, land, and freshwater shells, about seventy-two varieties, some rare.—J. W. B. Rodgers, 54 London Road, Sheffield.

TO EXCHANGE.—A few micro-slides (various); quantity of unmounted material: zoophytes, diatoms, stems, sections, double stained, &c., and other good preparations. Also splendid turn-table for making shells and finishing slides. Medical shocking coil, platinum contacts, three powers. Offers, photo, micro, or otherwise.—Kilgour, 21 Grieve's Terrace, Locke Road, Dundee.

OFFERED, "SCIENCE-GOSSIP," 1874, bound; some numbers Newman's "Entomologist," 1874, 1875; Cassell's "Countries of the World," 40 parts, comprising 4 complete volumes, with title and contents to each, beautifully illustrated. Wanted, one or more vols. Jeffreys' "British Conchology;" "British Beetles," by E. C. Rye; British Lepidoptera, Coleoptera, shells, &c.—Mrs. Smith, Jessamine Cottage, Lower Shapter Street, Topsham, Devon.

EXCHANGE. — *Eriophorum vaginatum* (cotton sedge) in flower (not in fruit yet), for other Glumiferæ, say *Lensia panicum, Spartina setaria* and *Chamagrostis*, or other southern grasses.—Smith, 50 Stanley Street, Cheetham, Manchester.

OFFERED, the minerals saponite, red and green varieties, pitchstone, spherulite, Analcime, Prehnite, Yorbaneite, Osmonde stone (a banded volcanic ash), cone in cone ironstone, and various carboniferous plants, in exchange for minerals and crystals, many common.—Robert Pettigrew, Jun., Gartlee, Airdrie, N.B.

CONCHOLOGY. — *Lyonsia Norvegica, Trochus granulatus, Pholadidea papyracea, Isocardia cor, Avicula hirundo, A. tarentina, Pinna rudis, Pecten nivea, Spirula Peronii, Hippothyris psittacea, Terebratula cranium, Hyalæ trispinosa, Diodonta fragilis, Ianthina exigua, I. pallida, Buccinum Dalei, B. Humphreysianum, Fusus Berniciensis, F. Norvegicus, F. Turtoni*, wanted in exchange for the following, and other rarer British shells: *Rissoa fulgida, R. semistriata, R. cingillus, R. inconspicua, R. punctura, Cæcum trachea, Cardium nodosum, Venus ovata, V. casina, Hydrobia ulvæ, Nucula radiata, Lachesis minima, Barleeia rubra, Scrobicularia piperita, Emarginula rosea, Pecten lineata, Pholas parva, P. candida, P. dactylus, Dentalium tarentinum, D. entalis, Psammobia Ferröensis, P. tellinella, Tellina fabula, Tapes aurea, Lacuna pallidula, Thracia villosiuscula*. Lists sent.—A. J. R. Sclater, M.C.S., 23 Bank Street, Teignmouth.

WANTED, British birds' eggs, blown with single hole. Will give in exchange North American birds' skins and squirrels; also British birds' skins, and British butterflies and moths.—T. Mottershaw, 11 Manchester Street, Nottingham.

HISTOLOGICAL and pathological micro-sections of first quality in exchange for anatomical sections, also sections of chick embryo sections, comparative or human of equal merit. List on application.—Thomas Rowney, 16 Savile Street, Hull.

WANTED, "SCIENCE-GOSSIP," for 1883 to 1887, single volumes, bound or unbound. Offered, fossils, minerals, or other exchange.—P. Thompson, 19 Guerin Street, Bow, London.

WANTED, Foreign shells and naturalistic specimens, in exchange for choice slides, anatomical, diatoms, parasites, botanical, &c. — R. Suter, 5 Highweek Road, Tottenham.

DIATOM slides in exchange for other miscellaneous micromounts, or for small induction coil.—Rev. E. A. Hutton, Mottram, Manchester.

WANTED, micro-slides (diatoms, vegetable preparations, and miscellaneous), in return for British mosses, including many rare species, all named.—J. J. C., 9 Wythenshawe Road, Sale, Manchester.

LARVÆ of *A. caja* for larvæ of other common species.—Tunley, Powerscourt Road, Landport.

FIRST-CLASS injected anatomical specimens, foreign parasites, &c., mounted or unmounted. What offers?—M., Oakbank, Haslemere, Surrey.

WANTED, to correspond with another microscopical student, who will forward living marine micro specimens in return for pond-life ditto.—P. Thompson, 19 Guerin Street, Bow, London.

WANTED, Lepidoptera of England, in exchange for those from the United States. Magnificent American moths and butterflies, for European species in good condition.—Chas. S. Westcott, 613 N 17th Street, Philadelphia, Pa., U.S.A.

WANTED, foreign land and freshwater shells; good exchange in English shells given. The shells must be accurately named, and their locality marked; or, at any rate, the locality must be accurately given. Should be pleased to correspond with any conchologist abroad.—J. W. Williams, 35 Mitton, Stourport, Worcestershire.

WANTED, fossils from Barton and Bracklesham beds, London clay, Woolwich and Reading beds, also from Carboniferous limestone, Wenlock limestone, in exchange for others. Send lists. Also, what offers for sixty micro slides.—Geo. E. East, jun., 10 Basinghall Street, London, E.C.

WILL exchange vols. i. and ii. of "Garner" (bound) for vols. i. and ii. of "Naturalists' World" (bound); also copy of Taylor's "Playtime Naturalist," in exchange for entomological apparatus.—A. Nott, 75 Waterloo Road, S.E.

BOTANY.—Correspondents wanted in South or West of England for exchange of fresh plants during season.—Wm. Wallace, 28 South Mount, Aberdeen, N.B.

OFFERED, Cuvier's "Animal World," with 200 well-coloured plates (10 by 14 in.); Strickland's "Ornithological Synonyms" (accipitres); Jardine's "Naturalists' Library" (humming birds, game birds, including sand grouse and whales). Wanted, "Zoologist," before 1888.—J. H. K., 18 Church Street, Commercial Street, E.

WANTED, a small collection of British water plants from ponds and ditches, named, dated and localised. Exchange fossils or pathological micro slides.—J. Eyre, 4 Kender Street, New Cross, S.E.

WANTED, a circle of about six persons willing to circulate "Nature." The writer is willing to pay half the price of the magazine, on condition of keeping the copies after circulation; the expense to each member would thus be one penny a week, including the halfpenny for postage. Please address A. G. Tansley, 167 Adelaide Road, London, N.W.

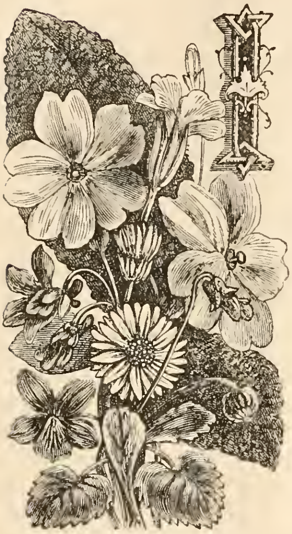
BOOKS, ETC., RECEIVED.

"Journal of the Royal Microscopical Society."—"The Microscope."—"American Microscopic Journal."—"A Further Contribution to the Study of the Mango Weevil" (the Report of the Sub-committee of the Microscopical Society of Calcutta).—"Home Rule and Federation," by a Doctor of Medicine.—"Contributions towards a Flora of Caithness," by J. F. Grant and A. Bennett.—"Anoplophyra Æolosomatis, a New Ciliate Infusorian Parasitic in the Alimentary Canal of Æolosoma Chlorostriatum," by H. H. Anderson.—"Canadian Entomologist."—"Haunts of Nature," by H. W. S. Worsley-Benison (London: Elliot Stock).—"The York Catalogue of British Mosses," by J. A. Wheldon.—"Fifth Annual Report of the Botanical Exchange Club."—"Diptera of Australia," parts iv. and v., by F. A. A. Skuse.—"The Rhætics of Leicestershire," by H. E. Quilter, with "Notes on Fossil Fish Remains," by A. Smith Woodward.—"Our Fancy Pigeons," by George Ure (London: Elliot Stock).—"Notes on Pet Monkeys," by Arthur Patterson (London: Upcott Gill).—"Celestial Motions: a Handy Book of Astronomy," by W. T. Lynn (London: Ed. Stanford).—"Science Examination Papers," compiled by R. E. Steel (London: Geo. Bell & Sons).—"The Nautilus."—"Transactions of the Hertfordshire Natural History Society and Field Club."—"The Garden."—"The Athenæum."—"The Gardener's Chronicle."—"The Asclepiad."—"Journal of the Royal Microscopical Society."—"Research."—"Knowledge." "The Century Magazine."—"The Amateur Photographer."—"The Garner."—"The Naturalist."—Cassell's "Technical Educator."—"The Botanical Gazette."—"Belgravia."—"The Gentleman's Magazine."—"American Monthly Microscopical Journal."—"Wesley Naturalist."—"Midland Naturalist."—"Feuilles du Jeune Naturalistes."—"The American Naturalist," &c. &c.

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

SOME WINTER BIRDS OF NEW JERSEY.

By Dr. CHARLES C. ABBOTT.



I HAVE been reading about British birds of late; my bookseller having sent me several dainty volumes, new and old, relating their many merits. One after the other, I have read each from title-page to index, and laid it down with a pang of jealousy, muttering something like this: "Their birds are preferable to ours." Then, before taking up some new author, I have gone for a ramble over fields and meadows, up hill and down dale, to see if we too cannot truthfully boast of birds of merit; and I have invariably come home, convinced that we can. But each new book that I took up caused the late walk to be forgotten, and I had all the unpleasant doubt and jealousy to undergo again.

Last night's meditations, however, solved the problem; we have the birds, but not the authors. No one yet has done them justice as a whole; although Burroughs, Torrey, Thoreau, Cones, and Maurice Thompson have done well, gloriously well, by many of them.

And now, a word or two of my recent walks—rambles in dull December's dismal days. Here in Central New Jersey, where our winters are milder than in New England and in even the northern section of our own State, we have birds in plenty, and, while few are of brilliant plumage, none are absolutely ugly and some are beautiful. Let us consider them briefly, bearing in mind that those mentioned are the familiar birds of a winter day.

Not because more abundant than certain sparrows, nor larger than most winter birds, for it is neither, but for the reason that no bright winter morning seems complete without him, I will mention first our beautiful sparrow-hawk. Whether hovering in the open, in search of a mouse, or dashing through underbrush in pursuit of a finch, this falcon is the embodiment of grace, and we are disposed to overlook his murderous errands, so attractively does he conduct himself. As a destroyer of song birds, if such only, I should have nothing but curses to fling at him; but this is an unfair view to take. From long observation, I am convinced that he prefers fun to feathers, and birds are safe whenever mice are accessible.

Of course the small birds do not look upon him in this light, and flee from his presence. So the pretty song sparrows did this morning, as I crossed an upland field, for one of these hawks came sailing by, and the songsters cut short their warbling, to dive into a clump of weeds. I crouched in an angle of the crooked fence to see what might happen, and had the hawk object within ten paces of me. He moved his head to and fro continually, looking for prey, and while so doing, the sparrows slipped to the ground and ran like mice for several yards; then up and darted into the bushes twenty rods away. In an instant the hawk was after them, but not quickly enough. Nearing the dense undergrowth, he saw it was too late and so sailed up into the air, wheeled and hovered over the field, looking, I am sure, for mice. Why sure? Because ere long he caught one, and sent the sparrows in haste from the thicket, as he flew to a tall tree therein, to enjoy a well-earned meal.

As I neared a clump of cedars by the public road, a host of tree sparrows fluttered about me. They were seed-hunting in the pasture as I approached, and were none too ready to leave it. These lively birds come to us from Canada in October and stay until April. I suppose those living near the haunts of the nightingale would not call tree-sparrows song birds, but the united twittering of a hundred or more cheers the gloomy winter day and robs the brown fields of their dreary outlook. What they lack individually is more than made up by their numbers, for all they do, and wherever they go, is concerted action.

Another Canadian bird, and a lovely one, is the white-throated sparrow, which in New England is known as the "Peabody bird." A favourite summer home of this finch is the White Mountain region of New Hampshire; and Ingersoll says, or ought to have done so, much about them in his delightful "Down East Latchstrings," a jolly book that a Yankee railroad gives away for the asking. White-throated sparrows sing magnificently all winter long. In jolly companies they crowd the sheltered thickets, and even when the mercury touches zero, or a foot of snow canopies upland and meadow alike, they are full of song; a few simple notes, it is true, but every one touchingly sweet. Here, too, is a case where concerted action makes the charm. A single white-throat would prove a trifle monotonous.

Akin to the above, is our splendid foxy sparrow, a grand songster, but one that is comparatively mute until March, when he haunts the hedgerows, and sunny nooks where the undergrowths are dense, and then sings with remarkable sweetness of expression. Bradford Torrey writes: "The finest bird concert I ever attended was given on Monument Hill (Boston, Mass.), by a great chorus of fox-coloured sparrows. . . . It was a royal concert;" and elsewhere he speaks of this bird as among the "immortals," and he is right.

Another finch, familiar in Europe as a cage bird, is our lively cardinal grosbeak. Locally, it is known as the "winter red bird," because here the whole year, and more of a songster in December than in June. His notes are very clear, penetrating and somewhat varied, so we do not tire of them. They are summer birds also, and in Southern Ohio last summer they were remarkably abundant and vocal. Both sexes sing, too, which is an advantage over most of our birds.

(*To be continued.*)

VARIATION IN THE MOLLUSCA, AND ITS PROBABLE CAUSE.

By Joseph W. Williams.

Part I.—Variation: to what extent must Varieties be named?

SOMETIMES I am accused as somewhat of a downright conchological "variety-monger" by those who do not personally know my views in this relation. I am ignorant of what reasons they have for assigning such a title to me, other than that I have named one or two well-marked variations, have published several articles on slug-variation, and have in my "Shell-Collector's Handbook" given a fairly full account of named varieties of British shells, some of which, perhaps, are practically worthless in a scientific sense, and not therefore worthy of a separate name. But these worthless—scientifically worthless—names have been added by workers in faunas, and consequently they must remain, and, more than that, they must at present be acknowledged. I make one or two references as to what kind of variety-names experience has taught me to be practically worthless. Such are, for example, the brown variety of *A. ater*, called (and appropriated) by Roebuck v. *brunnea*, since Lehmann in 1862 described a coffee or rust-coloured variation as *A. brunneus;* the v. *nigra* and v. *aterrima* of Dumont and Mortillet in the same species, which are respectively described by them as "animal black or blackish," and "animal entirely black," and which are nothing more or less than identical colour-forms, and, when all is said and done, nothing but types; the v. *pallescens* of Roebuck, described as "light yellow," when Moquin-Tandon previously had described a colour-form as "dirty-white, a little reddish or yellowish," under the same name; the v. *pumila* of Moquin-Tandon in *Limnæa stagnalis*, described as "shell much smaller, amber-coloured," when Linné in 1758 described a variety of this species as *Helix fragilis*—now well known as *L. stagnalis*, var. *fragilis*—which to all intents and purposes is identical with it. The so-called varieties *minor* and *major*, *maxima*, &c., which may be any size below or above a certain standard, and are nothing else than so many Tom Thumbs and Irish giants of their kind, not counting, indeed, that the whole thing brings in confusion, since in many cases what we proudly enough term var. *major* in this country are only ordinary sizes of the same species a country or so away from us on the Continent. Rather would it not be better if any exceptionally small or large form of a species be found, to give its length and its breadth (between two most widely separated points on the body-whorl) in millimetre measure than to so absurdly christen it either var. *minor* or var. *major*, as the case may be. I consider it absurd, as Locard has done in the case of *Bithynia tentaculata*, to name colour-forms very closely resembling one another, and withal not differing much, if at all, from the recognised type-colour. I refer to what he has termed var. *fulva* and var. *cornea* of this species. To revert slightly, the absurdity of the special naming of small and large forms is more especially seen, perhaps, when it is even carried to such an extent as to have two separately named Tom Thumbs, and two separately named Irish giants of any given species. Thus, taking *Succinea Pfeifferi*, there is a var. *parvula*, so named by Pascal, and a var. *minor*, so named by Rossmässler; or, taking *Clausilia biplicata*, there is a var. *grandis*, so named by Rossmässler, and a var. *maxima*, so named by A. Schmidt, which differ from one another just by the pigmy difference of a millimetre.

Then, would I ask, does it make conchology more scientific—does it not rather make it look more "big," with no practical or theoretical result to science—to call a colour-form var. *albida*, var. *rubra*, &c., when the whole matter would be as well expressed in the mother-tongue by saying "a white form," or "a red form of such and such a species," as the case may be? Does not all this rather tend to subvert the ends of science, since it is leading along the broad way to confusion? For example, there is a var. *albida* of *Helix virgata* described as "unicolor, spira paullo elatiore, d. 17, a. 11–12 mill.," and there is also a var. *albicans* described as "a shell entirely white or whitish, without markings," in the same species. Whence the difference?

What, then, do I propose? An ink-pot is an ink-pot, whether it contains red, black, or blue ink. It remains an ink-pot, and nothing more. But there are various shapes of ink-pots; there are varieties of ink-pots. I am not a variety simply because I am taller or smaller than my friend Albert Paling, or John Cook. Therefore, I would cut out for ever all the named so-called varieties, which simply denote a unicolorous colour-change from that in the recognised type, and designate its characteristic colour in English terms of speech. I would cut out for ever and ever all the so-called varieties—*major*, *grandis*, *minor*, *parvula*, *brevis* and *parva*, and designate their largeness or smallness in terms of measurement only —preferably in millimetres. But I would reserve all the variety-names which denote a well-marked structural change in the shell from the recognised type, as the vars. *Burnetti*, *stagnaliformis*, *ovata*, and *lineata* of *Limnæa peregra*, and so forth. But I would not recognise varieties marking only slight changes in shape from the type, or from previously described varieties, as the var. *acuminata* of *L. peregra*, which differs from var. *ovata* simply and only in having a smaller mouth and a more produced spire.

Some will doubtless think my notions somewhat too restrictive in character, but, if carried out, they will stay an almost inevitable confusion. The third part of my paper—The Probable Cause of Variation —will be chiefly worked out on the physiological basis of heredity, which I reserve till later, since I send this forward for the purposes of discussion, and for the gathering together of the present-day views of conchological workers on this question, several of whom will doubtless write on the subject to these pages. The second part will discuss this question in more detail.

(*To be continued.*)

Mitton, Stourport, Worcestershire.

Hairs on Pupæ.—All the members of the family Liparidæ have hairy chrysalides, viz.:—*Liparis chrysorrhœa*, *auriflua*, *salicis*, *dispar*, and *monacha*; *Orgyia pudibunda*, *fascelina*, *cœnosa*, *gonostigma*, and *antiqua*; *Demas coryli*. One of the commonest of these is salicis, which has a very hairy chrysalis.—*F. W. Paple, Bolton.*

THE FLORA OF THE PAST.

No. IV.

By Mrs. Bodington.

[*Continued from p.* 123.]

THE immense development of apparently new orders and species of mammals does not occur till the Eocene Tertiary. In Europe; as is well known, there is a great gap between the Upper Cretaceous and the Tertiary series; but in America they pass so gradually into one another in the Laramie formation, that it is still a matter of dispute whether the Laramie shall be called Upper Cretaceous or keep its old name of Lignite Tertiary. In the Canadian North-West there is no break between the Fox Hills group, undoubtedly Upper Cretaceous, and the Laramie; the beds of Miocene conglomerate lie unconformably on the latter, the Eocene being absent in this region. Professor Nicholson says, "The Lower and Upper Cretaceous rocks are sharply separated from one another, from a botanical point of view. The Mesozoic period is characterized by the prevalence of the Cryptogamic group of the ferns, and the Gymnospermic groups of the Conifers and Cycads. Up to the close of the Lower Cretaceous, no angiospermous exogens are certainly known to have existed, and monocotyledonous plants or endogens are very poorly represented. With the Upper Cretaceous, however, a new era of plant life, of which our present is but the culmination, commenced, with a great and apparently sudden development of new forms. We have now an astonishingly large number of true angiospermous exogens, many of them belonging to existing types, and along with these various monocotyledonous plants, including the first examples of the great and important group of palms." It is strange to think of this modern type of vegetation appearing whilst the "ocean was still tenanted by Ammonites and Belemnites, and when land and sea were still peopled by the extraordinary extinct reptiles of the Mesozoic period." There are indications, however, from later researches, that the development was by no means so sudden as it at first appears. Poplars, laurels, sassafras, mallows and willows, sedges and grasses have been found in Lower Cretaceous rocks, and we may safely infer that it is only the present imperfection of our geological researches which has prevented us from finding a much more extensive flora.

But in the Dakota group of North America, Cenomanian of Europe, a magnificent flora confronts us, richer and more varied than any collection of plants in one region of the earth could be now, owing to the peculiar conditions of climate, which allowed beeches, oaks, chestnuts, palms, tulip-trees, cycads, tree ferns, and magnolias to flourish together. To these may be added fig-trees, eucalypti, plum-trees, cinnamon trees, various species of leguminous plants, and, strange to say, splendid specimens of Compositæ, the most highly specialized of flowers.

The animal remains of the very highest Cretaceous formation, the Laramie, are still Mesozoic, containing bones of deinosaurian reptiles, an order on the point of disappearing for ever. These are found just below a bed of curious fossil fruits to which the name of Esculus has been given.

As in the Cretaceous period there are already to be found "forty-eight genera belonging to at least twenty-five families, running through the whole range of the dicotyledonous exogens." We are, botanically speaking, in modern times. Throughout the Eocene and Miocene period the same glorious vegetation flourished from the Equator almost to the Pole. One cannot help feeling that the most delightful conditions upon earth had passed away before man, or at least man as we know him, appeared upon the scene. The exquisite beauties of the Laramie, the Eocene and Miocene landscapes were lavished upon animals incapable of appreciating them, except from a gastronomic point of view.

During the Eocene and Miocene period all the known orders of mammals made their appearance, with an abundance of species, and a wealth of forms, of which we can have but an imperfect idea. Sir J. W. Dawson says, "It is certain that throughout the later Miocene and earlier Pliocene the area of land in the northern hemisphere was increasing, and the large and varied continents were tenanted by the noblest vegetation, and the grandest forms of mammalian life that the earth has ever witnessed. As the Pliocene drew to a close, a gradual diminution of warmth came on, accompanied by a submergence of the land, and changes in the warm ocean-currents. Thus gradually the summers became cooler and the winters longer and more severe, the hill-tops became covered with permanent snows, glaciers ploughed their way downward into the plains, and masses of floating ice cooled the seas. The more delicate forms of vegetation were chilled to death, or obliged to move farther south, and in many extensive regions, hemmed in by the advance of the sea on the one hand and land-ice on the other, they must have altogether perished."

Strange to say, the plants, which one would think had less power than animals to fly before the advancing cold, suffered less than the mammals, which have never recovered the shock of the glacial period, and survive as a sadly diminished remnant. Comparing the past climatic conditions of North America, Europe and Asia, with the present state of these regions, I think we are justified in considering that we still live in the glacial period, and that future geologists would so rank the insignificant deposits dignified as Pleistocene. Whilst the upper part of the Northern Hemisphere showed the highest mountain peaks hardly emerging from their glacial ice-sheet, the surviving animals and plants fled towards the south; in America to the regions about the Gulf of Mexico, and in Europe and Asia to Africa and the Indo-Chinese peninsulas. Thence the survivors gradually returned as far north as climatic conditions would permit. But the world is hardly likely ever again to see tree-ferns, palms, magnolias, and fig-trees in Canada and Siberia, still less in Greenland and Spitzbergen, where the glacial period still reigns in full intensity.

The struggle with the adverse conditions of climate has probably been highly beneficial to the evolution of the higher qualities of man. We have reason to think that he existed as a reasoning being even in the enervating conditions of Miocene times, but probably his reasoning faculties were more rapidly developed during the exigencies of life in the glacial period, than during long ages before. The great ape Dryopithecus disappeared for ever before the advancing cold, but man boldly struggled on, catching seals and reindeer, and hunting the whale in the estuary of the Firth of Forth. He thrives on the cereals which he himself has brought to their present perfection; he has cultivated to the utmost the fruits of temperate climates, and European man has no reason to envy his Miocene progenitor amongst his figs and palms.

STUDIES IN ECONOMIC BOTANY.

Paraguay Tea or Maté.—This name is applied to the prepared leaves of one of the hollies—*Ilex Paraguayensis*, St. Hil. A small shrubby tree with alternate, simple, ovate-lanceolate, smooth, irregularly-serrated leaves. The plant is cultivated

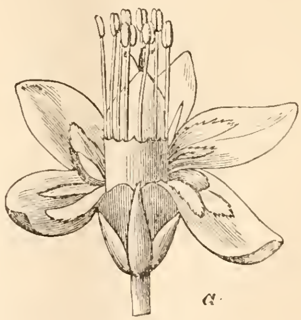


Fig. 103.—Flower of Coca (*Erythroxylon coca*).

in the provinces of Brazil and Paraguay to a very large extent for the sake of its leaves, which are used for making tea, as the leaves of the Chinese plant (*Thea viridis* and vars.) are used in this and other countries.

The means adopted for the preparation of the leaves differ very widely from those employed for the preparation of Indian and Chinese tea. Collectors are sent out to cut the branches off the trees, and these are brought in and laid upon hurdles and roasted over a fire; they are then placed upon a hard floor, and well beaten with sticks until the leaves are detached. The dried leaves thus separated are ground in rude mills into a coarse powder, after which they are ready for use. The material thus prepared is packed in leathern bags and skins (very frequently the skin of the great ant-eater) and sent to market, and one may easily judge of the importance of this article in South American trade, when it is stated that not less than 5,000,000 lbs. are annually exported from Paraguay alone. There are three sorts known in the South American markets—the Caa-cuys, consisting of half-expanded leaf buds; the Caa-miri, the leaf torn from its mid-rib and veins without roasting; and the Caa-guaya, or *Yerva de Palos* of the Spaniards, the whole leaf with the petiole and small branches roasted.

The maté is prepared for drinking by putting a small quantity in a teapot with a little sugar, and adding boiling water. When sufficiently cool, the tea is drunk from the spout, or imbibed by means of a small tube covered with a wire gauze or perforated at one end, known as a "bombilla." It has an agreeable, slightly aromatic flavour, and is very refreshing and restorative to the system after enduring fatigue. It contains the active principle "theine," as Chinese tea does. It acts in some degree as an aperient and diuretic, and, if taken in excess, causes diseases similar to those produced by strong liquors.

Fig. 104.—Cinnamon (*C. Zeylanicum*).

CINNAMON.—This favourite spice and medicine is the produce of more than one species of Cinnamomum, although the best kind is that furnished by *C. Zeylanicum*, Nees: a tree about forty feet in height, native of Ceylon, but now cultivated in many other parts, especially in India, where it is naturalised. The branches are smooth and shining, leaves variable, ovate, or ovate-oblong, three-nerved, smooth, shining. Flowers in terminal or axillary panicles. The tree succeeds best in Ceylon, where, according to Royle, the soil is pure quartzose sand, climate damp, temperature high and equable.

It is stated that the plant is rather difficult to cultivate in this country, but thrives best in a damp, high, and equable temperature in hot-houses.

The uses of cinnamon as a spice are well known. The bark is collected from May until October; in collecting it the branches are cut off, varying in thickness from ½ inch to 3 inches in diameter; longitudinal incisions are made, and the bark peeled off in strips. After twenty-four hours the epidermis and green colouring matter upon the inside are scraped off, when the strips quickly contract in the form of quills; the smaller ones are placed inside the larger, and in that way they are imported. They are dried by two processes—first, in the shade; and secondly, in the sun.

Cinnamon is largely imported from Ceylon; in fact, the best samples are imported from that country, although the quality varies according to the season and the time of collecting. It occurs in long, cylindrical bundles about forty inches long, is about one-fifth of a line in thickness, of a yellowish-brown colour, and very friable. An oil, known as "oil of cinnamon," is obtained from the bark and imported from Ceylon. The powdered bark is macerated in a solution of salt and then distilled. Spirit of cinnamon is obtained by dissolving the oil in spirit. The chemical nature of cinnamon is as complex as many other like compounds. There is a peculiar acid known as cinnamic acid, a volatile oil, tannin, resin, mucilage, colouring matter, and woody fibre. It possesses aromatic, stomachic, and slightly astringent properties. It is used in medicine in a powdered state, or the oil is used, which is a very powerful stimulant. The oil is also largely used in confectionery, cookery, &c.; it is also known in practice, and used as a tincture as an adjunct to other medicines.

Fig. 105.—Coca (*Erythroxylon coca*).

COCA.—This is the name applied to the dried leaves of *Erythroxylon coca*, Lam., native of Bolivia and New Grenada, also largely cultivated in those parts, as well as in Peru, to a height of from 2,000 to 9,000 feet. It is a shrubby plant, growing from 6 to 8 feet in height, having the appearance of the tea plant. Leaves 1½ to 2 inches long, oval, membranous, flat, acute, entire, dark green above, paler beneath, three-nerved in the middle. Flowers numerous, produced in the axils of the leaves often from the branches where the leaves have fallen away; calyx 5-cleft, petals five, appendiculate stamens ten, united at the base.

The matured leaves are collected, scorched in an earthenware pan, and dried. In that state they are ready for consumption. The annual consumption is enormous; it forms an article of internal trade with the various tribes. It is estimated that its annual consumption is not less than 30,000,000 pounds. The leaves are used for making an infusion as tea, or chewed with a little unslaked lime. After the morning meal both men and women take a mouthful

Fig. 106.—Paraguay Tea (*Ilex Paraguayensis*).

of the leaves with a little lime, adding constantly through the day fresh leaves, and without taking any more food they are enabled to do a hard day's work; it lessens the desire for food, and excites the nervous system. It produces about the same effect as opium, and those habitually chewing it find it difficult to abandon it.

J. T. R.

BOTANICAL NOTES FROM THE SWISS HIGHLANDS.

OVER THE GEMMI TO ZERMATT.

By Dr. De Crespigny.

I ARRIVED with a young friend very early in July at Thun, where I had arranged to meet a brother of the Vasculum, and proceed in his company over the Gemmi pass into the Valais country. I had anticipated the day and the hour of our meeting, so went to Merlingen on the lake for the interval; within easy reach of Interlacken by a newly-constructed carriage-road along the north shore, with many cuttings and tunnels on the mountain side, reminding one of the Axenstrasse by the lake of Lucerne. We visited the cave of St. Beatus, to which there is easy access from the road. On the rocks in this direction grow *Laserpitium Siler* and *Peucedanum Cervaria*,—the former also about the cave itself, with *Hieracium amplexicaule*,—*Dianthus sylvestris*, and *Saponaria Ocymoides*. In the woods, *Geranium sanguineum* and *sylvaticum*, *Digitalis lutea* and *ambigua*, or *grandiflora*,—the former the better name of the two, for, if anything, it is a size smaller than *purpurea*,—*Epipactis ovalis* and *Cephalanthera rubra*. By the roadside the commoner plants were *Teucrium montanum* and *Chamædrys*, *Stachys recta*, and *Silene nutans*.

Behind the hotel at Merlingen there is a ravine leading to an Alpine valley called the Justiz Thal, well worth an excursion from Thun, if not from Interlachen. A steep and stony footpath by the side of a torrent leads up the ravine to an altitude of about 1500 feet above the lake, when the ascent becomes more gradual and the valley opens out. It is enclosed in by the perpendicular crags of the Sigriswylgrat and of the Beatenberg on either hand. Narrowed-leaved willows, *incana* and *purpurea* mostly, with *Epilobium rosmarinifolium* and *Myricaria Germanica*, fringe the sides of the torrent; while several high Alpine plants—*Thlaspi rotundifolium*, *Hutchinsia alpina*, *Linaria alpina*, &c., from seeds washed down by floods from the higher ranges—grow among the stony debris adjoining. The first alpine pasture reached afforded an abundance of that beautiful umbel *Astrantia major*. This was growing in company of *Salvia pratensis*, *Colchicum autumnale* (alpine form), &c.; higher up towards the base of the cliff, *Gentiana lutea* and *Lilium Martagon*. Further on, under the pines, *Moneses uniflora*, *Stellaria nemorum*, *Galium rotundifolium*; here and there *Cirsium spinosissimum*, with *Carduus defloratus* and *personata*, *Rosa alpina*, blue and yellow Aconite. The rocks precipitated from the heights above were covered with mosses; many uncommon and interesting species among them. A projected visit to the Schaflock cavern and an ascent of the Gemmenalphorn were thwarted by the occurrence of a thunderstorm and setting in of heavy rain. We were compelled to beat a precipitate retreat and abandon the design. Among the plants collected there is nothing calling for remark except that the *Rosa alpina* had peduncles and young fruit covered with glandular setæ (var. *pyrenaica*); and some specimens of *Senecio erucifolius*, growing with others of ordinary characters, were almost white with hoary pubescence.

The following afternoon found us in company with our botanical friend at Spiez, on the opposite shore of the lake. Owing to the forbidding aspect of the weather, all question of attempting the Niesen was laid aside. We went on therefore to Kandersteg direct, whence we made the ascent of the Gemmi on the following morning, wrapped up in a Scotch mist—if there is any difference between that and a Swiss one—the whole way, and seeing nothing of the glorious views it affords; neither was anything gathered worth recording to compensate for the loss: as my botanical brother very justly remarked, the first part of an Alpine ascent, that through the forest, is what may be called the intervening unproductive region. *Thalictrum aquilegifolium*, *Bellidiastrum Michelii*, *Viola biflora*—why *biflora*, it is hard to say; as a rule, the slender stems are mostly single flowered—these with *Saxifraga rotundifolia* and *cuneifolia* were plentiful under the wet, shady, rocky banks. A peculiarity by the by, and one by which the plant may be readily recognised, is the rich violet-brown colour of the undersides of the leaf rosettes in *S. cuneifolia*, but the rosettes are double in the plant, and this colouring is peculiar to the lower or older one. As the termination of the steep portion of the ascent is neared, the appearance of *Alchemilla alpina*, *Adenostyles glabra*, *Bartsia alpina*, *Biscutella lævigata*, *Dryas octopetala*, *Astrantia minor*, *Kernera saxatilis*, *Saxifraga stellaris* and *Aizoon*, *Trollius Europæus*, *Primula viscosa* and *farinosa*, Rhododendrons, &c., indicates an approaching change for the better. The only uncommon plants met with was *Geranium lividum* or *phæum*, of which a patch was found in one place, and *Carex Micheliana*—a form of *glauca*. The first really good "find," a single specimen only, was *Aquilegia alpina*, then *Carex tenuis*, *Anthericum liliastrum*, a beautiful lily with racemes of large, pure white flowers; *Phyteuma betonicifolium*, spikes handsome, large, dark purple; *Veratrum album*, *Phleum Michelii*—this is a stouter grass than *alpinum*, and grows in wet muddy places, whereas the other affects dry stony pastures; the glumes, too, are lanceolate, not truncated. Also *Veronica Teucrium*, flowers intense blue, which do not fade on drying; *Pedicularis verticillata*, a purple-flowered species, with whorled leaves, and stems furnished with lines of glandular pubescence; *Pinguicula alpina*, *Athamanta cretensis*, *Gentiana bavarica* and *ciliata* (latter out of flower), *Anemone narcissiflora*, and *Hedysarum obscurum*. The path for some distance onwards leads along a slope which on the left falls into a deep ravine, with a glorious view of the Blümlis Alp in the vista beyond; of this nothing was seen, but on emerging upon the open plateau, which has to be traversed for about two leagues in order to reach the descent to Leukerbad, the mist and clouds began to lift and hold out promises, which were not unfulfilled, of brighter weather to-morrow. The greater part of this open space as far as the Schwarrenbach inn—half-way—is pasture more or less covered with debris, the remains of avalanches which have fallen from the Rinderhorn in former years; beyond the inn the path winds entirely among rocks and stones, and by the stony shores of a small lake called the Daubensee, enclosed on all sides by mountains bare of vegetation—a picture of barren desolation; the highest point of this plateau, a mile or so from the inn, is 7,500 feet above the level of the sea. A few stunted mountain pines grow near the inn, otherwise there is no vegetation other than the small alpine plants of the kind usually seen on calcareous soil at this elevation. The following were gathered:—

On the Kandersteg side, *Crepis aurea*, *Chrysanthemum atratum* and *alpinum*, *Cerastium latifolium*, *Erigeron alpinus*, *Erinus alpinus*, *Gaya simplex*, *Gentiana verna* and *acaulis*; *Gnaphalium dioicum*, *Globularia cordifolia*, *Hieracium villosum*, *Helianthemum œlandicum* var. *alpestre*, *Leontodon pyrenaicum*, *Myosotis alpestris*, *Oxytropis campestris*, *Potentilla aurea*, *Plantago alpina* and *montana*, *Phaca astragalina*, *Primula farinacea*, *Ranunculus montanus*, *Silene acaulis*, *Sibbaldia procumbens*, *Senecio doronicum*, *Salix retusa* and var. *serpyllifolia*, a slightly hairy form of *arbuscula*, *myrsinites*, *reticulata*, *Trifolium alpinum*, and *Viola calcarata*. Nothing calling for remark except that much of the alpine *Plantago* was the pubescent form with globose heads. *Cerastium latifolium* is a plant rarely met with except at a great elevation; it differs from *alpinum* chiefly in being furnished with a viscid instead of a simple pubescence, and in having no rosettes of sterile leaves, but the leaves of *alpinum* are quite as broad: of this no specimens were gathered, but an alpine form of *arvense* was plentiful among the stones. On the Leuk side where the soil is stony, and snow lying unmelted in patches: *Androsace bryoides* and *Chamæjasme*, *Avena distichophylla*, *Carex nigra* and *firma*, *Cherleria sedoides*, *Draba aizoides*, *Elyna spicata*, *Festuca varia*, *violacea*, and *nigrescens*, *Hutchinsia alpina*, *Lloydia serotina*. Near the Wildstrubel inn, where there is some pasture: *Phleum alpinum*, *Ranunculus alpestris*, *Thlaspi rotundifolium*, *Soldanella alpina*, *Sedum atratum*, *Saxifraga oppositifolia*, *moschata*, and *exarata*, *Sesleria cærulea*, etc. Time does not permit of search among the debris at the foot of the Wildstrubel glacier, nor of ascending the Schalmette, or *Ranunculus parnassifolius*, *Crepis pygmæa*, and *Kobresia caricina* might have been added to the list. With regard to *Elyna spicata*, however, the opportunity of examining this plant fresh gathered, and neither too immature nor too far gone, was not missed, and I noted as follows: there is an obtuse membranous glume common to a barren and a fertile floret, the latter sessile, and furnished with two small membranous scales, half the length of the achene. *Kobresia*, which differs in the spike being a compound instead of a simple one, is described as having spikelets similarly constructed, but with more than two florets in each of them. If there is no other difference, they might be combined and treated as species of a common genus. However, the stigmas are pubescent in *spicata*, papillose in *caricina*. Gremli does not apparently consider *Festuca nigrescens* (or *nigricans*, Schl.) as different from *violacea*, and structurally perhaps there is nothing of greater importance than the shorter awn of the lower glumella in *violacea*, and the slight difference in their respective ligules, but in habit they are obviously distinct: *nigrescens* is stouter, *varia* has a rhizome emitting fascicles of leaves; *violacea* and *nigricans* have roots which are simply fibrous, shorter leaves, and but for the awn and the violet tinge of the panicle and of the leaf sheaths might pass for forms of *ovina*. Bouvier lays stress upon the branches of the panicle being geminate.

I may remark also that *Avena distichophylla* in the early stage of its flowering might easily be mistaken for *subspicata*, if the peculiarity of its leaves be unobserved.

The descent to the baths is by a steep winding mule-path cut in the face of the precipice. From a ledge, almost inaccessible, we obtained *Aronicum scorpioides*, and, on debris at the foot of the descent, *Galium helveticum*.

In a meadow farther on, *Geranium lividum* was met with again. The vegetation about the baths of Leuk has still much of an Alpine character about it, for the height of the place is 4,600 feet above the level of the sea; and the first indication of being in a country possessing a somewhat different flora to that of Berne is the occurrence of the larch, which seems to take the place of the silver fir, so plentiful on the Oberland Alps.

A good carriage-road leads hence, nine and a half miles, along the Dala Valley to Leuk and Susten in the valley of the Rhone. The following interesting plants were gathered en route: *Convallaria verticillata*, *Coronilla varia*, *Dianthus atrorubens*, *Erucastrum Pollichii*, *Erysimum helveticum*, *Euphorbia Gerardiana*, *Laserpitium Siler* and *glabra*, *Lasiogrostis calamagrostis*, *Melica ciliata*, *Ononis natrix* and *rotundifolia*, *Sisymbrium austriacum*, *Stipa pennata* (near Leuk), *Sedum reflexum*, *Thalictrum fœtidum*. In the Rhone valley, the *Euphorbia* above mentioned is the prevailing species of the genus: on the Kandersteg side of the Gemmi it is *E. Cyparissias*, which one notes by the roadside among the rocks. *Lasiogrostis* grows in dense tufts; the awns are much longer than in *Calamagrostis* proper, and these with the long silvery hairs at the base of the caryopsis impart a silky appearance to the panicle. The cruciferous plants are not easily made out unless in fruit. The *Erucastrum* might be easily passed over for *Sinapis arvensis*. The *Sisymbrium* may be also mistaken, but in fruit readily recognised by the peculiar torulose character of the pods. *Erysimum helveticum* has narrow leaves, large petals, and a heavy puberulence, with angular stems and fruits. It is very common in the Valais.

(*To be continued.*)

ON A METHOD OF PREPARING AND MOUNTING MINUTE BEETLES.

AFTER trying various materials, I have found that the circles of thin glass used by microscopists are most convenient for mounting minute beetles. My experience so far has been confined to a tropical climate, where I was led to discard the old paper mounts because every sort of gum used invariably caused discoloration of the card. I now use Canada balsam to fix the insects on the glass and the glass on the small triangular card which receives the pin. The general appearance of the complete mount is shown in Fig. 107. The card

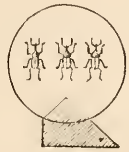


Fig. 107.

may be made of sufficient size to contain any notes of date, locality, &c., that may be considered necessary. The most convenient sizes of glass circles I have found to be ½-inch and ¾-inch. Small insects can be placed two or more on one circle, larger specimens singly.

I am accustomed to set the insects before finally mounting them, which allows of their being more neatly arranged. My method is as follows: for "setting-boards" I use thick glass slips, 3 inches by 1 inch (this size being convenient as fitting into micro-slide cases); a small drop of liquid balsam is placed on the glass and spread over a space corresponding to the size of the expanded insect; the beetle is placed in the centre of this patch, and its legs and antennæ neatly arranged with a setting needle, the viscid cement holding them in any position in which they may be placed. A large number of insects may be set out side by side on the same piece of glass, and allowed to remain there until sufficiently dry. The limbs of the most minute beetles can be accurately arranged with the aid of a watchmaker's lens or a simple dissecting microscope. After a few days they will be sufficiently stiff to retain their position. The glass slide should then be immersed in a bath of benzine collas, which quickly dissolves the balsam and releases the insects, which rise to the surface of the liquid. They can then be lifted out and placed on blotting-paper to dry. I have never found the benzine to injure even the most delicate colours, nor does it disturb scales and hairs when present on specimens. As soon as the benzine has evaporated the insects are ready for mounting on the thin glass circles; the very smallest touch of balsam is enough to keep them in position.

This same method is equally applicable to some other classes of insects, such as minute hymenoptera, ants, and hemiptera. I consider the advantages of this system to be—that insects can be more accurately set out before being mounted, thus ensuring greater regularity and neatness; that the under-surface of the insect can be readily examined through the glass; that the previous immersion in benzine acts as a preservative against mites and fungus; that the insects can be retained on the glass setting slips (in which condition they can be more easily packed) until it is convenient to mount them. (It might be advisable to keep all duplicates in this manner until required.)

E. E. GREEN.

Punduloyo, Ceylon.

A CURIOUS ANIMALCULE.

ABOUT a mile from this place there is a small stream which rises in a bank, and, after running perhaps for a hundred yards, discharges itself into the Six-mile Water which flows through the valley below, and afterwards enters Lough Neagh. The water is beautifully clear, and, until recently, was used in connection with the bleaching of linen. From a few yards of the source to near the place of its discharge, it is filled so completely with watercress that, in the early spring and late autumn, no water in the portion specified can be seen. At the lower end it broadens and deepens into a sort of basin before overflowing into the adjoining river. Here there is usually a quantity of floating vegetable matter, consisting of duckweed, and, in the season, sprays of watercress and other substances.

When looking for something new for microscopical observation about fourteen years ago, I happened to pass this stream, and so filled my bottle from the little basin just mentioned. On examining the contents shortly afterwards, I found it rich with animalcule life, prominent among which were the common rotifer, the bell animalcule, the drinking-cup animalcule (*Carchesium polypinum*), and an animalcule I did not know, of which the accompanying outline, drawn however from memory, is, I believe, a fair representation.

My microscope is but a small one; nevertheless, it has served for nearly thirty years for the observation of the larger forms of animalcule life. When I first caught sight of the stranger my attention was at once arrested, and I sat watching it for a considerable time. Its body was nearly as large, and somewhat similar in shape, to that of the common rotifer; but in place of the tail-foot, it had a couple of extremities that were about twice as long as its body. On these extremities, or legs, it stood upright, moved about as a person does on stilts, and when anything appeared specially to attract attention, it apparently became curiously inquisitive, then stood still, and swayed its body gracefully to and fro in a ridiculously sentimental sort of manner. When it met with a thread of conferva stretching across and above its path, it complacently laid its body over it, tucked up its extremities in the direction of its ciliæ, and twirled itself round like a wheel, putting one instantly in mind of certain performances one has witnessed on a tight-rope. This operation it continued for what seemed a long time. Then, apparently seeking a new diversion, it commenced a curious performance, which I could liken to nothing so much as that violent gymnastic exercise known as the cobbler's dance. Notwithstanding the fact that the creature's body was only about one-third of its entire length, it pounced down upon its posterior portion and rose again with astonishing rapidity, many times in succession, appearing greatly agitated at the conclusion. This operation was repeated again and again. Indeed, the creature was constantly on the move, and proved to be by far the liveliest specimen of animalcule life I had ever met with.

On making a second dip into my bottle, I again found another specimen of my new acquaintance on stilts, and I felt, whatever its name might be, it could have no more appropriate one than that of stilt-animalcule.

Fig. 108.—Curious Rotifer.

I at once looked at what books I had on the microscope, and especially at those portions treating of animalcule life; but could find neither figure nor description of the little stranger. Since, however, my books were all of a popular and not exhaustive character, I concluded it would be figured in more elaborate works, to which, however, I had no access; and, though I have since borne the matter in mind, I have never met with anything that threw any light on the subject.

About six weeks since, learning that the Belfast Field Naturalists, among whom there are several experienced microscopists, were to hold a microscopical evening, the thought occurred to me to send to the meeting a figure and brief description of my little animalcule on stilts, in the hope of eliciting some information respecting it; when I was surprised at being informed by the secretary that none of the members of the club present at the meeting knew anything about it.

I have on several occasions during the past fourteen years examined water and duckweed from the little stream from which I obtained my interesting specimens, but am sorry to say I have not been successful in getting more.

W. S. SMITH.

Manse, Antrim, Ireland.

LINES OF ELECTRICAL INDUCTION.

By B. W. CHAPMAN, M.A., B.C.E. (Adelaide University).

SOME very pretty experiments showing the lines of electrical induction across an insulating medium may be made by using as the insulator pure turpentine besprinkled with the small white needle-like crystals of sulphate of quinine. To perform the experiments, take a flat glass dish, and pour in turpentine to the depth of about a quarter of an inch. The turpentine should be perfectly pure and dry, or it will not act as a non-conductor. Having sprinkled this uniformly with sulphate of quinine, place two brass balls in the vessel, one at either end, and connect them by means of chains, one with an electrical machine, and the other with earth. On electrifying the machine, the crystals suspended in the turpentine will become polarised, and form in curved lines, end on end, between the metal balls, in exactly the same way as iron filings take up the lines of magnetic induction between the poles of a magnet.

This experiment may be varied in a great number of ways, by varying the number and shape of the electrified bodies placed in the medium. It may be used to show in a very pretty manner that there is no electric force within a closed conductor. To do this, a metal ring connected with the machine should be placed between the two balls, both of which should be connected with earth. On working the machine, the lines of force will be seen very distinctly mapped out between the balls and the ring; but within the ring, the quinine is seen to be in the uniformly cloudy state in which it was before the electrification of the system. The same thing will of course happen if the circular ring be replaced by any closed conductor, such as a stout wire triangle or rectangle. Again, if one of the balls be placed in the centre of a large metal ring, the ball connected with the machine, and the ring with earth, or *vice versâ*, the lines of force become radial straight lines from the centre to the circumference of the ring, and are mapped out with perfect clearness by the quinine crystals. The lines of induction may be rendered very complex by having a larger number of balls in the vessel, some attached to the machine, and others to earth, but they are in all cases distinctly marked by the crystals. By placing the glass dish upon an ebonite plate, thus securing a dark background, I have been enabled to secure photographs of a number of interesting cases.

THE CANNIBALISM OF THE LADYBIRD (*Coccinella dispar*).

WHETHER the pupæ of this useful insect are protected by their peculiar odour against other enemies, it is not decided. But they are sadly open to the attacks of the larvæ of their own species. It must be confessed that *C. dispar*, with probably its congeners also, is a cannibal. When a larva in its travels encounters a pupa, moored by the posterior extremity to a leaf and unable either to fight or flee, it at once seizes the booty from behind. I have watched not a few such encounters through a lens, and have distinctly seen the mandibles of the larva plunged into the body of its victim, and working very diligently. The pupa which is thus being devoured at times raises its head or moves it from side to side, until its life is extinct. Mr. Billups, F.E.C., one of our most observant entomologists, tells me that he has observed similar cases. But as his cannibal specimens were in captivity, he suspected that they might have been driven to such an unnatural diet from want of their legitimate prey, aphides. I am sorry that I cannot give the ladybirds the benefit of this doubt. I witnessed instances of cannibalism, not merely in a glass box in which I had placed some larvæ and pupæ, but on a row of black-currant bushes where aphides were swarming. Hence, I fear that the Coccinellæ are deliberate and habitual cannibals. It is needless to ask if this practice must not seriously interfere with the multiplication of the species, and limit its usefulness as an aphis destroyer.

Whether this form of cannibalism tends to weed out the strongest or the weakest members of the species, I am not able to determine. The destruction falls chiefly upon the progeny of such ladybirds in each brood as are the earliest to deposit their eggs. If such eggs, as I suspect, give rise to the finest specimens, we have here a process likely to result in the survival of the unfittest.

I have never seen an adult Coccinella thus attacking any of the pupæ of its own species. This cannot be from mere want of appetite and indifference to food, since I have seen the mature specimens preying upon plant-lice quite as eagerly as do the larvæ.

J. W. SLATER.

SILLOTH IN JUNE.

FOLLOWING my article on "Solway Dunes in April" (SCIENCE-GOSSIP, p. 125), it may be interesting to note how great a change had come over the flora and fauna when I next visited Silloth on June 1st. The weather had been hot and showery for a fortnight, and everything had made rapid progress. I was able to secure the following among other prizes—some of them introduced with foreign corn, others now well established, if not actual natives of the place: *Vicia Bobartii*, *Viola Curtisii*, *Viola flavicornis*, *Carex arenaria*, *Xanthium spinosum* (not yet in flower, but found in bloom later in the season of last year at the same spot), *Lepidium Smithii*, Brome grass with *Ustilago bromivora* in its inflorescence, *Cerastium semidecandrum*, *Linum usitatissimum*, *Erysimum orientale*, *Sisymbrium Pannonicum*, *Amsinckia lycopsioides*, *Trifolium arvense*, *Anthyllis vulneraria*, *Geranium sanguineum* (very abundant near Skinburness, where the little burnet-rose will also shortly be profuse), *Cakile maritima*, *Plantago coronopus* and *P. maritima*, *Armeria maritima*, and sea-holly, the latter not yet in flower; *Scandix Pecten*, not so common in the north as in many other localities, gold of pleasure, corn gromwell, gilia, and many other desirable plants.

Turning to the parasites, I found in addition to the smut on bromus, the white rust (Cystopus) on shepherd's purse, the cluster cup on violet and coltsfoot, the latter being followed here by rust on the grass that grows near, the sweet rust on thistles, &c. Weevils were abundant on flowers of Brassica and Sinapis, and another on the purple sea-rocket, while the dead carcase of an old crow was a splendid hunting-ground for beetles and their curious larvæ. The beautiful Nostoc called *Cylindrospermum* had spread amazingly, and was in fine form, while the tidal pools yielded such an abundance of life as to astonish me.

Here I must correct one statement made in my former paper, which, though accurate at the time, might easily prove misleading. When I got home from my brief visit, I was delighted to find that the little bottle of sea-water which I had brought with me contained some minute shells of the kinds whose absence I had regretted, and I am therefore able now to state, that as the season advances, these shells may be successfully sought among the seaweed of the pools after a receding tide. In these pools I also found small crabs, plenty of periwinkles, and hosts of microscopic crustacea in various stages of development.

I may here be permitted to refer to one or two matters of critical interest. During my visit to Silloth in April, I was surprised to find the apical cell of *Cylindrospermum* possessed of numerous hyaline and very minute cilia. Finding no reference to the fact in the text-books, I informed Mr. Bennett of my observation. He stated that a similar remark had been made respecting an American species, that he put it down to error of observation or a minute parasite, and that he would be glad of further light. I have now found the plant coming into fruit, and in every instance I observe that the apical cell, which in this genus forms the heterocyst, is ciliated, whether followed by a spore or not. The reader is referred to the illustration given in Bennett and Murray's "Cryptogamic Botany," p. 432, the hyaline terminal cells in my gatherings of which are clothed with cilia.

Many diatoms grow intermingled with this plant, chief among which I observe *Pinnularia viridis*—often with its characteristic green colour, *pace* Cooke, "Ponds and Ditches," p. 94. Their number, however, is nothing compared with that of the diversified forms found *in situ* on all the little sprigs and sprays of fine filamentous algæ attached to stones about the breakwaters, which one might spend many pleasant hours in examining, especially the different species of Schizonema in their hyaline capsules.

Tipula maculosa occurs close to the water, wherever a plant is within reach, along with its more prosaic cousin, the common daddy-long-legs.

HILDERIC FRIEND.

NOTES ON NEW BOOKS.

THE PRIMITIVE FAMILY IN ITS ORIGIN AND DEVELOPMENT, by C. N. Starcke (London: Kegan Paul). Scientific bibliophilists always look with pleasure to the issue of a new volume of the now celebrated International Scientific Series. Nor is this to be wondered at, considering that each volume has been written by the man who knows most about each subject. The consequence is that the above library collectively represents the most authoritative scientific opinion of our time. The last issue of the series, by Professor Starcke of Copenhagen, is not less interesting than its predecessors. We have here stated in plain and even attractive language the nature of the primitive family, the ideas on which it is based, and the germ of moral growth it contains. The work is based both upon philosophical and ethnological lines. The habits of the Aboriginal natives of Australia, America, Africa, Asia, Polynesia, &c., are gone into, and the opinions of ethnological writers on these peoples are discussed. Some of the most interesting chapters are on the relation of father and child, polyandry, nomenclatures, exogamy and endogamy, or marriage within or without the tribe. Then we have a lengthy and most important chapter on marriage and its development, showing the gradual evolution, in the course of time, of the relationship between the sexes from a practically brutal condition to the pure and home-founding life which the best marriages of our time are

Fig. 109.—Monkey-nuts (*Arachis hypogæa*). From Patterson's "Notes on Pet Monkeys."

the foundations of. The last chapter in this very interesting work is devoted to the family, clan, and the tribe, in which we find the primitive state of mankind gradually developing into the political life of to-day.

The Uses of Plants, by Professor G. S. Boulger (London: Roper & Drowley). We possess a good many works upon economic botany of more or less scientific value; but for compactness, accuracy, and usefulness, we know of none to equal Professor Boulger's manual. Of late years botany has been almost entirely devoted to histological details and classification, so that it is almost refreshing to cut the page of a new book which puts these matters aside and deals with the uses of plants. Mr. Boulger has arranged his matter in an easily understood and easily remembered form. Thus his Introduction is occupied with the history and progress of economic botany during the last half-century, and it forms an exceedingly readable chapter. In Part I., where food-stuffs and food-adjuncts are discussed, we have sections devoted to starches, sugars, pulse, roots and tubers, vegetables, fruits, and nuts. The food-adjuncts include alcohols, condiments, flavourers, and alkaloids. Part II., on Materia Medica, will prove exceedingly useful to those preparing for either medical or pharmaceutical examinations. Afterwards come

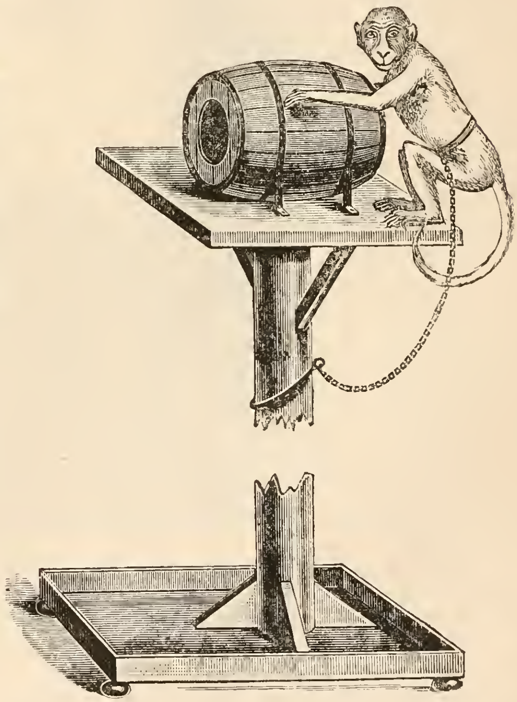


Fig. 110.—Pole and Barrel for Monkey. From Patterson's "Notes on Pet Monkeys."

chapters on the following subjects:—Oils and oil-seeds, gums and resins, dyes and tanning materials, fibres and paper materials, timbers, agricultural plants, miscellaneous products, &c. To add to the value of this very practical and useful volume we have also a copious synoptical index and general index. We cordially recommend this work to the large circle of people whose practical interests it affects.

Notes on Pet Monkeys and How to Manage Them, by Arthur Patterson (London : Upcott Gill). It is a sign of the times that we are no longer ashamed of our poorer relations. It is a better sign still, instead of despising them as poor relations are apt to be, when we turn them into pets. A pet monkey establishes a relationship between its owner and itself other than Darwinian. Possibly the introduction of monkeys as pets, may be the means of affording us a more accurate knowledge of our ancestors than we should have otherwise obtained. The fact, however, remains certain, whether due to Darwinian theories or not, that monkeys are greater favourites with us now than ever they were before. The wonderful monkey show at the Alexandra Palace is proof of the larger interest now being taken in this interesting and varied class of pets. Properly trained and looked after, there is no pet which can be so interesting or amusing as a monkey. In Mr. Patterson's book we have a charming description—written as a book like this should be, by a man who knows enough of his subject to be enthusiastic about it—of all sorts of monkey-pets. He tells us a good many amusing stories about them, and writes in such a way that, after reading this little work on pet monkeys, one feels inclined to go and buy one. Nor is Mr. Patterson's book without scientific value, for it contains very accurate and concise descriptions of the Quadrumana in general. To intending keepers of pet monkeys, the author's practical items, how to build a monkey-cage cheaply with all its appendages and utensils, such as the trapeze, pole and barrel, ring and bell, swing looking-glass, feeding-dish, sleeping-box, will be found highly useful. So will his chapters on

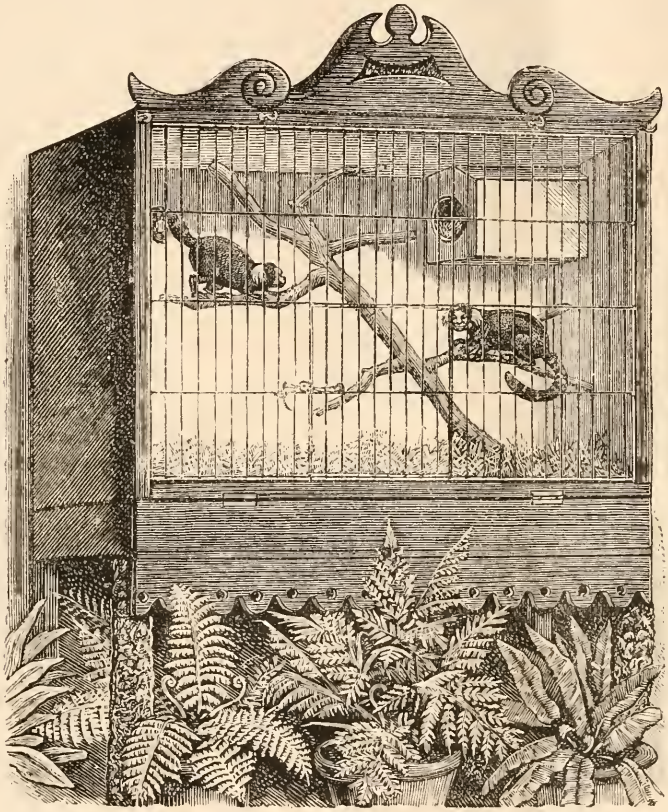


Fig. 111.—Cage for Marmosets, Lemurs, and delicate Monkeys. From Patterson's "Notes on Pet Monkeys."

"Choice of Monkeys and what Kind to Buy," as well as "Where to buy them, lists of their prices, their diet and general management." Pets are liable to fall ill, so there is a chapter on "Monkey Ailments and How to Cure them." Perhaps they can't be cured and die : if so, Mr. Patterson gives us instructions how to stuff them.

Haunts of Nature, by H. W. S. Worsley-Benison (London : Elliot Stock). Mr. Worsley-Benison has followed up the success which his pleasant "Nature's Fairyland" obtained, by this new venture. It is practically a new series of his first work, and is devoted to that wide encircling and numerous group of natural history subjects which have grown into such remarkable importance during the last few years. The work is as charmingly written as "Nature's Fairyland," and as prettily got up. It gossips delightfully about the swallows, the plants on the chalk cliffs, wild roses, gnats, water scavengers, beetles, aphides, sundews, moles, dragon-flies, insect mimicry, glow-worms, wild flowers, leaves, and other subjects. We congratulate Mr. Worsley-Benison on his second success.

By Leafy Ways, by F. A. Knight (London: Elliot Stock). The influence of such writers in America and England as John Burrows, Thoreau, and the late Richard Jeffries, is being largely felt in popular literature. Take the above book as an example. The various chapters originally appeared in the "Daily News," and were eagerly and widely read at the time. Twenty years ago no London newspaper editor would have thought of inserting such a series of papers. They were not political! We think Mr. Knight has done wisely to collect his charming fresh-air sketches of nature and natural history objects into this dainty and attractive little volume—all the more attractive by Mr. E. T. Compton's exquisite vignettes and sketches. It is a summer holiday book above all things,—a book you can take with you to the songful woods, the green hills, and the babbling seashore, and dreamily read and learn of the ubiquity of the Great Spirit whose Presence is the breath of life to the organic world.

Sylvan Folk, by John Watson (London: T. Fisher Unwin). This is another highly readable volume of natural history papers. Mr. Watson had previously made his mark by his "Year in the Fields," and he has maintained his reputation by these sketches of bird and animal life. There is not one chapter which cannot be picked out anywhere which is not highly readable. All of them bear strong marks of originality and are full of fresh air.

Our Fancy Pigeons, by George Ure (London: Elliot Stock). This handy volume is a great boon to all young fancy pigeon breeders. Time was when this amusement was regarded as a somewhat degrading one, particularly in the north of England. In our day, however, pigeon-keeping and pigeon-breeding have come to be a favourite pursuit amongst the middle and upper classes of society. Mr. Ure, the author of the above volume, is an observant naturalist as well as a pigeon-fancier, and he gives us the result of over fifty years' experience both in breeding pigeons and in the observance of natural phenomena. The different well-marked and recognised varieties are fully described, and there is a long chapter entitled "Rambling Ornithological Notes," which gives an interesting account of our native song-birds and other common species.

The Middle Lias of Northamptonshire, by Beeby Thompson (London: Simpkin, Marshall & Co.). The author of this neatly got up little monograph has already obtained a good position among practical geologists, which will be sustained by this useful work. There is a practical side to it, as it deals with the problems connected with the finding of water and the mitigation of floods in the district about which Mr. Thompson writes. The author treats his subject stratigraphically, palæontologically, economically, as a source of water supply, and as a mitigator of floods. All the available sections in the Middle Lias of Northamptonshire are detailed, and lists of their fossils given. Mr. Thompson has laid all students of the Lias formation under a debt of gratitude.

Cosmic Evolution, by E. A. Redsdale (London: H. K. Lewis). To students of the literature of evolution, this little work will not be without interest. Although there is much in it that we have read of before, there is also much that is new, particularly the chemical aspect of cosmic evolution.

Celestial Motions, by W. T. Lynn (London: Edward Stanford). The fact that this handy little book has reached the sixth edition is a sufficient proof of its value. The present edition has been revised and rearranged. Young students of astronomy could not do better than procure it. Its arrangement is clear and terse, and one wonders how so much trustworthy matter has been got into so small a space. It is in short a miniature handbook of astronomy of the very best kind.

Lectures on Massage and Electricity, by T. S. Dowse (Bristol: John Wright & Co.). This work has been variously received, yet there can be little doubt but that it contains a vast number of important and practical reflections on the subject of massage and electricity. It consists of fifteen lectures with illustrations, showing how massage should be applied to various kinds of muscular and nervous affections, particularly gout, rheumatism, spinal complaints, lumbago, neuralgia, hysteria, writer's cramp, sleeplessness, low spirits, dipsomania, wasting diseases, and the changing of life. The rapidity with which massage treatment has come up in the last few years endows a volume like this with extra importance.

Elementary Bandaging and Surgical Dressing, by Walter Pye (Bristol: John Wright). We are pleased to see the third edition of this useful little handbook, and would advise every member of the numerous ambulance classes throughout Great Britain to procure a copy.

Letters from the Lakes; this is a translation from the German of Kempferhausen, written in 1818. *The Study of Lichens*, by J. A. Martindale. Both these little brochures are published by Mr. Geo. Middleton, of Ambleside. The latter has special reference to the Lake districts. Both will be very acceptable to the numerous visitors who frequent this lovely country every summer.

ASTRONOMY.

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

THE Reverend S. J. King, director of Stonyhurst Observatory, recently delivered a very interesting lecture at the Royal Institution, on the Solar Surface during the last ten years. He had taken a great number of drawings of sun-spots, and, allowing for the effects of foreshortening, in this respect his drawings are more accurate than photographs. Although he had to contend with the bad climate of Lancashire, he succeeded in making on an average 258 drawings a year. The period of minimum sun-spots will be reached shortly, as the decrease has been going on now for about three years.

The area of the spots sometimes changed as much as one hundred million square miles in a day. The magnetic records of terrestrial magnetism follow the rate of such change with great regularity. The maximum of sun-spots and magnetic swing occurred in the year 1882.

In concluding, the lecturer suggested that sun-spots might be caused by meteoric streams.

The annual visitation of the Royal Observatory, Greenwich, took place on June 1st. A pair of glass discs twenty-eight inches in diameter have been completed by Chounce for the new refractor, and a special telescope, which will be a photographic refractor of thirteen inches' aperture, will be made to enable Greenwich to take part in the great photographic chart of the heavens.

At the last meeting of the Royal Astronomical Society, Rev. J. Roberts read a paper on a photograph of the Nebula 51 Messier taken with an exposure of four hours. Mr. Roberts pointed out that the nebula shows a spiral structure, and that lines of stars seem to follow the trend of the spiral streams.

Mr. Frank McClean read a paper on Parallel Photographs of Spectra of the Sun, of Iron, and of Iridium from H to near D. Mr. McClean presented to the Society a photograph of the solar spectrum on the scale of Angström's charts of the normal solar spectrum. A photograph of the iron spectrum is shown on one side of this, and a photograph of the spectrum of iridium obtained by the electric spark on the other. The coincidences of the iron lines and iridium lines with solar lines is beautifully shown, and the E line is double. The scale of these photographs is bigger than any photographs of metallic spectra which have previously been published.

The Astronomer Royal read a paper on the results of measures of sun-spots, which was accompanied by a diagram showing how sun-spots are distributed in latitude.

Mr. Common read a paper on the white spot on the ring of Saturn, observed by Dr. Tenby, which has been easily seen during the last few weeks. Mr. Common considers that the white spot is an optical illusion, being an effect of contrast with the broad shadow of the ball of the planet on the ring.

Rising, Southing, and Setting of the Principal Planets in July.

	D.	Rises. h. m.	Souths. h. m.	Sets. h. m.
Mercury ☿ .	2	3 6M	10 53M	6 40A
	9	2 43M	10 37M	6 31A
	16	2 34M	10 39M	6 44A
	23	2 48M	10 58M	7 8A
	30	3 25M	11 29M	7 33A
Venus ♀ . .	2	1 26M	8 53M	4 20A
	9	1 15M	8 51M	4 27A
	16	1 7M	8 51M	4 35A
	23	1 2M	8 53M	4 44A
	30	1 1M	8 57M	4 53A
Mars ♂ . .	2	3 24M	11 46M	8 8A
	9	3 19M	11 39M	7 59A
	16	3 15M	11 31M	7 47A
	23	3 11M	11 24M	7 37A
	30	3 7M	11 15M	7 23A
Jupiter ♃. .	2	7 31A	11 25A	3 24M
	9	7 0A	10 54A	2 53M
	16	6 29A	10 23A	2 22M
	23	5 59A	9 53A	1 51M
	30	5 29A	9 23A	1 21M
Saturn ♄. .	2	7 10M	2 41A	10 12A
	9	6 47M	2 17A	9 47A
	16	6 24M	1 53A	9 22A
	23	6 1M	1 28A	8 55A
	30	5 39M	1 4A	8 29A

July 1st: The earth will be at the greatest distance from the sun, 9 hours aft.

July 12: Partial eclipse of the moon, partly visible at Greenwich. The first contact will take place with the shadow at 7 hrs. 43 min., aft. Middle of the eclipse 8 hrs. 54 min. aft., and last contact with shadow at 10 hrs. 5 min. aft. The moon rises at Greenwich 40 min. before the middle of the eclipse, and about half the moon's surface will be eclipsed.

There will be no occultations of interest in July.

Mercury will be a morning star.

Venus will be a morning star.

Mars will be a morning star.

Saturn will be an evening star, and will be in Leo near Regulus.

THE DEVELOPMENT OF THE COLOURS OF FLOWERS THROUGH INSECT-SELECTION.

MR. EDWARD H. ROBERTSON'S paper with the above title in the current number of Science-Gossip seems to call for a few remarks.

In the first place, I am surprised to see the old argument against the insect-selection theory (used by Mr. Bulman in October, 1887) again appearing: namely, the argument from the existence of bright colours in other parts of the vegetable kingdom. It is difficult to see what bearing these facts are supposed to have upon the insect-selection theory, other than the light they may throw on the chemical origination of the colours of flowers, since these are in many cases produced by the same or allied pigments. Most of the colours mentioned by Mr. Robertson are caused by products of destructive metabolism, or by products incidental to constructive physiological processes: some have themselves a distinct physiological significance—e.g., the colouring pigments of the red and brown Fuci and other algæ, which are assimilative pigments. Now it is out of the question that the colouring pigments of flowers are merely incidental products of physiological processes, though no doubt they were originally such; it is clear that they now have a physiological significance of their own. Can there be any reasonable doubt that their function is to attract insects, assuming the benefits of cross-fertilisation? Further, this explanation cannot apply to any of the other instances of bright colour mentioned. They cannot possibly have any connection with insects.

If this be so, and it cannot be otherwise, Mr. Robertson's question:—"By what process of insect-selection have these colours been evolved?"—needs no answer. Insect-selection, which at least *may* have something to do with the colours of flowers, has not nor can have the slightest connection with these other colours. To borrow and adapt an illustration used by Mr. Robertson, it would be just as reasonable to object to the insect-selection theory, on the ground that we cannot explain by it the colours of "Orient gems," as on the ground that we cannot explain by it the other bright colours of the vegetable world; for, from this point of view, the latter have just as little connection as the former with the colours of flowers. For a somewhat fuller discussion of this point, viz., the essential difference between the colours of flowers on the one hand, and colours produced by pigments, which are mere incidental products of physiological processes, and have no physiological significance of their own, I will refer Mr. Robertson to my last paper, SCIENCE-GOSSIP for Feb. (pp. 25, 26).

I am at a loss to understand the meaning, from an evolutionary point of view, of Mr. Robertson's question:—"Can it be argued that the highest forms were created destitute of their most attractive features, until fortuitously visited by the wandering bee?" Mr. Robertson talks of "attractive features;" he must remember that each of the other colours he has mentioned has an explanation, either as caused by a product of metabolism, or as having a physiological significance of its own; and that their "attractiveness" is an explanation of none of them (except those of fruits and seeds, which are adaptations for dispersal by birds, etc.). On the other hand, if he admits, as he must, that in their attractiveness lies the physiological significance of the colours of flowers, it must be plain that, from an evolutionary point of view, the colours of flowers could not have been permanently developed before their function was existent! Surely Mr. Robertson is familiar with the fact that at one time phanerogamous plants did not exist; that the primitive phanerogams were anemophilous; and finally that entomophily is only a recent devolopment of the mechanism of cross-fertilisation. And since, as I have said, the colours of flowers could have no function before entomophily became general, it becomes clear that though the hypothesis that "the highest forms were *created* destitute of their most attractive features" may be a "myth worthy of arm-chair theorists," that the foliar structures surrounding the proper reproductive organs of primitive phanerogams were permanently coloured, or partook in any way of the nature of an entomophilous perianth, is an evolutionary impossibility.

I must confess that I do not fully understand the drift of the whole of Mr. Robertson's argument about the relations of long- and short-tongued insects to flowers and to each other, but much of it is clearly based on misconception. Thus, for instance, Mr. Robertson has apparently argued upon the assumption that if certain flowers have benefited by increasing complexity, all flowers remaining primitive ought to have been eliminated in the struggle for existence. He should remember that the function of a flower is to carry on the process of reproduction, and that there are many different ways of perfecting the discharge of this function. Thus, Müller:—"The dependence of entomophilous flowers on guests so infinitely various in habits, tastes, and numbers, in their food and in the means of obtaining it, must have rendered possible not one but countless paths towards perfection, paths leading not always forwards but sometimes backwards; and only in such a way could the infinite variety of existing flowers have come into existence." The advantages of primitive open flowers, with honey and pollen unconcealed, lie in the great number of insects of all descriptions attracted (when the flower is large and conspicuous), and thus the strong probability at least of cross-fertilisation being effected. The disadvantages, on the other hand, are great, as large quantities of pollen have to be produced, to make up for that stolen by pollen-eating insects, and to ensure the bodies of the visitors getting well covered with it. Further self-fertilisation is effected by the visitors climbing from the anthers to the stigmas just as often as cross-fertilisation. Now in the case of highly-specialised flowers adapted for long-tongued insects only, there is certainly the chance of the flowers not being visited at all; but, in most cases, if an insect thrusts its proboscis into two flowers consecutively, cross-fertilisation must take place, which is far from being the case in the primitive open flowers. The advantage to the long-tongued insects in having flowers especially suited to them is clear. I do not see any evidence to justify the assertion that it is more "trouble" to a bee, for instance, to thrust its proboscis into an orchid than into a pear-blossom, and it is certain that the honey is less likely to be gone, and the bee is less likely to be jostled in the former than in the latter case. Thus there is room for both primitive and highly-specialised flowers in the floral world, for long and short-tongued insects in the insect world. A. G. TANSLEY.

(*To be concluded.*)

THE GEOLOGISTS' ASSOCIATION.

An enjoyable Whitsuntide excursion was spent by the members of the above association amongst the Suffolk Crags, under the directorship of Mr. W. Whitaker, F.R.S., and Dr. J. E. Taylor. On Saturday the party visited Southwold, where special attention was paid to the wasting away of the cliffs at Covehithe. It was noticed that the waste of these cliffs was less than was formerly the case. On Monday the party took train for Felixstow, whence they drove to Bawdsey Ferry. Crossing over, they stopped at Bawdsey Manor, where, thanks to Mr. Cuthbert Quilter's hospitality, refreshments awaited them. Thence to Bawdsey Cliff, which was new to the association. It gives the finest section of Red Crag in the country. The Crag is in places overlain by glacial sand or gravel, and underlain by London clay rich in pyritised wood. Mr. Whitaker pointed out that it was not, as was generally supposed, the sea alone which wasted away the cliffs. This was rather due to landslips caused by weathering, through the percolation of water and other agencies, aided and abetted by the slipperiness of the surface of the London clay upon which the crag rested. Then the sea acted as scavenger in clearing away the debris which had fallen. The fossils as a rule were not in good preservation, owing to the beached-up condition of the formation. The most valuable find was a fine specimen of *Voluta Lamberti*, picked up on the beach. Leaving Bawdsey the party returned to Ipswich, where after dinner they visited the Ipswich Museum, to inspect the valuable crag collection, Dr. Taylor giving an interesting address on the principal specimens. On Tuesday the first place visited was Butley pit, containing a section of Red Crag noted for the occurrence of land and fresh-water shells. A fine specimen of *Helix nemoralis* was found. Next came the Chillesford stackyard pit, where the Chillesford Crag and Clay overlie the Red Crag. Another pit showed a good section of Chillesford Clay, containing many Arctic forms of shells embedded in the position in which they lived. These, however, were so brittle that it was almost impossible to get good specimens. The next two pits visited contained Coralline Crag; in one of them this was overlain by the Red Crag, which was of a white colour whilst the Coralline was of a deep red, thus reversing the order of things. Then the party visited the famous pit of Coralline Crag in Sudbourn Park. Here many fine specimens both of mollusca and polyzoa were found. The visits to the various pits were made doubly interesting by the short addresses of the two directors. At about half-past three the party lunched in the fine old keep of Orford Castle, and afterwards drove back to Ipswich, and thence by rail to London.

SCIENCE-GOSSIP.

We have received the Annual Report of the Yorkshire Philosophical Society for 1888, which besides the lists of members, catalogue of donations to the museum and library, &c., contains the following papers: "On the Occurrence of *Ananchytes Ovatus* in the Margate Chalk," "On *Terebratula bisinuata* from the London Clay of Hampshire," "On *Oolitic Brachiopoda* new to Yorkshire," all by Mr. J. F. Walker; "On the *Spinose Rynchonellæ* found in England," by S. S. Buckman and J. F. Walker; "On a Head of *Hybodus Delabechei*, associated with Dorsal Fin-Spines, from the Lower Lias of Lyme Regis, Dorsetshire," by A. Smith Woodward.

Mr. W. A. Smith sends us his "Report as to the Best System for the Maintenance of Main Roads in the County of Hereford." This report should be read by all interested in the subject of road-making, etc.

W. Wesley's Catalogue of Works on Geology and Mineralogy contains a large assortment of books at very moderate prices.

Mr. W. P. Collins' Catalogue of Books relating to Cryptogamic Botany, etc., contains prices of all the best works on the subject.

A Field Club has been formed for Wincanton and neighbourhood. The following subjects will engage the attention of the club:—Archæology (including Architecture); Earthworks, Local History, etc.; Natural History, including Geology, Botany, Entomology, Zoology, etc.; and other subjects connected with science and art.

The Rhætics of Leicestershire is the title of an interesting paper by H. E. Quilter. The same cover includes Notes by A. Smith Woodward "On Some Remains of Fossil Fishes from the Rhætic Beds of the Spinney Hills, Leicestershire," and "On a Species of Pholidophorus from the Rhætic Paper Shales of Wigston."

No. 31 of "British Dogs," by Hugh Dalziel, the well-known authority on all matters connected with our canine friends, is to hand. The work when completed, which will evidently be before long, will be the best book on the subject for ordinary readers.

Nos. xi. to xiv. of Mr. Howard Saunders' "Illustrated Manual of British Birds" is to hand. The illustrations are up to their well-earned mark, and the descriptions are comprehensively and lucidly written.

Miss Jelly intends to publish, as soon as a sufficient number of subscribers has been obtained, a catalogue of the species of recent polyzoa. We advise intending subscribers to enter their names as soon as possible, as Miss Jelly intends to print only a limited number of copies.

It is proposed to form a Museum Association for the intercommunication and co-operation of the various museums throughout the country. The advantages of such an association are manifest, and we hope soon to see it an accomplished fact. A meeting for the consideration of the subject took place at York on June 20th.

Mr. James Thomson sends us his paper "On the Detection of Mural Pores in the Genus Alveolites." It is an answer to a paper of Professor A. H. Nicholson's in the "Geological Magazine" for March, 1888, and is full of interesting matter illustrated by woodcuts.

A very important "Bulletin" has just been published by the United States Government, as one of the memoirs of its geological survey, entitled the "Nature and Origin of Deposits of Phosphate of Lime." It is one of the best and most exhaustive essays of its kind we have ever studied, running to one hundred and forty-three imperial octavo pages of letterpress. The author is Mr. R. A. F. Penrose; but the work has a very able preface by Professor Shaler. Mr. Penrose discusses the modes of occurrence of the Apatites of Canada, Norway, and Spain; the Nodular phosphates of North and South Carolina, Alabama, Florida, North Wales, and England; the phosphate beds of the Cretaceous upper and lower greensands; and of the Tertiary phosphate beds. There is also a very interesting chapter on the "History of the Rock Phosphates of England." Next follow others on the Phosphates of Belgium, Northern and Central France, and Russia; on the Phosphatic Limestones of Kentucky; on Guano Deposits, Cave and Lacustrine Deposits, &c. Moreover, there is appended an exhaustive bibliography of all works treating on this important subject.

Mr. H. Lamb has just brought out a capital "Flora of Maidstone." The catalogue is a very exhaustive one. The nomenclature is according to the eighth edition of the London Catalogue. It may be had of Mr. W. S. Vivish, 28 King Street, Maidstone. Price 1*s*.

MICROSCOPY.

Scales on Red Currants.—My attention has been called to a paragraph in August Science-Gossip, 1888, by Sidney Tindall, on the subject of the curious scales found inside red currants. As long ago as 1874 I sent some of these currants, with two mounted slides dry and in *C. balsam*, to the Editor of Science-Gossip. Mr. Groathin, of Cambridge, thought that silica must enter into their structure; they polarize beautifully in *C. balsam*, and in the dry state the colours are softer. I find them nearer the crown, forming a cover to the seeds; they are rounded, not flat and split when pressed; it is in very dry seasons they mostly abound, though last year I found a few.—*Louisa S. Saunders*.

Microscopic Life in Hailstones.—We take the following letter by Mr. I. C. Thompson, of the Liverpool Microscopical Society, from the "Liverpool Daily Post" for June 4th:—The violent hailstorm of this afternoon, and the very unusual dimensions of the hailstones, afforded an excellent opportunity of making observation thereon. Happening to have two microscopes at work at the time, I collected a number of the hailstones as they fell through my open study window, putting them at once into clean watch-glasses placed under the microscopes. Several observations have been recorded during the last few years upon the substances, organic and inorganic, found in hailstones. Amongst the organic bodies have been noticed amœbæ, rotifers, bacilli, and particles of vegetable matter. Various inorganic substances have also been detected, but I am not aware that their nature has been accurately determined. The hailstones accompanying to-day's storm were of remarkable form and structure, some being round and thick with flat surfaces, and composed of a number of concentric layers, both transparent and opaque. Others were large, jagged, and angular, while some resembled broken pieces of ice. As they dissolved in the conical-shaped watch-glasses, a deposit fell to the centre, which a rough microscopical examination showed to be composed of a dark-coloured amorphous inorganic substance, and minute stone particles. Interspersed with them I noticed small pieces of vegetable tissue, having the appearance of parts of cryptogamic spore-cases, and amongst them were numbers of very minute oblong bead-like bodies about one-fifty-fifth of an inch in length, each having a dark patch at the apices. These small bodies I at once mounted in a clear glycerine medium, and subjected them to a further high-poised microscopical examination. Under a one-eighth inch objective they were found to have a rough, knobby surface, the dark ends being curled up extensions and were similar in character to the forms known as belonging to the spores of some of the lower cryptogamia, especially the lichens, to which they evidently belong, although, after careful search, I am unable to refer them to any known British species. So here we find microscopically small spores floating at a great elevation in our atmosphere, probably forming the nuclei around which the hailstones formed themselves. Their presence here is very interesting and instructive, and throws considerable light upon the manner in which floating particles, whether minute animals, poisonous bacteria or bacilli, or vegetable organisms, may find their way amongst us, and settle wherever they happen to secure a congenial nidus or resting-place, or are distributed over new pastures.—Yours, &c., *Isaac C. Thompson.*

ZOOLOGY.

A Rotifer?—I visited Burdwan on Saturday last, and took my box of empty bottles with me. Some successful dips were made in the tanks at the Dilkhoosha (Heart's Delight) Gardens, belonging to the Maharajah. Amongst other beasties secured was an organism, of which I send you a drawing. It

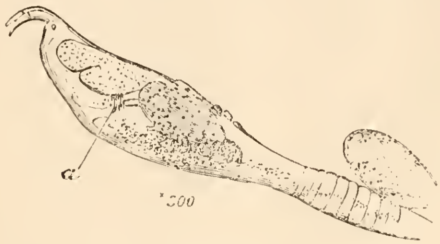


Fig. 112.

had no ciliary disk, and not much of a "gizzard" (*a* in the drawing), but its viscera, both in colour, arrangement, &c., were notably those of a rotifer. It possessed two strong hooked processes, and, at the base of these, two clear organs which looked like eyes. Its general "get-up" was that of one of the Rotatoria, and but for its bearing an ovum I should have concluded it was probably a male rotifer. There were, however, two specimens with ova. I did not detect a mouth, but this may have been due to my not looking for it carefully. The "gizzard" was not in action, and its parts were ill-defined. I think there is no doubt that these curiosities were rotifers, but to what class should they be referred?—*W. J. Simmons, Calcutta.*

Shells from North London Districts.—The following records may interest conchologists resident in the north or north-western portion of the metropolis. Taking Hampstead Heath, *Paludina vivipara* and its unicolorous variety, vars. of *Limnæa peregra* and *auricularia*, *L. stagnalis*, *Planorbis corneus*, *P. albus*, *P. spirorbis*, *Sphærium corneum*, and *Anodonta anatina* are plentiful in the "bathing" and adjacent pond; *Limnæa truncatula*, *L. stagnalis*, *L. peregra*, *Paludina vivipara*, *Sphærium corneum*, *S. lacustre*, *Bithynia tentaculata*, and *Planorbis albus* exist in the "Red Arches" pond; *Hyalina cellaria* is to be found on the heath; *Paludina vivipara*, *Sphærium corneum*, *Planorbis albus* and *spirorbis*, with *Limnæa peregra*, are present in the "Leg of Mutton" pond; while near this last-named pond, and in a field on the right of Platt's Lane, is a pond wherein may be found *Limnæa stagnalis*, *L. peregra*, and *Sphærium corneum* with its variety *brunneo-fasciata*. In the "Moat" at Finchley live *L. stagnalis*, *L. peregra*, *Physa fontinalis*, *Planorbis spirorbis*, *P. umbilicatus*, *Bithynia tentaculata*, and *Sphærium corneum*; and near to the "Moat," in small ponds in a field through which the footpath to Hendon runs, is to be found *Limnæa stagnalis*, with, comparatively speaking, a fairly abundant number of subscalariform monstrosities of that species. In a small pond near the footpath leading from the "Spaniards" at Hampstead to Hendon, exist *Limnæa truncatula*, *L. palustris*, and *L. peregra* in tolerable plenty. In some private fish-ponds near the Brent, at Hendon, *Anodonta cygnea* is very plentiful, some of the specimens being of large size. In the river Lea at Tottenham are to be found many specimens, of which an account is to be found in my paper, "A Day's Shell-Collecting," which was published in Science-Gossip last year. On the way across the fields from Hampstead to Hendon is a bank whereon live many specimens of *Helix Cantiana*, with its white variety. *Helix rufescens*, *H. nemoralis*, *H. hortensis*, and *Limax lævis* are to be found in Highgate Woods; while near the bank where *Helix Cantiana* is to be found, but nearer Hendon, is another nettle-covered bank which contains very many varieties of *Helix nemoralis* and *H. hortensis*. Making use of the somewhat objectionable terms used by conchologists in recording colour variations, I have found here the following varieties of these two species:—*Helix nemoralis*, var. *libellula*, 00300, 00000, 00345, 12345; var. *carnea*, $_{12}$345; *Helix hortensis*, var. *lutea*, 0000c, 12345, (123)45, 123(45), 1(23)45, (123)(45); var. *pallida*, 12345, (12)345, $_1$(23)45, (123)(45), 00345, 1(23)45.—*J. W. Williams.*

Parasites of the White Ant.—Errata.—Page 61, in the first line of the descriptive note to the drawings, for "Figs. 46 to 54," read "Figs. 46 and 53;" same line, for "Figs. 49 and 50," read "Figs. 47 and 48." Second line of descriptive note, for "Fig. 49," read "Fig. 47," and for "Fig. 50" read "Fig. 48." Page 62, eleventh line from bottom, for "(Figs. 49 and 50)" read "(Figs. 47 and 48)"; eighth line from bottom, for "54" read "53"; fifth line from bottom, for "worked down," read "looked down." Page 76, ninth and eighth lines from bottom should "run on," without being broken into separate paragraphs; and should be read "eight hundred diameters (F)."—The above errata have occurred through the writer's inability to see the proof.

BOTANY.

COMPARATIVE RARITY OF THE PERIWINKLE (*Vinca minor*).—In Hooker's "Student's Flora of the British Isles," this plant is not mentioned as being either rare or local, yet it would seem that such was the case in some districts, at any rate. The flora of the Tunbridge Wells neighbourhood, a district with which I am well acquainted, is considered both rich, and, I believe, representative, yet I only know of three localities there for *V. minor:* (1), on a bank in a footpath off the road between Rusthall and Southborough; (2), on the roadside beyond the church at Eridge Green, Sussex; (3), near Pembury, Kent, on the banks skirting the road from "Blueboys," Pembury to Frant Station, Sussex. At the last-named locality it is very plentiful. It would be interesting to know of any places where it is abundant without being even local, and what soils suit its growth best. In connection with what has just been said, it is worth noting the interest taken in the rarity of a plant by children and others who only gather flowers for the pleasure it affords. The first locality I mentioned is known as "Periwinkle Lane," and quite recently, on the occasion of my visiting it, I was forestalled in my search for the flowers by several children, who said, "There were no periwinkles, and it was no use looking for them!"—*Archibald T. Clarke.*

FORMS AND COLOURS OF FLOWERS. — After reading the article on "Red Leaf," and the reflections to which it has given rise, contained in several numbers of SCIENCE-GOSSIP, I cannot avoid thinking it not only possible, but likely that the brilliant colours assumed by petals were evolved previously to the operations of winged insects upon them. My reasons for this opinion are, that in the growth of leaves there is a progress from the cotyledons through the primordial and cauline leaves to the bracts, all of which are produced before winged insects take notice of them, unless it be to lay eggs on their surface from which live caterpillars may be hatched to feed upon them. Nevertheless, red leaves appear in autumn when also other colours may and do come out on plants previously green, and with no propensity to flower, as in the variegated kale, which I have raised myself from seeds of Portugal cabbage. Plants of this race, if white or purple in their infancy, commonly die young, I suppose from inability on the part of their discoloured leaves to perform the functions of nutrition. If green when young, they may grow to accumulate a store of nutriment whereon to live till they become, as my neighbours tell me, too pretty to eat; then they either run to flower or assume a snowy whiteness till they fade away and die. Why may not such a process have been carried on in the evolution of the lily? If it were, one can understand the theory of Grant Allen that wheat and other grasses are florally degraded lilies. If otherwise, I cannot understand how lilies could have existed at all before they were degraded into grasses, for I suppose that grasses may have covered the earth when all its flowers that were not self-fertilised were anemophilous, and insects had not yet learned to fly. Most liliaceous plants have regular though highly-coloured flowers. If they were formed, or if their colours were evolved or even stereotyped and fixed by insect agency, how came they to retain their symmetry? Flowers whose forms had not become already fixed became irregular after insects had come to play their pranks upon them. This took place independently of their colour. Blue and yellow crocuses are equally regular in form. Species and varieties of gladiolus are all irregular, but neither the ministration of insects nor the art of the gardener has made them blue. Blue and yellow lupines are alike irregular; insects having modified their shapes alike, but left their colours different. Other instances might easily be quoted, but the above may serve at present as enough to make it probable that flowers owe their shapes to one set of causes and their colours to another.—*John Gibbs, Chelmsford.*

THE BEE AND THE WILLOW.—With reference to Mr. Bulman's paper on this subject in SCIENCE-GOSSIP for last month, some recent observations of my own seem to me to support his views as to the fertilisation of the willow; in examining some catkins last spring, I was led to the conclusion that the fine silky hairs of the bracts (the chief characteristic of the little-geese of school-days) play an important part in the intricate process of fertilisation. These downy bracts retain the pollen until carried off and conveyed by a gust of wind to pistiliferous plants. If the anthers were to shed their pollen on a still and quiet day it would be prevented from falling direct to the ground, and, being lost by these silky hairs, such a temporal retention of the pollen may prove to be advantageous, to protandrous plants especially. However, whether the willow be anemo- or entomophilous, the silky down of the bracts appear to be an admirable contrivance to ensure fertilisation.—*G. Rees, Aberystwyth.*

GEOLOGY, &c.

ORIGIN OF MOVEMENTS IN THE EARTH'S CRUST.—A paper on this interesting subject has just been read before the Geological Society by James R. Kilroe. The author thinks that a very important factor has been omitted from the usual explanation offered in accounting for the vast movements which have obtained in the earth's crust. From a somewhat conflicting mass of figures he concludes that about twenty miles would remain to represent the amount of radial contraction due to cooling during the period from Archæan to recent times, corresponding to a circumferential contraction of one hundred and twenty miles. This will have to be distributed over widely separate periods, at each of which there is abundant evidence of lateral compression. He considers that this shrinkage alone will not account for all the plication or distortion of strata which constitute so important a factor in mountain-making, and he is disposed to supplement it in the way to which allusion has already been made by Mr. Wynne, viz. by considering the effects of the attenuation of strata under superincumbent pressure from deposition in subsiding areas, which involves the thickening, puckering, reduplication, and piling up of strata in regions where pressure has been lessened. It should be noted that, until disturbance of "cosmical equilibrium" takes place, mere pressure does not produce metamorphism. The extent of these lateral movements is described, and it is asserted that the theories hitherto adopted to account for plication, &c., are inadequate. The origin of the horizontal movements is further discussed on the hypothesis that solids can flow after the manner of liquids, when they are subjected to sufficient pressure. He considers that the displacement in N.W. Scotland may have been initiated by the force due to contraction and accumulating in the crust throughout the periods marked by the deposition of Torridon sandstone and Silurian strata, the elements of movement finding an exit at the ancient Silurian surface. In this case the pile of Silurian strata formerly covering the region now occupied by the North Sea and part of the Atlantic forced the lowest strata to move laterally, the protuberances of the underlying pre-Silurian rocks being also involved in the shearing process. Similar results in other mountain areas. The strata compressed have been greatly attenuated, and extended in proportion; in this way we may account for the piling up of strata by contortion in certain regions. The connection of this interpretation with Mallet's theory of volcanoes is also indicated, and the author concludes by applying these views to other branches of terrestrial physics.

NOTES AND QUERIES.

WEATHER CYCLES.—The computation by cycles or circles is at once the most natural and familiar of methods, but, as regards mensuration, certainly the most abstruse; hence Solomon piously advocates it, Euclid fails to attain unto it, and our modern algebraists reach it only by methods of approximation. He who would again wave the sigil and starry wand that invoked earthward that most delightful of entities, the wisdom of the universe, let him go and moralize over the concentric circles that strike the gaze on the mist-swept rocks and tombstones of our Celtic lands, which stamp the idea of time in the conventional rings and rays of the tree-stump; let him ponder how the years of forgotten chieftains were chequered with joy and sorrow, and how it is the darkest hour that precedes the dawn; and let him there and then awake to an impression that the stream of time is full of eddies, and that his own days and years are spinning on in circles. Hardly a trio of centuries has gone since there existed in this country a much-abused faith in climatical years, and a belief in the luck and ill-luck of the sevens and the nines; and now the lamp of Science aids us to seek the burden of the years in those eleven-year periods in which the sun runs through its appointed cycles of spots, and the reason of our weeks in the proverbial changes of weather. In dealing with a venerable idea which is public property, I do not desire to grapple with those who find a reason to suppose that the weather is dependent upon the moon or the planets in their courses, though for myself I believe it to be coincident with the sun spots in their fluctuations and movement; and though I further find a more decided proof in statistics that leads me to conclude that there originates a cyclonic disturbance in the earth's atmosphere every twenty-five days on the average, with a tendency in blows to recur every eighth or ninth day; upon which premises I have even ventured to construct an index. This as it may be, there remains ample reason in the weather cycles to explain that notion of dearth and plenty which, according to the Jubilee or Jewish seven year calculation, recurred every 7, 14, 21, 28, 35, 42, 49, and 50 years, and, according to modern astronomers, may arise every 8, 11, 19, 22, 30, 33, 41, 44, and 52 years; the voice of joy and mourning. Here is a marked similarity of figures, and, on the best authority, a mere question of an ancient and modern astronomical unit, 7 or 11, for the latter of which there is a good reason. As regards the weekly changes, we may conclude that they have been already considered by King Solomon, for he says, "Give a portion to seven and also unto eight, for thou knowest not what evil shall be upon the earth."—*A. H. Swinton.*

CLUTCHES OF BIRDS' EGGS.—With great satisfaction I observe that attention is being drawn to the modern fashion of collecting birds' eggs in clutches. I have repeatedly heard all the arguments that can be advanced in favour of the new system, and am still unconvinced of any superiority over the old style. The argument advanced by Mr. Nunn in your June number is easily answered. All collectors are aware that frequently one egg of a clutch varies widely from the rest. But supposing the rest are normal, why take them? Would not a note accompanying the peculiar variety be enough? And should your correspondent's surmise prove correct, that the odd egg is usually unfertile, the cabinet could be enriched by a curious specimen without any loss to the bird-life of the country. In passing, I may say I have no belief in this theory of some relation between the colour and fertility of eggs, as I have frequently found nests in which the aberrant egg was fertile, and other cases in which normal eggs were unfertile without displaying any symptom of their addled state externally. The most fallacious argument under which these nest robbers shelter themselves is, that the bird will rear another clutch, and can as easily do that as bring up a part only of their family. Probably your correspondent is unmarried, and therefore has not had an opportunity of judging of the difference between rearing a large and small family. But should some "clutch collector" come across the second brood, what then? Mr. Young has adduced a striking example in two recent numbers of SCIENCE-GOSSIP, where we find it reported that a pair of ravens have four times this season endeavoured to bring out a brood at Portland. A single clutch of these eggs would have supplied the wants of as many collectors under the old system as the whole four would under the new. Verily they are more rapacious than the ravens themselves. I have ever associated the black cloth of the clergy with a warm and kind heart underneath, but to my dismay I find that the Rev. Canon Raine has introduced the new method into the York Museum, where may be seen clutch upon clutch of the eggs of our more uncommon warblers, etc., some of them, exhibiting no variation, being probably taken for the locality's sake. Surely a single egg would well answer this purpose. This collection, I am told, was last week enriched by the addition of a clutch of seven green woodpecker's eggs from near Helmsley. Why take seven eggs from a rare bird, when there is absolutely no variation amongst them? To what can you apply the epithet Vandalism, if not to this? The teal sometimes lays twelve or more eggs, varying from pale yellow to pale green. Would it be necessary to load one's cabinet with two dozen eggs, to show these two slight variations? And to prove the range of distribution, would it be necessary to have such clutches from half-a-dozen localities? Because I hold that all unnecessary destruction of nature's products is Vandalism, I sincerely trust that all true naturalists will humanely endeavour to withstand this perilous innovation, as it is likely to cause the extermination of many of our rarest birds.—*J. A. Wheldon, York.*

NOTHOLCA SCAPHA.—Your correspondent, Mr. R. P. Grace, refers to "Hudson's *N. scapha.*" I suppose he means the species described by Gosse at p. 127 of vol. ii. of "The Rotifera," and figured by Gosse in plate 29 of the same work. It is true that the species is there described as marine only; but if Mr. Grace will refer to SCIENCE-GOSSIP for 1887, he will find an article by Mr. Lord on "A Prolific Pond," containing a long list of Rotifera found in a pond near Rawtenstall, among which is *Notholca scapha.* A few months later Mr. Lord contributed an illustrated article on the species; and in 1888 I stated in SCIENCE-GOSSIP that I had found it inhabiting fresh water near Cheadle, Staffordshire. I have now found it in four or five places in that neighbourhood. Both Mr. Lord and I sent specimens to Mr. Gosse.—*J. W. Blagg.*

NESTS IN STRANGE PLACES.—On the 27th of April last the men employed on Messrs. Stratton, Gentry and Co.'s Coal Wharf at Clapham Junction found on the top of a loaded truck, between two large lumps of coal—one of which slightly overlapped the other—a nest containing five eggs of the pied wagtail (*Motacilla alba*); while on the 3rd of May, in another loaded truck but at the bottom of the coals, they found a starling's (*Sternus vulgaris*) nest rather roughly built with straw, etc., and containing two eggs. Curiously enough in the latter instance the birds had begun to build at one end of the bottom of the truck, but evidently finding their situation rather precarious, they abandoned the half-built nest and constructed another at the opposite end, towards one side where the coals were more firmly stacked, and here it was traced by the men, from the exuviæ around the top of the passage connecting the nest with the surface of the loaded truck. Both trucks came from the neighbourhood of Burton-on-Trent, and though there but a comparatively short time, had evidently been left loaded long enough for the birds to build in them and lay their eggs. I may add that such an occurrence has not been known at that wharf for twenty years. Both nests are in my possession, and on Thursday the 14th idem excited much interest at the usual monthly meeting of the Practical Naturalists' Society.—*A. G. Hammond, St. John's Hill.*

AN ASTROLOGER'S IDEA OF FOSSILS.—In looking through the works of John Heydon, the astrologer, I have been much struck with one or two passages in which that author reveals the clearness of his vision in observing the curious and occult in Nature. Heydon styles himself "a servant of God, and a secretary of Nature;" and whatever may have been his claim to the first part of the epithet, most impartial judges will probably be willing to admit the justice of his claim to the latter. Heydon's "Holy Guide: Leading the Way to the Wonder of the World," published in 1662, contains a vast fund of deep and interesting information which reads quaintly in the light of modern science. The following is an extract from the book (lib. iii. pp. 88–9):—"And it is observable, that if Nature shape anything near this geometrical accuracy, that we take notice of it with much content and pleasure, as if it be but exactly round, as there be abundance of such stones upon Mesque, a hill in Arabia; I have seen them there, ordinarily quadrangular, and have the sides parallels, though the angels (angles) be unequal, as is seen in some little stones, and in a kind of alabaster found here in England, and other pretty stones found upon Bulverton-hill, near Sidmouth, in Devonshire, and near Stratford-upon-Avon; and in Tyms Grove at Colton, and at Tardebick, Stony-hill, the Shawes and Quarry Pit, Hazle-hill, and Ash-hill in Warwickshire, are found such stones that grow naturally carved with various works, some with roses, others with lions, eagles, and all manner of delightful works. These stones, I say, gratifie our sight, as having a nearer cognation with the soul of man that is rational and intellectual, and therefore is well-pleased when it meets with any outward object that fits and agrees with those congenite ideas her own nature is furnished with."—*George Clinch.*

ANODONTA CYGNEA AND ANATINA.—As Mr. Webb evidently believes that *A. anatina* is not a species, inasmuch as he brings forward the "principal authorities" (see SCIENCE-GOSSIP for October, p. 235) to prove that it is not, and he is not inclined to consider it a variety, I should like to ask what it really is, and whether it is worthy of having a special name, and what position it should occupy in our handbooks? I suppose he will say it is a variation; but if so he might equally as well call cygnea a variation, for both are variable, and both have been known as different forms from the time of Linnæus. I imagine that it would be very difficult to say whether the two have arisen from two pre-existing forms, or one is an offset from the other. But allowing Mr. Webb to call anatina or any other well-marked form a variation, I should further like to ask him to define what is the difference between such variation and what is usually called a variety. In other words, I wish to know clearly what in his opinion is a species, what is a variety, and what is a variation. In one of his notes Mr. Webb mentions "worthless varietal names." Would he kindly enumerate a few of the worthless varietal names that have been lately introduced, and say whether he has personally examined any of the forms which bear those worthless names, and compared the value of their distinguishing characters with the characters of those varieties which are generally acknowledged?—*Geo. Roberts.*

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.

G. Rees.—The address of the Secretary of the Selborne Natural History Society may be obtained by addressing him, c/o Elliot Stock, Publisher, 64 Paternoster Row, London. All information with reference to the society and its publication can be obtained of him.

Mr. James Bowman writes: "Will you kindly inform Mr. Whatmore that I have in preparation a further article on *Formica rufa*, in which I shall detail some fresh experiments as to the hearing powers of ants. The experiments have further convinced me that the 'hearing' of *Formica rufa*, and, I suppose, every other species of ant, is very acute."

J. N.—We have no doubt you will get all the articles you require either of Mr. E. Hinton, 12 Vorley Road, Upper Holloway, London; of Mr. Walter White, Litcham, Swaffham; or of Messrs. Christy, 25 Lime Street, London.

H. Giraux (Paris).—Our exchange column is free to subscribers; but it is expected that exchanges will not exceed three or four lines, unless the exchanger is a contributor.

A. W. (Headingley).—Spiders' webs, or rather their lines, are used in transit instruments to render observation easy. They are mounted at right angles to each other; generally five vertical lines are crossed by three horizontal ones. Nothing in nature has been found equal to spiders' webs for this purpose. At the Melbourne Observatory, we believe that a certain kind of spider is kept for the sake of using the webs they spin for the above purpose.

EXCHANGES.

Wanted, to exchange a folding camera and three best double backs for plates up to 8 × 5, for high power microscope objective by some good maker.—E. B. Fennessy, Pallasgreen, Limerick.

Wanted, any back numbers of Science-Gossip, "Entomologist," "Entomologist's Monthly Magazine," or "Journal of Conchology." Offered, rare foreign marine shells.—H. L. T., Woodside, Rowditch, Derby.

Smith's "Diatomaceæ," vol. i., Beal's "Micro in Medicine," Baker's "Employment for the Micro" (original plates, 1753, whole calf), Ross's F eye-piece, twelve quarterly parts "Postal M. J.," 1882–5, twelve slides, test diatoms, scales, &c. What offers?—J. E. Lord, Rawtenstall.

Cox's "Brit. Coleoptera," Harrison's "Geology of Counties—England and Wales," Brodie's "Fossil Insects of Secondary Rocks," and other good books: also first-class lias fossils, including reptilian and fish remains, ammonites, rare gasteropoda, &c., for good scientific and natural history works.—H. E. Quilter, 77 Conduit Street, Leicester.

Wanted, rarer British marine and land shells, also British eggs, all kinds. Exchange British shells and odd numbers of Science-Gossip.—J. T. Lightwood, Lytham.

Wanted, twelve or more vallisneria roots. Will give in exchange some "Dog's Bay sand," micro seeds, and some beautiful plant scales and hairs.—Henry Hyde, Ardwick Museum, Manchester.

Limnæa glabra in exchange for *Acme lineata, Helix lamellata, H. obvoluta, Limnæa glutinosa, L. involuta, Physa acuta, Succinea oblonga, Testacella haliotidea* (shell), *Vertigo angustior, V. pusilla, V. pygmæa, V. substriata, V. tumida, Zonites radiatulus, Z. excavatus, Z. purus.* Anxious to exchange British land and freshwater shells for foreign ones; American and Continental chiefly wanted.—J. W. Williams, Mitton, Stourport, Worcestershire.

Transverse sections of porcupine quill, mounted and unmounted, in exchange for other good slides or unmounted objects of interest.—W. J. W. Stocks, High Street, Uppingham.

Offered, skin of snake, ten feet long. Wanted, exotic insects or offers.—J. W. Neville, Wellington Road, Handsworth, Birmingham.

Diamond circle cutting tool for cutting thin glass in circles, lever micrometer measuring instrument by Ross, for gauging this glass, in exchange for first-class objectives, or special grouped diatoms or other choice show objects for exhibition purposes.—M., 20 Be'size Crescent, Hampstead, London.

Wanted, Wood's "Insects at Home," Figuier's "Insect World," or such, in exchange for foreign insects.—H. M., c/o Dr. Burford, 13 Greville Road, Kilburn, N.W.

Wanted, Huxley's "Anatomy of Vertebrated Animals," also a skull of a dog; good exchange given.—H. Parritt, 103 Camden Street, Camden Town, N.W.

Orbulites striata, Polystomella crispa, Placentula asterisans, club-shaped spirolina, trochus-shaped rotulites, minute corals and shells, echini spines, fine objects for the microscope, in exchange for slides of rock and diatomaceæ.—A. J. R. Sclater, M.C.S., Bank Street, Teignmouth.

Well-mounted sections of liver fluke, amphioxus, and earth-worm, &c., offered for other objects, unmounted, or books.—Alfred Draper, 179 Cemetery Road, Sheffield.

What offers for a Steward's guinea microscope with three powers, inclines to any angle, in polished case, with forceps, nearly new; also a good collection of minerals?—A. G. Hammond, 10 St. John's Hill, New Wandsworth, S.W.

Wanted, a three-inch O G and D eye-piece by good makers, also "Introduction to Entomology," by Kirby and Spence.—W. F. Kelsey, Maldon.

Mr. C. Carus-Wilson would be glad to have the address of some one who would polish a quantity of stones at a reasonable rate. Address—Allthome, W. Bournemouth.

Side-blown eggs of eider duck, oyster catcher, Richardson's skua, com. gull, lesser b. b. gull, puffin, guillemot, black guillemot, herring gull, common tern, Arctic tern, ringed plover, green cormorant, great skua, in exchange for others not in my collection. Also a quantity of the Oamaru diatom deposit (good), and some other "material," in exchange for really good micro slides.—T. E. Doeg, Evesham.

1500 fossils from chalk, greensand, lias, coal measures, Silurian and other beds, all localized, and many named. Offers wanted.—J. A. Floyd, 5 Hospital Road, Bury St. Edmunds.

Fine specimens of *Ananchytes ovatus* from the chalk, also other chalk and Tertiary fossils in exchange for shells, lepidoptera, fossils.—Frederick Stanley, M.C.S., Margate.

Wanted.—Galls, freshly gathered, from all kinds of plants, and parasites from animals. Will give in exchange lepidoptera, coleoptera, or birds' eggs.—S. L. Mosley, Beaumont Park Museum, Huddersfield.

Offered, *H. nemoralis* and *hortensis* from various localities, *H. virgata, caperata, Tellina tenuis, fabula, balthica,* and *Solen ensis.* Wanted, land, freshwater, and marine shells.—Thos. H. Hedworth, Dunston, Gateshead.

Wanted, foreign shells and naturalistic books and magazines in exchange for choice micro slides, diatoms, parasites, anatomical, double-stained botanical, &c.—R. Suter, 5 Highweek Road, Tottenham, London.

Wanted, ammonites of any species, for polishing, from 1 inch to 3 inches in diameter. Good exchange in ferns, &c.—H. W. S. Grimshaw, Mossley Road, Hurst.

British mosses (named and localized), including many rare species from Scotland and Wales, offered for good micro slides. Zoophytes, insect and vegetable dissections wanted.—J. J. C., 9 Wythenshawe Road, Sale, Manchester.

Wanted, smoking pipes of primitive or early design, chiefly Russian and Siberian; also fishing-hooks of shell, bone, wood, &c. Offered, ethnological specimens, rare shells, crustaceans, &c.—Ed. Lovett, West Burton House, Outram Road, Croydon.

BOOKS, ETC., RECEIVED.

"The Flora of Maidstone," by H. Lamb.—"The Uses of Plants," by G. S. Boulger (London: Roper and Drowley).—"The Middle Lias of Northamptonshire," by Beeby Thompson (London: Simpkin, Marshall and Co.).—"Report as to the best system for the Maintenance of Main Roads in the County of Hereford," by W. A. Smith.—"Letters from the Lakes," by Philip Kempferhausen (Ambleside: Geo. Middleton).—"Study of Lichens," by J. A. Martindale (Ambleside: Geo. Middleton).—"Flora of Switzerland," by A. Gremli (London: David Nutt).—"Illustrated Manual of British Birds," Parts xi.–xiv.—"Insect Life."—"Fanciers' Journal."—"British Dogs."—"Annals and Magazine of Natural History."—"The Entomologist."—"The Selborne Magazine."—"The Century Magazine."—"The Amateur Photographer."—"The Garner."—"The Naturalist."—Cassell's "Technical Educator."—"The Botanical Gazette."—"Belgravia."—"The Gentleman's Magazine."—"American Monthly Microscopical Journal."—"Wesley Naturalist."—"Midland Naturalist."—"Research."—"Feuilles du Jeune Naturaliste."—"The American Naturalist," &c. &c.

Communications received up to the 13th ult. from: J. L. M.—C. N. P.—G. C.—E. S.—A. G. H.—T. E. D.—W. B. B.—R. W. C.—W. J. S.—H. B. B.—F. M. H.—J. W. S.—P. J.—J.—H. K.—H. M.—W. B. P.—M. E. P.—O. V. D.—J. A. W.—A. J. F.—E. B. F.—W. J. S.—W. H. D.—A. J. J.—H. L. T.—J. E. L.—H. E. Q.—H. F.—W. A. T.—A. L. C.—H. M.—J. W. B.—J. T. L.—J. W. S.—C. C. W.—H. P.—C. W. H. B.—G. R.—J. W. W.—J. W. N.—A. J. S.—W. F. K.—A. D.—H. H.—F. C.—R. S.—G. T.—T. G.—T. A. D.—J. C.—T. H. A.—J. F.—J. H.—T. H. H.—S. L. M.—F. S.—R. M. W.—A. G. T.—J. N., &c. &c.

BOTANICAL NOTES FROM THE SWISS HIGHLANDS.

OVER THE GEMMI TO ZERMATT.

[*Continued from page* 153.]

THE Rhone valley has rather a dreary look about it, apart from the mountains which enclose it; and the towns, apart from the grand hotels, Sion excepted, have a mediæval dilapidated aspect which do not improve it. The river sides are for some distance overspread in places with stony detritus brought down by the many mountain tributaries when swollen; in other places, either a scrub of willow and alder mingled with narrow-leaved *epilobium*, sallow-thorn, and *myricaria*, or a marsh abounding in sedge and *Typha minima*. There is but little cultivation in the upper section of the valley, but vines seem to grow well on the lower slopes of the hills; and, if there were but a little more summer than what usually prevails, the wine produced would be better than it is.

The Vispthal or St. Nicholasthal, up which lies the road—horse-path only in parts—to Zermatt, is very narrow for the greater part of the distance, and very hot; the hill-sides clothed with scrub and forest in some parts, bare and rocky in others. The bush by the roadside was frequently barberry, *Lonicera xylostrum*, *Sambucus racemosus*, *Prunus Mahaleb*, *Juniperus sabina;* trailing over these our old friend *Clematis vitalba*, not unfrequently about Stalden for instance, and the following were collected en route: *Asclepias vincetoxicum*, *Astragalus onobrychis*, *cicer* and *leontinus*, *Achillea nobilis*, *Asperugo procumbens*, *Allium sphærocephalum*, *Arenaria grandiflora* (rocky debris near Raudau village), *Artemisia absinthium* and *campestris* (this not in flower), *Bromus squarrosus*, *Cynodon dactylon*, *Centaurea paniculata*, *Campanula rhomboidalis*, *Chondrilla juncea* (not in flower); a *Cuscuta* on *Berberis*, species not known; *Colutea arborescens*, *Carum carui*, *Crepis fœtida*, *Echinops sphærocephalus*, *Echinospermum Lappula*, *Erucastrum obtusangulum*, *Gypsophila saxifraga*, *Hieracium amplexicaule*, a coarse kind of the genus, with large leaves and viscid yellow pubescence, wet rocks; *florentinum*, slender and more attractive (=*piloselloides* of Villars), inflorescence in a many-flowered corymb, with small capitula on divaricating peduncles—some specimens, starved perhaps, had remarkably small capitula, rocky debris by the side of torrents;—*Lactuca scariola* and *perennis*, *Lasiogrostis* again, *Leonurus cardiaca*, *Luzula nivea*, *Linaria italica*, *Linum tenuifolium*, like *angustifolium*, but of less straggling habit, petals lilac and more persistent; *Lilium Martagon* (meadows); *Melica ciliata*, common; *Nasturtium pyrenaicum*, *Ononis columnæ*, and *Natrix*, much alike, and when not in fruit easily passed over the one for the other (in the former species the flowers are subsessile, and the calyx is of a tawny hue below, its divisions shorter than in those of *Natrix;* the pubescence too is shorter and denser, imparting a dull greyish look to the leaves);—*Phleum Boehmeri*, *Podospermum laciniatum* (var. β), *Phyteuma hemisphæricum*, near Zermatt; *Rosa alpina tomentosa*, *Rubus—cæsius* by the fruit, but a small flowered form; *Silene otites*, *Sedum album*, *Selaginella helvetica*, *Sempervivum arachnoideum* and *montanum*, *Saponaria officinalis*, *Tetragonolobus siliquosus*, *Tolpis staticifolia*. Common roadside plants noticed were *Stachys recta* and *Potentilla argentea; Sisymbrium Sophia* was frequent, but no note was taken of any thistle but *Defloratus* and *Personata*. A *Medicago* was gathered, possibly *minima*, being tomentose, and in other respects like it, but of more rigid growth, spines shorter and less curved.

At Zermatt two excursions were made: one to the

Schwarzseeberg, the mountain which forms the base of the Matterhorn towards the village, and that which is usually traversed en route by the adventurous spirits who make the ascent of that famous peak; and the other to the Riffelberg. The following is a fairly complete list of the plants collected on these occasions—ascents, as usual, zigzag, up steep mule-paths, through forest of red pine, fir, and larch, with an undergrowth of green alder and rhododendron: en route, near the village and lower part of the ascent:—*Cotoneaster vulgaris*, *Campanula spicata*, *Eriophoron alpinum* (marshy meadow); *Lascrpitium hirsutum* (rocky places); *Phaca alpina*, *Rosa pyrenaica*, *Rumex alpinus*, *Salix nigricans*; *Viola biflora*, Saxifrages, &c., as usual. Among the rhododendrons it was impossible not to note the singular abundance of *Geranium sylvaticum*, and a hawkweed not unlike *vulgatum*, but differing from it in the stems being monophyllous[1]; the radical leaves are strongly inciso-dentate at their bases, and inflorescence a closely-set corymbose panicle with diverging pedicels; capitula about seven or eight, sometimes in starved specimens two or one only,—*H. nemorense*? On rocks high up, and in adjoining pastures: *Aster alpinus*, *Androsace septentrionalis*, *Botrychium lunaria*, *Carex Davalliana*, *frigida*, *aterrima*, *nitida*, *ericetorum*; *Centaurea nervosa*, flower heads large, single, involucral appendages curious, brown, pinnate or plumose, and recurved; *Geum montanum*, *Gentiana campestris*, slender form; *Nigritella angustifolia*, *Phaca astragalina*, *Primula viscosa*, *Potentilla grandiflora*, a trifoliolate species; *Pedicularis comosa*, flowers a dull yellow, *adscendens*; *Rumex scutatus*, *Senecio Doronicum*, &c. Above the pines the ascent continues up the bare mountain side to an open, undulating, somewhat moory slope beyond, extending with intervening ridges to a craggy prominence called the Hörnli; behind this the Matterhorn.

The following plants were collected on the slope and about the ridges:—*Asplenium septentrionale*, *Anemone Baldensis*, *sulfurea*,—the latter a stouter plant than the typical *alpina*, with a much denser pubescence on the stems and petioles; the former might easily be passed over for a ranunculus from the involucral leaves being situated so low down the stems as to be hidden among the radical ones;—*Azalea procumbens*; *Androsace chamæjasme*, *carnea* (also on the Riffel)—leaves linear, rigid, pointed, ciliated, rosulate; corolla pink with a yellow throat;—*Carex nigra*, *curvula*—leaves incurved and rush-like, as in *incurva* (the synonym *juncifolia* of the latter species may, with equal propriety, be applied to the former. As it is, the terms *curvula* and *incurva* are apt to cause confusion of ideas with regard to the plants: the one has three stigmas and is of crespitose habit; the other two only and stoloniferous. In both the glumes are membraneous, though but partially so in *curvula*); *hispidula*, among the rocks high up, a coarse-looking species, unattractive though rare;—*Cherleria sedoides*; *Chamæorchis alpina*; *Chrysanthemum alpinum*; *Cardamine resedifolia*—may be known at sight, by its slightly rose-coloured sepals; *Draba aizoides*; *Johannis* (form *genuina*, furnished with a bifid or trifid pubescence: stems sometimes leafless, but usually with one or two leaflets more or less well developed on it);—*Elyna spicata*, *Erigeron uniflorus*, *Gaya simplex*, *Gnaphalium carpathicum*, *Hieracium glanduliferum*, *Juncus Jacquinii*, *Lloydia serotina*; *Luzula lutea*, *spadicea*; *Meum mutellina*, *Primula viscosa*, *Pedicularis rostrata* (corolla bright rose casque with a long beak; characteristic, the root furnished with thick fibres swollen in their centres); *Oxytropis lapponica*; *Ranunculus rutæfolius*, recognised at once by the orange spot at the base of the white petals; *pyrenaica*, leaves lanceolate;—*Saxifraga androsacea*, *exarata*, *muscoides* (form of *moschata*, having a glandular pubescence); a dwarf *Senecio* not in flower, apparently *incanus*; *Scirpus alpinus*, a small plant two inches high with sheathing stems, sheaths with a short limb, rare; *Silene acaulis*, *Thlaspi alpinum*, *Viola calcarata*, *Gentiana brachyphylla*.

Higher up towards the Hörnli, my companion obtained *Ranunculus glacialis*, *Potentilla frigida*, and starved specimens of *Thlaspi rotundifolium*, an inch or so high, reporting the stony ground in that direction unproductive of anything else. In addition to many of the plants above mentioned, we obtained from the grassy slopes of the Riffel leading to the Gorner Grat, *Saussurea alpina*, *Lychnis alpina*, *Oxyria digyna*, *Arabis cærulea*, *Arctia vitalliana*, *Androsace glacialis*, and *Carex fœtida*, possibly *microstyla*: the fact is, the specimens gathered are too immature for certainty; some of the spikes were so ultra-cordate as to impart a bilobate character to them—if that is the signification of the synonym *lobata*, Kth., and by which it may be better known. The sterile florets of its androgynous spikes were in some specimens at the summits; in some they are fairly mixed with the fertile ones, while in others they were all apparently sterile or all fertile; the glumes of a yellowish-brown colour, as long as the compressed utricles; the two lowermost glumes much larger than the others, with broad scarious margins and nerve running out into a long mucro; stolons very short. Possibly by some botanists the two species, very near each other, may have been confounded; for *fœtida* is named *lobata* by Villars.

Time did not unfortunately admit of a search among the moraines and rocks adjoining the Findlen and other glaciers—the home of most of the alpine rarities for which the Valais canton is justly celebrated. A notice, however, in the salon of the Grand Hotel, begs tourists to be considerate when collecting, as the plants were becoming scarce in the neighbourhood: possibly, therefore, the "hunting grounds" are no longer at present the "happy" ones they were in the times when the locality was less frequented than it is nowadays.

The geological character of the mountains is entirely different to that of the Bernese Oberland: instead of limestone, the prevailing rock is gneiss and mica-schist. A second visit, a month or so later in the season, might be made advantageously, from a botanical point of view, to these elevated regions.

We stayed on our return for half a day at Sion, noticing in particular the profusion in which *Diplotaxis tenuifolia* grows about the place. On the rocks crowned by the old fort grow *Androsæmum Ischæmum*, *Asperula longiflora*, *Coronilla varia*, *Isatis tinctoria*, *Stipa capillata* (panicle hardly emerged), *Thymus pannonicus* (a hirsute form of *Chamædrys*). The custodian of the place assured us that many rarities grew formerly within the precincts of the place, but that they had all been exterminated; in proof of his assertion he produced a specimen of an *Artemisia*, not in flower, which looked like *spicata*.

My brother of the vasculum brought back as the "finds" of an afternoon walk in the environs of the town, fine specimens of *Allium sphærocephalum* and *acutangulum*, *Delphinium consolida*, *Quercus pubescens*, and *Ephedra helvetica* in fruit; also, but rather *passée*, of *Adonis flammula*, *Bupleurum rotundifolium*, and *Caucalis daucoides*.

SOME WINTER BIRDS OF NEW JERSEY.

By Dr. Charles C. Abbott.

[*Continued from p.* 146.]

I REMEMBER some years ago reading in Science-Gossip, a protest against introducing this finch (cardinal grosbeak) into England, because it would prove destructive to fruit. This is nonsense, or you must put a deal more value on wild berries than we do. As to cultivated fruits, they will not disturb them. They are birds that will hold their own wherever they may be, and would not be out of place even in English wild woods.

In my walk to-day, I chanced upon a vigorous growth of winter-berry, laden with its crimson fruit. Had there been snow upon the ground, it would have made a splendid show; and when I was within arm's reach of the bush, out flew a cardinal that had been lurking among the berries. I have since been wondering if it knew how effectually the red fruit concealed it. Had it been sitting there to avoid detection? I looked about for a lurking hawk, but saw only one, and at a great distance. Perhaps it was hiding from me only.

I did not see the pretty purple finches to-day, but have already noticed their arrival from the north. They, too, can sing sweetly. Thoreau in his journal records: "I think it must be the purple finch . . . . which I hear singing so sweetly. . . . It has a little of the marten warble and of the canary bird." Later he describes the song as "a twitter witter, weeter wee, a witter witter wee." As I hear it, at the close of winter, it is less elaborate than described above: but that is its summer song. Here, in winter, it is practising only, but it is melody for all that.

It is too early yet for the snow buntings, and, it may be, we shall have none to visit us; but I always look for at least one goodly flock, after a general snowstorm. As he is one of your winter birds, I will say nothing more, but a comparison of his habits here and with you might be of interest. Here, in New Jersey, as Thoreau has written of them in New England, they "are the true spirits of the snowstorm. They are the animated beings that ride upon it and have their life in it." And elsewhere, in his winter journal, "As I flounder along the corner road against the root fence, a very large flock of snow buntings alight with a wheeling flight amid the weeds rising above the snow: . . . . they keep up a constant twittering. . . . Besides their rippling note, they have a vibratory twitter, and from the loiterers you have quite a tender peep, as they fly after the vanishing flock." I have heard this many and many a time, and suppose it is nothing new to my English friends, who know the bird at all.

There are yet others of the great finch family, but I can name but two at this time,—the pine-finch and the common crossbill. The former never fails us; they are here to-day (December 11) in abundance; but the crossbills are not so certain. Both are given to pine and cedar forests, but the pine-finch is less particular, and deciduous trees are freely hunted over, so probably seeds are not its only food. Our text-books of American Ornithology give the impression that severe cold is necessary to bring these birds as far south as New Jersey. This is not true. They come very often before winter fairly sets in, and, whether cold or mild, it matters little, if any; here from November to April they are sure to be.

Their song is not elaborate, certainly, but it gains by concerted utterance, as do so many of our winter birds. To have a hundred or more of these finches settle upon a low pine, and each bird singing as best he can, is to have something more than a lively jingle. It has that suggestiveness which makes us forget that it is winter; or leaves us in the still better frame of mind, that winter is not a long period of nature paralysed, and of decay and death.

Crossbills are tantalisingly uncertain, and are often in the Pennsylvania cedar swamps and among the clustered pines there, when here, in New Jersey, not ten miles away, there are none. The thermometrical conditions have something to do with it. Writers do not credit them with marked musical powers, and here they chirp only, but certainly not in an unmusical way. I would that they were more abundant. Less frequently seen are the white-winged species. As you, too, have these birds, I shall say no more, save that when I happen to look out from my study windows and see in the pines about the house a flock of crossbills flitting among the branches, that is for me a red-letter day.

But we have other winter birds besides the sparrow-hawk and sparrows. We have two kinglets, and one, the golden-crowned wren, so called, is with us always from November to April, inclusive; the other, the ruby-crowned wren, less regularly. Both are dainty birds, darlings wrapped in fluffy down that mind no weather, that sing as cheerfully during the tempest as when the sun shines brilliantly on our warm south hillsides. Likewise the nut-hatches, one of which, the red-bellied, comes in autumn, and is so restless and small, that many a time he is overlooked, unless our eyes are open to every bird that flies. This nuthatch is not a songster, it is true, but has a cheerful chirp at times, and adds to the landscape a charm by its lively manner; that is, when we happen to spy him out and follow the mazy paths he takes over our tallest trees.

Emerson has immortalised our little black-capped titmouse:

"Piped a tiny voice hard by,
Gay and polite, a cheerful cry,
Chic-chicadeedee! saucy note
Out of sound heart and merry throat,
As if it said, 'Good day, good sir!
Fine afternoon, old passenger·
Happy to meet you in these places,
Where January brings few faces.'

* * * *

Hopped on the bough; then, darting low,
Prints his small impress on the snow,
Shows feats of his gymnastic play,
Head downward, clinging to the spray."

Lastly, the grand Carolina wren, a bird unlike any of the British fauna. What I have had to say of him has been already printed, and I will not repeat. Grand singer; lively companion; never a day can be called dreary when he is abroad.

I have had my walk; even gathered stray violets in the sheltered woods, and am ready for another book on British Birds. No, our native songsters do not suffer by comparison. Even in winter they loom up as a never-ending charm of our hills and valleys. Nor are those that I have mentioned, all. I have said nothing of many a land and water bird that frequent the wilder tracts, and make of them, to him who loves an outing, gladsome spots indeed.

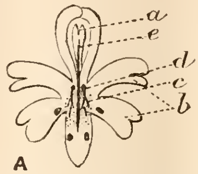
If ever it should be my happy lot to listen to British song birds, on British soil, I think I can do so without blushing for my feathered friends at home.

SCHIZANTHUS—A BOTANICAL STUDY.

IN my garden there grows an annual which sprang from seed that I sowed under the name of *Schizanthus pinnatifolius*. It is undoubtedly a Schizanthus; but, as I can find no reference to the specific name, I think it must be the gardener's name for a variety of some better known species. However that may be, there are some suggestive peculiarities about the flowers which have much exercised my mind. As it may be doubtful whether I have satisfactorily solved the rationale of the mechanism, I write these notes to elicit the opinions of other observers.

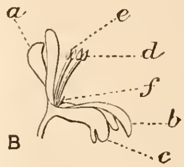
Schizanthus belongs to the natural order Scrophulariaceæ, and is apparently very closely allied to the genus Veronica.

An examination of a flower of Veronica will show that the sepals and petals are each four in number, and the stamens two. The single posterior and two lateral petals are much larger than the anterior one. The corolla is gamopetalous, is easily detached and slipped over the style. In Schizanthus the same characteristics hold good for the corolla; but the



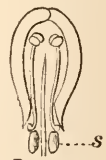
A

Fig. 113.—Front view, stamens not shown. *a*, hood of posterior petal; *b*, lateral petal; *c*, ridges and groove; *d*, two staminodes; *e*, style (nat. size).



B

Fig. 114.—Lateral view. *a*, hood of posterior petal; *b*, anterior petal; *c*, lateral petal; *d*, style, two fertile stamens parallel with style; *f*, ridge and staminodes (nat. size).



D

Fig. 115.—*s*, staminodes (enlarged).

C

Fig. 116.—*s*, staminodes; *r*, ridge (enlarged).

structure is much more complicated, and the sepals are five in number. Fig. A will show that the posterior petal has assumed a trilobed form. The two lateral lobes are curved towards one another, so as to meet at the points, but lie in one plane, and surround an oblanceolate opening. The two lobes form what I term the platform. Within and below the opening lies the mid-lobe, which is hood-shaped, with a deep terminal emargination. This lobe I will call the hood. Next, the two lateral petals, which in Veronica are entire, are here deeply divided, and each segment so produced is again deeply notched. There remains the anterior petal, which corresponds in size to that in Veronica; but towards the centre of the flower it is elevated into two ridges with a deep groove between them, giving externally the appearance of the entrance to a spur. The ridges are yellow, with spots of purple, and a streak of the same colour passes into the groove. There is always a blotch of purple on each side the entrance to the groove, and a larger blotch on each front lobe of the lateral petals. The rest of the corolla is pink. It also agrees with

Veronica in having two fertile stamens, which are the same in position, but it differs in possessing three staminodes.

One of them, representing the posterior or fifth stamen (the rudiment of which is so frequently found in this order), is a very insignificant, although quite distinct, structure, attached to the very base of the hood, and just at the bottom of the groove. Whether it fulfils any function in producing nectar, I have not been able to determine. The other two staminodes, representing the anterior stamens, are attached to the hinder end of the ridges, in the manner represented in Fig. C. The two fertile stamens lie at first deeply ensconced within the hood, the filaments being strongly curved back from their point of attachment. Later they lose this curvature, and become parallel with the style which projects straight forward from the corolla tube, with the tip curved so as to present the slightly lobed stigma to any entering visitor. It will be observed that there is a rough resemblance in the appearance of the flower to an Orchis, and this is enhanced by the fact that the flower is inverted, not, however, by torsion, but by a sharp curvature of the pedicel, so that the platform and hood lie lowermost and horizontally. To realise the normal position of the flower, imagine Fig. A tilted up through an angle of 90°.

Having described the structure, we come to the action, which is very curious. Taking a leaf out of Darwin's book, I at first experimented on the groove with pins and pencils. In about one flower out of six, one and sometimes both stamens would spring forward and become nearly parallel with the style. This is the mysterious part of the business, as in every case where a stamen came forth in that manner, the anthers had already discharged their pollen, and I have failed to detect either the part which such a movement would play in fertilisation, or the mechanism by which it is effected. I am inclined to believe it is a phenomenon of old age, due to the release of the tension of the filament, caused by its curvature from its point of attachment into the hood. The platform and hood are attached to the rest of the corolla by an elastic hinge; and any pressure on the platform will depress it and cause the stamens to come forth, not by any movement of their own, but by remaining stationary. An insect would alight upon this platform, and not upon the lip or anterior petal. The depression of the platform would follow, and the anthers would strike against the underside of the visitor. Upon the removal of the weight, the stamens, if they are young, resume their original position within the hood; but the older the flower, the less is the elasticity by virtue of which the hood flies to the old position. This flower seems to be very rarely visited by insects in our climate. On one occasion only I saw a bee visit it, and then the weight of the insect detached the corolla. It is apparently fertilised by a small winged insect: but in the absence of any such visitor the anthers dehisce while yet within the hood. Subsequently the hood and platform will fall back of their own weight, and the stamens will be found parallel with the style, or at any intermediate angle. Whether this or the sudden movement of projection is in any way a provision for self-fertilisation, I am quite unable to determine. The arrangement for cross-fertilisation is clear enough, and, in addition to what has already been said, the style slightly projects beyond the anthers, so that it would be the first to come in contact with the breast of an insect, or it may be a provision to secure its passing right through the region where the pollen was deposited by a previously visited flower.

With regard to the release of the tension in the filaments, the structure of the staminodes and the groove should be intimately observed. By causing the groove to be penetrated by a bristle, the two staminodes will be made to diverge, and the style (if the flower is in the right stage of maturity) will slip forward between them. It is quite possible that this may release a tension which allows the stamens to come forward. The two fertile stamens have filaments somewhat dilated at the base, so that the space between them is rather narrower than the width of the style. At the base, therefore, the filaments would be held back by the style, and the passing of the style between the staminodes would be followed by a forward movement of the fertile stamens. At any rate, the first effect of passing a bristle into the groove is to cause a rising movement of the style, and this would still more facilitate its contact with the breast of an insect. With regard to the stamens, their filaments are curved back into the hood without any visible means of retention in that position; but their bases are attached outside to the lower part of the platform, and it is only at that point where they are in contact with the style. I have a theory that at a certain stage the stamens are irritable, like those of *Berberis*, and that the stimulus is imparted by the release of the tension at the base; but it is a theory, and nothing more.

Simple and insignificant as this flower may seem, it presents a perfect maze of adaptations, and I should be glad to hear of a more successful effort to unravel it than that presented in this feeble attempt.

J. HAMSON.

Bedford.

A DAY AT SELBORNE.

By REV. F. H. ARNOLD, LL.B.

THE members of the Emsworth Natural History Society having often expressed their desire to visit the scenes depicted in Gilbert White's classic pages, so dear to all lovers of nature, the 1st of June was resolved on as a date when they would probably be seen at their best. A more perfectly lovely and delightful day could not have been chosen; not only was it fine throughout, but its warmth was tempered by a pleasant breeze. Proceeding by rail to Liss, we had a nice drive of about five miles, through a beautiful country "in nature's greenest livery drest," by several hop-gardens, where the bines were trailing towards the tops of the poles. As we passed through the long straggling village, we saw the picturesque old house in which the great naturalist spent his tranquil years. We first walked round the grounds of the rectory—charmingly situated, and noted for several rare and well-grown pines; the church was next visited, with its plain tablet to White, who is simply designated as "the historian of Selborne," and saw his grave, marked by a little headstone bearing his initials and the date 1793. We measured the yew in the churchyard and found its circumference to be twenty-four feet six inches, whereas a hundred years ago it was twenty-three feet, and were thus able to ascertain its growth during the period. It is a tall and shapely tree, although its body is well described as "squat, short, and thick." White estimated its age as "several centuries," only; perhaps, as many as eight may be assigned it. Little symptoms of decay are visible.

The next object of interest was the sycamore in the "Plestor," which replaced the vast oak there, blown down "in the amazing tempest of 1703." This sycamore is not of large girth. Seated on the bench around it, one could almost realise White and those about him on a summer evening. Thither, too, at the end of the day, the young botanists of our party repaired to spread their floral treasures on the green, and compete for prizes offered for the best collections of wild flowers. One brought seventy, and another sixty species, correctly named. It was also easy to imagine how pleased the veteran naturalist would have been to have witnessed the interest now taken by many in the pursuits he so dearly loved, but which in his days were confined to few.

Selborne Hanger is probably much as it was of yore; some of the party ascended it by the zigzag, others breasted the steep. Mr. W. Jeffery, searching for molluscs, found, climbing the beeches, *Clausilia rugosa*, *C. laminata*, *Helix rufescens* (pale variety), *H. lapicida*, and other common species, with the rare *Bulimus montanus* and *B. obscurus*. There, too, we heard the notes of the wood wren, the tree pipit, the tree sparrow, and the nightingale, and listened to the laugh of the yaffle. On plants intent, my search was rewarded by *Epipactis latifolia*, *Neottia nidus avis*, *Listera ovata*, *Daphne laureola*, and *Lysimachia nemorum*; and, conducted by a lady pioneer, we went on to the High Wood, which much resembles parts of the New Forest. Our object was to find the green hellebore, said to grow there; but after much search the plant turned out to be the bear's-foot, which occurred in profusion, and was just going out of flower. White has well noted its most obvious distinction—the presence of the dark-green leaves of the previous year, whereas *H. viridis* dies down in the winter, and has all its foliage of a paler hue. *H. fœtidus*, considering its locality here, I am strongly inclined to consider indigenous, notwithstanding Watson's doubt on the subject.

As to the wildness of *H. viridis*, both in Hants and Sussex, there can be no question. The afternoon was passed in exploring the "Liths." There we met with *Lithospermum officinale*, and in a low-lying meadow observed a plant, by no means common in the district, and unrecorded by White—the snake weed, *Polygonum bistorta*, said by Gerard to be good "against the biting of serpents and other venomous beasts." It was growing in profusion, and its pretty pinkish blossoms were very conspicuous. Time would not permit an examination of the boggy portions of the parish. A day, indeed, little suffices for investigating a place which afforded material for a lifelong study, yet on our return all agreed that very great pleasure had been experienced from the "finds" made, the charming scenery, and the manifold associations which clung about Selborne.

VARIATION IN THE MOLLUSCA, AND ITS PROBABLE CAUSE.

By Joseph W. Williams.

Part II.—Variety-naming more fully considered.

I HAVE, in the first part of my article, considered one or two main points as to the futility of a too promiscuous variety-naming, and I now proceed to consider the subject more fully as to how far varieties may be named to accord with a strict scientific sense; that is, on a scientific basis of value, and as to how far they may not be named to accord with a strict scientific sense or basis of value. I wish it to be well understood that Science does not concern herself with handing the names of variety-mongers, appended to the varieties they have latinised, down to posterity, but that she rather and only concerns herself with varieties just so much as will help her to render unto posterity a true and faithful cause of those variations. This promiscuous variety-naming has its source in one narrow specialised circle—the plates at the end of a shell-book; this being all the knowledge that a variety-monger aspires to. He knows a shell when he sees it and can call it by its specific name and perhaps by a new-fangled variety-name, but a schoolboy with a small knowledge of shells, a little practical tact, and just as much an acquaintance with the dead languages, could do as well as he has done. Outside this narrow circle he is a simple Peter Bell: outside that he knows no more about nature than Peter Bell did of the yellow primrose by the river's brim. He can tell you nothing about the structure and physiology of the animal that inhabits the shell to which he has, but a few minutes ago, given a variety-name; and while fondly imagining that by giving variety-names he is doing something for Science, he is but leading her to confusion and making himself like the man in the 'Lobgesang,' a wanderer in night and foulest darkness. Fondly imagining that he has to seek the cause of variation in the shell itself, he has foolishly stared at a shell and asked that shell to render unto him a full account as to how it became white, yellow, or red. The shell is the *all* to him because it is a very pretty object to stare at in a collection, and to show visiting friends, perhaps; he forgets the excessively plastic nature of the ovum and of the spermatozoon, or, perhaps, he has never heard or read of such things, since, as far as his natural history goes, he has kept in his 'one narrow specialised circle—the plates at the end of a shell-book.'

I will not say that the modern variety-monger has not had a precedent for all that he has done in his blind and unintelligent manner—a precedent traceable to the French schools of Moquin-Tandon, Locard, Dumont, Mortillet, and others; which, however, a Bacon or a Zimmermann would, for the most part, have declared to be a dubious or even an erroneous one. I am glad to see, however, that the Coryphæi of the Leeds school, to whom attaches assuredly some of the blame for all this in relation with British collectors, are turning their backs upon an ill-usage of latinised terms in variety-naming, which, in the end, would lead us along the broad way to a confusion and subvertency of our science. With them it remains to turn the stream into a securer channel, and, until they publicly unveil their advertence to this subject of too promiscuous variety-naming, and pronounce at first hand their veto, the banks of the present course of the stream will still give way and lead to utter ruin and desolation.

To consider some of the already named varieties seriatim. Let us take the following postulates, under which all variations will fall, and which the unprejudiced reader will readily concede to at first sight; by these a variety-name may be judged by the same parity of reasoning as to whether it be good or bad.

Postulate A.—That it would be absurd and tend to no good end to call O'Brien, the Irish giant, whose skeleton is in the museum of the Royal College of Surgeons, in London, *Homo sapiens*, var. *major*, or var. *maxima*, or to call Tom Thumb *Homo sapiens*, var. *minor*, or var. *parva*, when their greatness or littleness may be alone expressed accurately in terms of measurement.

Postulate B.—That it would be just as absurd to call a blonde, brunette, or black human being *Homo sapiens*, var. *alba*, or *albida*, *Homo sapiens*, var. *brunnea*, or *Homo sapiens*, var. *nigra*, as the case may be, when our common speech provides terms equally and as accurately—scientifically considered—expressive.

Postulate C.—That it would be just as absurd to call a human being with pale whitish lips *Homo sapiens*, var. *albolabiata*, or one with rosy lips *Homo sapiens*, var. *roseolabiata*, when our common speech provides terms equally and as accurately expressive.

Postulate D.—That it would be absurd to name minor changes of form in a human being by special variety-names; for example, such as *Homo sapiens*, var. *nasoarcuata*, or *Homo sapiens*, var. *frontalis-prominentia* (for a man whose frontal sinuses are larger and butt out more prominently than ordinary), when our common speech provides terms equally and as accurately expressive.

On the other hand—

Postulate E.—That it is not absurd to give special names to colour-variation when the colours are many and well defined in any one form, since the name subserves the purpose of a kind of shorthand and cannot be as shortly and as conveniently expressed in terms of common speech.

Postulate F.—That it is not absurd to give special names (for the same reason as in *E*) to structural modifications when they are well defined. Such, for example, are given in human teratology as *acrania*, *labium leporinum*, *ectopia*, *anencephalus*, *acormia*, etc.

To postulate *A* belong:—*Sphærium corneum*, var. *minor* (Gray); *Pisidium pusillum*, var. *grandis* (Adams); *Unio pictorum*, var. *latior* (Jeff.); *Anodonta cygnea*, vars. *radiata* (Müll.), *Zellensis* (Gmel.), *ventricosa* (Pfeiff.), *lingua* (Yoldi, Mönch); *Anodonta anatina*, vars. *ventricosa* (Pfr.), *minima* (Mill), *crassiuscula* (Drouet); *Bithynia tentaculata*, var. *major* (Locard); *Valvata piscinalis*, var. *depressa* (Pfr.); *Planorbis lineatus*, var. *major* (Locard); *Planorbis nitidus*, var. *minor* (Jeff.); *Planorbis albus*, var. *major* (Locard); *Physa hypnorum*, var. *major* (Charp.), *Physa fontinalis*, vars. *curta* (Jeff.) and *oblonga* (Jeff.); *Limnæa peregra*, var. *rivalis* (Stud.); *Limnæa auricularia*, vars. *magna* (Colb.), *minor* (Moq.); *Limnæa stagnalis*, vars. *major* (Moq.), *pumila* (Moq.), *minor* (Dumont and Mortillet); *Limnæa palustris*, vars. *minor* (Taylor), *obesa* (Taylor); *Limnæa truncatula*, vars. *major* (Moq.), *minor* (Moq.); *Limnæa glabra*, var. *major* (Gassies); *Succinea putris*, vars. *grandis* (Haz.), *major* (Cooper), *subglobosa* (Jeff.); *Succinea Pfeifferi*, vars. *parvula* (Pasc.), *minor* (Rossm.); *Hyalina fulva*, var. *major; Helix pomatia*, vars. *minor* (Westrl.), *grandis; Helix aspersa*, vars. *minor* (Moq.), *maxima* (Taylor); *Helix nemoralis*, vars. *major* (Fér.), *minor* (Moq.); *Helix hortensis*, vars. *minor* (Moq.), *major; Helix arbustorum*, vars. *major* (Jeff.), *minor* (Westrl.); *Helix cantiana*, var. *minor* (Moq.); *Helix rufescens*, vars. *minor* (Jeff.), *cœlata* (Stud.); and so on.

To postulate *B* belong:—*Sphærium corneum*, var. *Scaldiana*, sub. var. *citrina; Pisidium nitidum*, var. *flavescens* (Moq.); *Pisidium nitidum*, var. *splendens* (Baudon; MSS. Moq.); *Unio margaritifer*, var. *olivacea* (Brown); *Neritina fluviatilis*, vars. *cerina* (Colb.), *nigrescens* (Colb.); *Paludina contecta*, var.

virescens (Jeff.); *Paludina vivipara*, vars. *unicolor* (Jeff.), *atro-purpurea* (Lloyd), *albida* (Nelson and Taylor); *Bithynia tentaculata*, vars. *albida* (Rimmer), *rufescens* (Ckl.), *fulva* (Locard), *cornea* (Locard); *Bithynia Leachii*, var. *albida* (Rimmer); *Valvata piscinalis*, var. *albina* (Taylor); *Valvata cristata*, var. *alba* (Rowe); *Planorbis lineatus*, var. *albina* (Taylor); *Planorbis nitidus*, var. *albida* (Nelson); *Planorbis spirorbis*, var. *albida* (Nelson); *Planorbis carinatus*, var. *albida* (Hudson); *Planorbis umbilicatus*, var. *albina* (Jeff.); *Planorbis corneus*, var. *albina* (Jeff.), *albinos* (Moq.), *ferruginea* (Pasc.); *Planorbis contortus*, var. *albida* (Jeff.); *Physa hypnorum*, var. *cuprella* (Rowe); *Physa fontinalis*, var. *albina* (Jeff.); and the various other unicolorous named varieties that have been described.

It is a sign of the degeneracy of the times of variety-naming that there is a proneness on the part of some to give definite names to the variation in the body-colour of molluscs; to me this resembles a collector of plants, withal a bad botanist, who strove to render aid to science by naming in latinised form the various colour shades to be found in leaves of the ground ivy.

To postulate *C* belong:—*Physa hypnorum*, var. *roseolabiata* (Pascal); *Limnæa stagnalis*, var. *roseolabiata* (Sturm.); *Limnæa palustris*, var. *roseolabiata* (Jeff.); *Helix nemoralis*, vars. *luteolabiata* (Ckl.), *albolabiata* (v. Martens), *roseolabiata* (Taylor), *bimarginata* (Moq.); *Helix hortensis*, vars. *roseolabiata* (Taylor), *fuscolabiata* (v. Martens), *luteolabiata* (Ckl.); *Helix arbustorum*, var. *roseolabiata* (Roberts); and so on.

To postulate *D* belong such as *Sphærium corneum*, var. *compressa* (Gray); *Sphærium rivicola*, var. *compressa* (Pasc.); *Paludina vivipara*, var. *inflata* (Locard); *Bithynia tentaculata*, var. *angulata* (Roberts), and the various decollated monstrosities termed separately in latinised form as *m. decollatum*.

To postulate *E* belong such as the named particoloured variations of the slugs and the helices.

To postulate *F* belong such as *Pisidium fontinale*, var. *Henslowana* (Shepp.); *Anodonta cygnea*, var. *rostrata* (Ziegl.); *Limnæa peregra*, vars. *Burnetti* (Alder) and *stagnaliformis* (Taylor), with others, etc.

So that of all the named varieties it is only those that can be placed under the category of the postulates *E* and *F* that I would keep as valuable aids to scientific expression. In the following parts it will be my aim to show that the cause of variation must be sought in the plastic nature of the ovum and the spermatozoon, and not by variety-naming or by mere getting together locality collections of varieties.

(*To be concluded.*)

We have received Nos. 1 and 2 of the first volume of "The Optical Magic Lantern Journal and Photographic Enlarger," and judging from these numbers the journal will supply a want.

NOTES IN ECONOMIC BOTANY.

NUX VOMICA.—This most energetic poison is the produce of a plant belonging to the family *Loganiaceæ*, named by Linnæus *Strychnos Nux vomica*. It is a native of the Indian Archipelago and Peninsula, as well as the southern part of the Bengal Presidency. It grows to a moderate-sized tree, with a short crooked trunk; branches irregular, covered with smooth dark-grey bark; wood white, intensely bitter. Leaves opposite, oval, pointed, 3–5 nerved, varying in size. Flowers small in terminal corymbs, greenish-white. Fruit round, about

Fig. 117.—*Strychnos Nux vomica*. *a*, flower; *b*, seed.

the size of an orange, filled with a soft, white, gelatinous pulp, in which the seeds are immersed attached to a central placenta. Seeds round, or shield-like, depressed on one side, convex on the other, about ¾ inch broad, and two lines thick, thickly covered with silky, ash-coloured hairs. They have little smell, but an intensely bitter taste, which is due to the presence of two most energetic poisons, viz., strychnia and brucia, united with a peculiar acid known as strychnic acid. Besides these substances the seeds contain a yellow colouring matter, a concrete oil, gum, starch, bassorine, and a small quantity of wax.

A third base has also been detected and named "igasuria."

The action of *Nux vomica* is a powerful excitant of the spinal system of nerves, poisonous, producing tetanic convulsions without affecting the brain. It is used in the form of a powder or other extract, is employed as a stimulant of the nervous system in cases of paralysis, etc.

Strychnia is the crystalline alkaline prepared from the seeds, occurring when pure as white, brilliant, oblique octahedra; or as elongated four-sided prisms, or even sometimes seen in a simple granular state. It is so intensely bitter that one part is perceptible in 60,000 parts of water. The strychnia as sold is seldom or never pure. It contains brucia and colouring matter, as well as lime and magnesia.

Brucia resembles strychnia, although not so powerful; it crystallizes in transparent crystals, or in pearly scales.

Strychnia is employed for the same purposes as

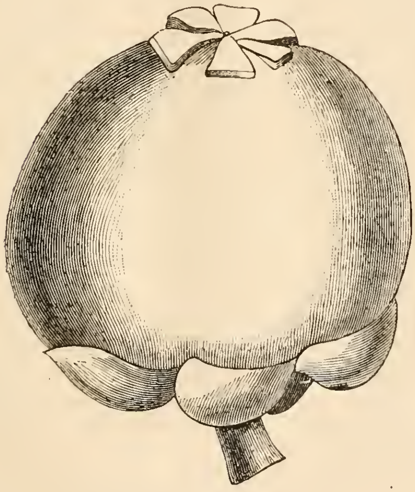


Fig. 118.—*Garcinia mangostana.*

Nux vomica, but only in very small doses. The first effects experienced from a dose are twitches in the muscles. In larger doses, tetanic spasms ensue, and a tendency to lock-jaw. It is so powerful that Dr. Christison mentions that he has seen a dog killed in two minutes, when not more than the sixth part of a grain has been injected into the animal's chest. It is also stated that as small a quantity as $\frac{1}{1000}$ part of a grain, diffused in the water in which a frog is immersed, will cause the animal to have tetanic convulsions.

GUTTIFERÆ.

Mangosteen or Mangusteen.—This most delicious of all tropical fruits is produced by *Garcinia mangostana*, L. (Fig. 118), a plant belonging to the Guttiferæ. It is a native of the Malay Archipelago, where it is cultivated, as well as in the southern and eastern parts of India, although the fruits produced in the Malay Islands are much superior in flavour to those grown in India. It is a tree about twenty feet in height, with regular horizontal branches. Leaves rather rhomboidal, obtuse, opposite, coriaceous, smooth, dark-green above, paler beneath. Male flowers clustered; female flowers solitary, terminal, about the size and colour of a dog-rose. Fruit round, about the size of an orange; when ripe, with a yellowish-brown, toughish rind, enclosing a most delicious white pulp.

It is undoubtedly the most delicious fruit. Abel says, "We were anxious to carry away some precise expression of its flavour, but after satisfying ourselves that it partook of the compound flavour of the pine-apple and peach, we were obliged to confess that it had many other equally good and utterly inexpressible flavours." Wallace says in his 'Malay Archipelago,' page 84, "The Dyaks brought us daily heaped-up baskets of mangusteens and lansats, two of the most delicious of the sub-acid fruits."

It is said that any quantity of the fruit may be taken without injury. As well as being largely used as a luxury, it is given in cases of fever with the sweet orange. In the year 1855 the tree first produced flowers and fruit in this country, at Sion House, the seat of the Duke of Northumberland.

J. T. R.

A VENERABLE NATURALIST: MR. JOHN RALFS.

[*Concluded from p.* 128.]

When he received Mr. Borrer's letter Mr. Ralfs was in ill-health, but the idea which he had dropped in a moment of anger, and which his friend had accepted with such enthusiasm, was too good to be dismissed in a hurry; and after due consideration, he determined to carry it into execution. But in the meantime Hassall's "History of the British Fresh-water Algæ, including descriptions of the Desmideæ and Diatomaceæ," had appeared. It was accorded a cool reception by the scientific papers, and in nearly every case praise was distinctly qualified. A review appeared in the "Annals and Magazine of Natural History;" it was on the whole favourable, but the reviewer strongly condemned the scanty amount of credit which the author gave to Mr. Ralfs and Mr. Jenner. This review is noteworthy on one or two points. When Mr. Hassall's book appeared, Mr. Borrer sent a copy of it to Mr. Ralfs: and a short time afterwards Taylor, the general editor of the "Annals," wrote to Mr. Ralfs on the subject of the recent work. In reply, Mr. Ralfs, sinking his own personal interest, pointed out some blunders, and demonstrated that, even in conveying matter from another man's work, the author was careless and untrustworthy. Most of Mr. Ralfs' remarks were coolly appropriated by the reviewer!

The "Annals," it should be said, had a special reason for backing up the subject of this notice. By arrangement the Botanical Society of Edinburgh had entered into an agreement by which the more valuable papers should appear in the "Annals" a few weeks after they were read. The Society was in several respects the gainer by this plan. Mr. Hassall wrote a letter, which appears in the "Annals" of February 1846, answering some of the objections, and explaining certain points to which exceptions had been taken. It was a false move. The "damning with faint praise" was infinitely preferable to the "crusher" which appeared in the following or March issue. This time the reviewer does not spare him, and declares that Mr. Hassall should have been "well satisfied when he reflects how plentifully he has appropriated to himself the work of others." In consequence of this decidedly plain-speaking an action for libel was threatened, but it did not get beyond this stage.

When a monograph of the Desmideæ was decided upon, Mr. Ralfs wrote to botanists in various parts of the world. And now another very extraordinary incident occurred which is well worth recording. Kutzing, an eminent German botanist, and Brebbison, an equally distinguished Frenchman, both wrote to Mr. Ralfs, unknown to each other, at the same time, each proposing to write a work on the Desmids, and the three letters were actually in transit simultaneously! It seems almost incredible that three botanists in as many parts of Europe should have thought of writing a book on an obscure subject, and of announcing that fact within a few hours of each other. Such, however, was the case. But both immediately wrote to Mr. Ralfs, not only renouncing their intention, but offering to assist him in his undertaking. Mr. Ralfs, who has resided principally at Penzance since November 1837, at once commenced putting his material into something like order, and hunting after new species. And it is remarkable, as showing how unworked the subject was, that one-third of the species which Mr. Ralfs describes in his book were discovered after the prospectus was issued.

"The British Desmideæ" by John Ralfs, with drawings by Edward Jenner, A.L.S., and dedicated to W. Borrer, F.R.S., appeared in 1848. There were twenty-five plates illustrating the 134 species described in the text, which were comprised in the twenty-one genera of which the family was then made up. Besides an analysis of the genera, there was another of the species, and a highly interesting introduction of forty-five pages. The list of subscribers is one of the most influential that had up to then appeared in any book, and offers a striking contrast to that which appeared in Mr. Hassall's work. Mr. Ralfs' list of 306 included all the leading scientific institutes of the day, and such men as G. A. Walker-Arnott, J. H. Balfour, C. E. Broome, W. B. Carpenter, C. G. B. Daubeny, G. Dickie, R. K. Greville, A. Henfrey, J. S. Henslow, W. J. Hooker, J. D. Hooker, W. A. Leighton, and John Lindley. The success and universal approval of Mr. Ralfs' labours were immediate, and perhaps seldom has an author received letters of approbation from so many and unexpected quarters. The care and accuracy of the text, the high-toned character of the preface, and the exceptional fidelity and beauty of the plates, even more than justified the expectations of the subscribers. It is also worthy of note that the book is now worth about five times its original commercial value; that its utility is further proved by the fact that it is placed in the "Gallery" of the British Museum Reading-Room, and that it is still an indispensable book to the student of the Desmids. Scarcely any scientific books possess a practical value nearly half a century after publication; but we have here a very distinct exception to the general rule.

When Pritchard was contemplating a fourth edition of his "Infusoria," he requested Mr. Ralfs to write the section on Desmids. This resulted in the valuable section in the 1861 issue of Pritchard's book. The editor in his preface acknowledges the aid of Mr. Ralfs, "whose name is so intimately identified with the knowledge of these organisms."

But apart from his writings on the Desmids and Diatoms, Mr. Ralfs' work has been of a chiefly local interest. His "Flora of West Cornwall," in MS. in the Penzance Library, has occupied him many years, and we can only hope that he may be spared to complete it. The "Transactions of the Penzance Natural History and Antiquarian Society," of which he has been president, contain very many of his papers. Readers of Darwin's "Insectivorous Plants" will also recall the great naturalist's graceful reference to some facts supplied him by Mr. Ralfs. A very nearly complete catalogue of his works and papers will be found in Boase and Courtney's "Bibliotheca Cornubiensis."

Mr. Ralfs has been a familiar figure in Penzance for over half a century; and the present writer is glad of an opportunity of putting on record a few of the numerous reminiscences with which Mr. Ralfs has favoured him during several years' close personal intercourse. Mr. Ralfs' sitting-room is quite in accordance with the usual notions of a naturalist's den. Piles of papers, which contain specimens of all sorts, on one side, are "counter-balanced" by an "admired disorder" of books and pamphlets on the other. Plates of decayed and decaying fungi are on every hand, and little dishes with evil-looking—and not always particularly fragrant—weeds, at all times present. The delightful botanising excursions in the rich neighbourhood of Penzance, and the many entertaining chats and smokes in Mr. Ralfs' pleasant, if somewhat varied, "den," will always occasion pleasant retrospections to those who have been privileged with the friendship and company of Mr. Ralfs.

It is no exaggeration to say that every distinguished botanist who has visited Penzance has, almost as a matter of course, made it a point of duty to call on Mr. Ralfs, who may be regarded as the *doyen* of English botany.

ASTRONOMY.

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

At the meeting of the Royal Astronomical Society held on June 14th, Mr. Taylor read a paper on the spectrum of Uranus. On May the 16th, broad flutings were detected in the spectrum of the planet.

There were four dark bands in the orange-green, blue and yellow. There were no solar or narrow lines visible in the spectrum. In a later observation ten dark bands were noted and their position measured, and also the position of several bright lines.

A letter from Dr. Huggins was read, in which he said that on the 3rd of June, with an exposure of two hours, he got a fine photograph of the spectrum extending to M in the ultra-violet. In this photograph all the chief Fraunhofer lines are distinctly visible.

In August, Mercury will be an evening star at the end of the month, not well situated for observation.

Venus will be a morning star.

Mars will be a morning star.

Jupiter will be in Sagittarius.

Saturn will be too near the sun for observation.

On August 7th there will be an occultation of Jupiter by the moon. The disappearance will take place at 7 hrs. 4 min. and the reappearance at 8 hrs. 1 min.

There will be no other occultations of interest during the month.

Rising, Southing, and Setting of the Principal Planets in August.

	D.	Rises. h. m.	Souths. h. m.	Sets. h. m.
Mercury ☿	6	4 17M	0 2A	7 47A
	13	5 12M	0 30A	7 48A
	20	6 1M	0 51A	7 41A
	27	6 43M	1 6A	7 29A
Venus ♀	6	1 0M	9 1M	5 2A
	13	1 4M	9 6M	5 8A
	20	1 13M	9 13M	5 13A
	27	1 26M	9 19M	5 12A
Mars ♂	6	3 5M	11 7M	7 9A
	13	3 3M	10 58M	6 53A
	20	3 1M	10 49M	6 37A
	27	2 59M	10 40M	6 21A
Jupiter ♃	6	4 59A	8 53A	0 51M
	13	4 31A	8 24A	0 21M
	20	4 3A	7 56A	11 49A
	27	3 35A	7 28A	11 21A
Saturn ♄	6	5 16M	0 40A	8 4A
	13	4 54M	0 16A	7 38A
	20	4 32M	11 52M	7 12A
	27	4 10M	11 28M	6 46A

SOME NEW AND LITTLE-KNOWN ROTIFERS.

By W. Barnett Burn, M.D.

No. 2.—Stephanops intermedius, sp. nov.

Characters: *Lorica pyriformis*, with a neck; prolonged behind into three ovate spines; foot without a spine (Fig. 119). There seem to be several of these small rotifers, differing in slight particulars,

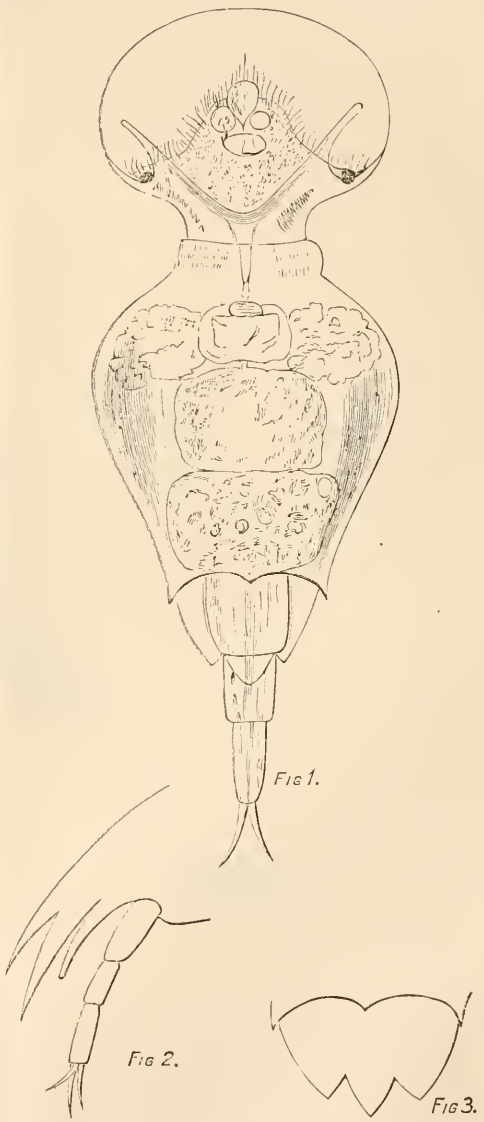


Fig. 119.—*Stephanops intermedius.*

scarcely deserving to be separated into distinct species; and I intended to include this one in my papers on "Little-known Rotifers," under the head of "*Stephanops lamellaris*," recorded by Mr. Gosse as found in a garden tub; but the definition just prevented this, it being "lorica prolonged into three subparallel slender acute spines; foot furnished with a toe-like spine" (see Fig. 119, 2); the lorica in the species under consideration being as in Fig. 119, 3. In *S. muticus*, the lorica ends in an unarmed, spoon-like shield, foot without a spine. The present species having characters between these, I have called it "intermedius," but I think they should be all joined. Mr. Gosse, indeed, says that he thinks *S. lamellaris* and *S. muticus* are but one species, he having seen the spines of lamellaris disappear under his eyes in a way he could not account for. I had a number under observation, but there was never any variation in the spines; but, being of glassy transparency, it was occasionally difficult to see the end of the lorica at all.

These rotifers are small in size, about $\frac{1}{150}$ inch. They are interesting, on account of the front projection of the lorica giving an appearance of the nimbus round the heads of saints in pictures.

This stephanops sails wildly about at first, but soon goes much more slowly. She (rotifers, like ships, are "she's," though called Hector, maybe) never rolls over, being kept on an even keel by the flat front; then the foot is used as a rudder, as if the order "Port!" were given. The foot goes on one side, and the head turns. But stop! there is a grain of sand, a rock ahead. Starboard there! The foot turns to the other side; the head, obedient, veers round, and the danger is past.

Fig 1.

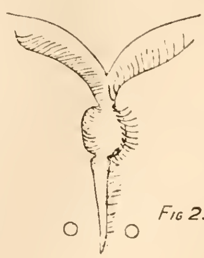


Fig 2.

Fig. 120.—*Œcistes umbella*.

The foot seems very flexible indeed; I have seen it preen itself round the head with it like a bird does its feathers with its bill. The toes too it can arch, the points touching, and a wide space being between. In the one drawn the foot seems shorter and thicker than usual; it was very quiet, and possibly may have been of a retiring disposition, wishing to keep itself to itself, or perhaps pulling itself together for a fresh start in life. I have not seen it lengthen and shorten its foot with the double telescopic power possessed by many rotifers. In colour it is of a pearly grey hue, with two red eyes. The shield turns round the head somewhat like a collar, and the edge, looking down on it, appears like a bristle.

No. 3.—Œcistes umbella.

This beautiful rotifer was discovered in 1878 at Snaresbrook. It has since been found at Sutton Park, Birmingham, at Woolston, Cheltenham, also at Perth and Fife. In length $\frac{1}{12}$th inch, it can be easily seen with the naked eye. I have found it in some abundance on Tooting Common in a shallow pool, from which I have taken some of the rarest rotifers, including *Œcistes velatus*, *Notops hyptopus*, *Copeus labiatus*, and a new stephanops.

Œcistes umbella lives on the leaves of myriophyllum, in a very transparent mass of gelatinous material, forming an irregular case of a yellowish tint, and which does not seem to be of an adhesive nature, on account of which a good view can be had of the entire animal.

In Figure No. 120 the foot is in a contracted state; when elongated it would be at least double the length shown. The chief characteristic of this species is the circular corona, strengthened with radiating ribs, and surrounded with long cilia. It must not be thought that this leads down like a funnel to the mouth; it is almost a disk when fully expanded, without any opening in the centre.

The buccal cavity, Fig. 119, 2, is just under the corona, running transversely across the animal, opening between and above the ventral antennæ. The second row of cilia is beneath the corona, forming a channel, along which the food is carried; this ciliary wreath then runs down round the margin of the buccal funnel, which thus opens between the two wreaths. The food is drawn down by the whirlpool, formed by the cilia on the margin of the disk, and is immediately turned over its edge into the gutter formed by the second wreath, and conveyed with great rapidity to the buccal cavity. It there impinges on a sensitive cushion, and is divided into two portions; one passes on to the mastax to be swallowed as good food, the other to be forcibly ejected as refuse. The attractive force of the current created by the cilia of the margin must be great, as I have seen a large volvox, at some distance, drawn on to the disk, and driven round on it with great velocity, this novel cup and ball forming a lovely object. I have also seen a rotifer macrurus treated in the same way.

The œsophagus is plainly seen, as a curved tube, opening into the back of the stomach. The intestine bends upward, and terminates at a slight enlargement, only a little below the level of the antennæ, but on the opposite side of the animal. The contents are thus, when expelled, driven upwards, and out of the tube the animal lives in. The eggs are long, and dark in colour.

Under a low power the animal, in a contracted state, may be recognised by an orange stain in the region of the mastax, and by the ribs of the large folded corona. As this expands, it is first pushed forward, and appears as a dark grey cone. The ribs open like an umbrella, the membrane being regularly folded between them, as in that useful incumbrance, whence the species takes the name "umbella."

THE DEVELOPMENT OF THE COLOURS OF FLOWERS THROUGH INSECT-SELECTION.

[*Continued from p.* 162.]

THEN, as to Mr. Robertson's "three alternatives," I have shown that it is absurd to assume that the first ought to have happened; one might as reasonably argue that all low forms of animal and plant life ought to have been eliminated long ago. As to the other two alternatives, the second is true in the main, and Mr. Robertson's description of what would happen in that case is strikingly like what has actually taken place; but some short-tongued bees have been little altered as regards the length of their tongues. (I may ask, in passing, why the evolution of long-tongued insects should be considered a "disturbance of Nature's scheme"?) I do not see why we "might reasonably expect to find a much larger proportion of specialised . . . . flowers than are actually to be found"; we might as well argue that we ought to find a larger proportion of specialised animals than are found, on the ground that the general process of natural selection and other means of specialisation have been in operation since the first appearance of life. According to Mr. Robertson, short-tongued insects "probably . . . . far outnumber the long-tongued," and it is for these that the unspecialised flowers are adapted. There will always be room for primitive organic forms, and moreover there is plenty of time for further specialisation in the future. The same general argument applies to the objection that more species of bees ought to be specially adapted to particular species of flowers: and further it must be remembered that excessive specialisation in this direction has serious drawbacks; for suppose the flowers of one of these species were very scarce for a season: the bees would get no honey; and, if the bees were very scarce, the flowers would not be fertilised; whereas, if several species of bees are adapted to each specialised flower, and several species of flowers to each long-tongued bee, the flowers are pretty certain to be visited, and the bees can usually gather honey at their ease.

It may seem somewhat presumptuous in me to criticise Mr. Robertson's emphatic testimony as to bees not preferring blue, since he has had such extensive opportunities of observing the habits of hive-bees, and I have had very few; but I must say that the conditions he describes strike me as hardly offering a fair test as to the preference of bees for special colours. The bees of such an apiary have to collect a large amount of honey in a short time, a far larger amount in a far shorter time than is the case with wild bees. They are quite intelligent enough to know that when large quantities of good honey-secreting flowers are in bloom in the immediate neighbourhood, they can get more honey in less time from these, than by following out what the theory supposes to be their natural tastes. Not only would this be the case with regard to the half-acre of good honey-producers cultivated by Mr. Robertson, but also with regard to the blossoms of fruit-trees, limes, and heath, which, while they last, carry, as it were, all before them. The conditions will thus be seen to be quite different to the normal ones of ordinary wild bees. Has Mr. Robertson enjoyed such extensive opportunities of observing the habits of these latter in visiting flowers? Here I may allude to Sir John Lubbock's experiments with hive-bees, where there was no question of collecting large quantities of honey in a short space of time, and their preferences for certain colours inherited from wild ancestors were consequently able to have free play. The results were most markedly in favour of blue. I need not trouble your readers by transcribing Sir John's account of the experiments, which will be found in "Ants, Bees, and Wasps" (Int. Sci. Series), pp. 303–307.

Pausing to notice that it is not Müller, but Mr. Grant Allen who says, "Bees show a marked taste for blue, because blue is the colour of the most advanced flowers," I pass on to Mr. Robertson's question, "What grounds have we for assuming that of long and short-tongued insects the former produced a greater number of intelligent individuals than did the latter?"

The answer is simple. The insects that became long-tongued were also increasing in perfection in other respects: they were advancing in the scale of organic life, and leaving their short-tongued brethren behind them, and increase of intelligence was part of the general advance. If it be asked what authority I have for these statements, I must refer to those who have made the evolutionary history of insects their study. Among other works, I may mention Lubbock's "Origin and Metamorphoses of Insects," and several German treatises by Hermann Müller. I may be allowed, however, to quote a passage from the "Fertilisation of Flowers," which shows very clearly the facts mentioned above:—"Another class of facts shows clearly that those insects whose bodily organisation is least adapted for a floral diet, are also least ingenious and skilful in seeking and obtaining their food; so that in anthophilous insects intelligence seems to advance *pari passu* with structural adaptation. This statement is fully proved by the insect lists given in the sequel. The following examples may serve to illustrate the point at present. *Coccinella septempunctata*, which is not adapted at all for a floral diet, behaves so awkwardly on flowers of *Erodium cicutarium* that it generally loses its hold, and often falls to the ground; and many attempts fail to make it more skilful. *Sarcophaga carnaria* seeks honey diligently on flowers of *Polygonum bistorta*, but it usually misses its aim in trying to insert its proboscis into the flowers; *Andrena albicans* at first is equally awkward, but gradually becomes more skilful and learns to insert its proboscis with greater accuracy. The hive-bee never fails in any case to insert its proboscis accurately."

With regard to Mr. Robertson's argument against the theory of "perpetuation of certain intense colours," it must be remembered that the colours were not necessarily originally "intense," and did not probably exhibit that extreme variety, owing to which we now find it difficult to keep strains pure. I am utterly at a loss to understand the distinction which Mr. Robertson draws between "accidental" and "designed" adaptations of plants to insects, and insects to plants.

Mr. Robertson says that "to insects can in no sense be due the often rich colours" of flowers secreting no honey, and that "they are not now visited by insects." Surely Mr. Robertson is aware of the fact that insects visit numbers of flowers solely for the sake of the pollen.

I fail to see any "strange commingling of the modification and development of the colours of flowers" in the discussion; and why may we not use the word "development" to express chemical development? Why substitute the meaningless word "creation"? Chemical development of colouring pigments is not entirely a fortuitous process, though the laws that govern the successive appearance of the colouring pigments of evolving flowers are not understood. When we have a reasonable theory to account for this, it will throw new light on the insect selection hypothesis.

Who are the "modern theorists"? If Mr. Grant Allen and Hermann Müller are meant, to what conclusions beyond their intentions have their "disciples" pushed their theories? I can think of none.

In conclusion, I would advise Mr. Robertson, and indeed all interested in this deeply interesting subject, to read Hermann Müller's "Fertilisation of Flowers," an able and most exhaustive work, embodying all recent investigation. Though it might not convert Mr. Robertson to a belief in the "selection theory," it would probably convince him that the theory in question possesses even more advantages than "the equivocal merit of plausibility"!

A. G. TANSLEY.

ANOTHER DAY AMONG THE SALT MARSHES AT HUNSTANTON.

IN our "day at Hunstanton," in August 1881, we passed over many of the plants which abound in the salt marsh and along the shore, the weather being too wet to allow of a prolonged search. This year we were favoured with a gloriously fine day, and were able to examine the neighbourhood more closely. We drove to a place called Holme (pronounced "Hullum"), within a few hundred yards of the marsh. Crossing the sand dunes, a bright purple colour over the low-lying lands showed us that we had arrived at our destination, and that the sea-lavenders were in profusion. A little before this *Erythræa centaurium* grew among the sand. The three species of statice do not grow mixed together: *S. limonium* covers the wetter parts of the marsh; the rarest one, *S. caspia*, forms a narrow line where the wet ends; while *S. auriculæfolium* covers the sand a little higher up, but does not extend anywhere far from the marsh. On *S. limonium* we found the uredo and teleutospores of *Puccinia statices*. *Armeria vulgaris* grows in many places, and the flowers were very pale. In the wet parts grows also *Aster Tripolium;* both the discoid and radiate forms occurred, though the former was most abundant. The discoid form looks very like a senecio at first sight; the other cannot be mistaken, as the contrast between the whitish purple flowers of the ray and the yellow florets of the disc is very striking. The sea purslane (*Atriplex portulacoides*) forms greyish spreading shrubs. *Suæda fruticosa* and *maritima* grow together in some parts near the edge of the marsh; the samphire (*Salicornia herbacea*), the sea sagina (*Sagina maritima*), and *Triglochin maritimum* nearly in the water. In the marsh are many cracks caused by shrinkage, and filled with water. On the bottom of these diatomaceæ grow luxuriously, but under them was such dirty-looking black mud that I was afraid to gather any, knowing that I should not be able to clean them for some weeks.

And here may I make a slight digression, and mention a few of the diatoms I got here in 1881. They were mixed with so much dirt that I had to pick many of them out. *Pleurosigma balticum* and other Pleurosigmas abound, but cannot be got pure; *Bacillaria paradoxa*, *Actinaoptychus undulatus*, *Biddulphia rhombus*, *B. aurita*, *Navicula Bombus;* and I found one solitary frusture of *Auliscus sculptua*, and numerous others of less beauty.

We made a prolonged search for Frankenia all in vain. We then turned our attention to the plants on the sand dunes, and found the sea holly (*Eryngium maritimum*), the sandwort (*Arenaria peploides*) in seed, the lyme-grass (*Elymus arenarius*), the sea bindweed (*Convolvulus soldanella*) in fruit, the saltwort (*Salsola kali*), and the sea cakile (*Cakile maritima*). The grayling butterfly (*Hipparchia Semele*) was flying about among the Eryngium.

Following along about high-water mark, we picked up a number of pieces of a silicious sponge, some Echini, *Flustra foliacea*, and other Polyzoa, &c. Turning seaward, we came to some pools in the sand, the bottom of which was covered with bubbles. One of our party suggested that they were due to some confervoid algæ, but I bottled some and found I had a pure gathering of a diatom (Amphiprora?), almost free from all dirt, except sand. Farther on we came upon part of the submerged forest among the sand. Continuing back under the cliffs, we took a few minutes examining the red chalk, but, of course, did not find any fossils that we could bring back. Our time being now up, we returned laden with "finds," and well satisfied with the results of a most enjoyable excursion.

G. H. BRYAN.

Peterhouse, Cambridge.

SCIENCE-GOSSIP.

THE Delegates of the Clarendon Press have the following works ready for early publication:—An edition, with notes for students, of Tertullian's "Apology," by Mr. T. H. Bindley of Merton College; "Selections from Burns," by Mr. J. Logie Robertson (uniform with "Selections from Clarendon," just published); Mr. Oliver Aplin's "Birds of Oxfordshire." In mathematics they will issue shortly the second volume treating of Electro-Dynamics of Messrs. Watson and Burbury's "Mathematical Theory of Electricity and Magnetism," and a new edition of the fourth volume on the Dynamics of Material Systems (which has long been out of print) of Professor Bartholomew Price's "Treatise on Infinitesimal Calculus." A school edition of Scott's "Marmion," by Mr. Thomas Bayne, is nearly ready.

MR. A. H. ARNOLD BEMROSE has completed a very useful "Alphabetical Index to the Collection of Minerals in the Derby Museum." The arrangement is the same as that used in the British Museum. Curators will find this catalogue of much service.

MR. W. P. PYCROFT, of the Leicester Museum, sends us a paper read by him before a meeting of the Leicester Literary and Philosophical Society, on "The Recent Immigration of Pallas' Sand-grouse." This subject is treated in a very interesting manner. Copies may be obtained on application to the Editor, "Naturalist's Gazette," Ram Street, Birmingham, post free, $2\frac{1}{2}$*d.*

LONDON botanists were much exercised all last month by the flowering of *Amorphophallus titanum*, of which a sketch appeared in the "Illustrated London News" for July 6th. This plant belongs to that singular, widespread, and altogether remarkable order Aroideæ, and the specimen in question came from Sumatra, that fragment of an ancient Indian peninsula; it and Java are the homes of Rafflesia and other singular freaks of nature. The botanical Old Lady has been on the spree in those big islands for millions of years past. It is little good bringing any of the specimens produced there to the bar of common-place botanical opinion. You have to take them as you find them. Amorphophallus was discovered eleven years ago in Sumatra, and seeds of it were brought over to Europe. These have been raised both at Florence and Kew. In Sumatra the leaf-stalk of this remarkable plant measures ten feet in height, and is three feet in circumference. The spath is thrown up from the tuber at a different period. The flower of this remarkable plant stands nearly six feet high.

MR. J. R. B. MASEFIELD has compiled an excellent "List of the Land and Freshwater Mollusca of North Staffordshire."

THE "Report of the Botanical Exchange Club of the British Isles for 1888" has just been published. The "Report of the Distribution" is by Mr. G. C. Druce, F.L.S. This is the fullest record hitherto issued by the Society, and will be welcomed by all genuine botanists throughout the kingdom.

THE "Long Excursion" of the Geologists' Association this year will be to North-West Cumberland and the Eden Valley district, from August 5th to 10th. An excursion to the volcanic regions of Italy and the islands, under the leadership of Dr. Johnston-Lavis, Professor Silvestri, and many others, is planned to begin on September 30th at Naples, and to last over a month.

MICROSCOPY.

"CARPENTER ON THE MICROSCOPE."—The correspondent who sent us the paragraph which appeared in page 139 of our June number, to the effect that Dr. Dallinger and Mr. John Mayall, jun., were the joint editors of the new edition of Carpenter, appears to have been misinformed. Dr. Dallinger is the only editor.

A NEW CELL.—Mr. C. H. H. Walker, of Liverpool, has brought out a new cell for large mounts. They are rectangular in shape, and are made of one standard size, $1\frac{1}{4}$ in. by $\frac{5}{16}$. They are also made with three sides only for use as live troughs, &c. The thickness varies from $\frac{1}{24}$ in. to $\frac{1}{12}$ in.; if a deeper cell be required, two or more can be cemented together. Mr. Walker has hit on a happy thought in bringing out these cells.

MR. A. C. COLE'S NEW SLIDES.—We have just received a new series of slides from this well-known microscopist, which are of much importance to physiological workers in that they present them with a new method of staining tissues, and particularly nervous structures. This method is strikingly brought out by the slide showing sections of the lumbar and dorsal region of the human spinal cord in four colours. This new stain is particularly effective for microphotography, as is proved by another slide mounting a transverse section of the left median human nerve. The other slides, mounted with the new staining, are very interesting:—Transverse section through the spinal cord and stomach of a snake, showing a semi-devoured lizard, and also section of the lizard's spinal cord; section through the cervical region of snake, showing spinal cord, œsophagus, &c.; and an effective mount (for microscopic purposes) giving vertical and horizontal sections of the human scalp, showing the hair follicles, &c.

NEW EDUCATIONAL SLIDES.—We have received a box of slides from Mr. H. P. Aylward, 164 Oxford Street, Manchester, illustrating the structure of the vegetable kingdom in such a way that students of structures will find half their difficulties gone if they obtain a set. The dicotyledonous division of plants is illustrated by twelve slides of plant-structures of all sorts, and the monocotyledons and cryptogams by the same number. The short paper accompanying the box gives references to various authors, and where the structures are described. The objects themselves are beautifully mounted, and altogether it is a pleasure to recommend this cleverly got-up series.

NEW SLIDES.—From Mr. H. Meller, Stockport Road, Manchester, we have received three remarkable slides of objects: one, a transverse section of a tadpole's eye; a second, a similar section of the embryo of a rat, through the thorax and fore limbs; and the third, the section of the chick, two days old.

DIATOMS.—Last summer two of us resolved to have a run to the West Highlands, and a walk up and down the hills and glens of the Island of Skye. At the geological questions and the Crofter questions, which are being fought out there, and which are likely to be settled about the same time, we indulged in an interested, if not supremely intelligent, look. As the worlds of science and politics, however, are likely to hear enough of these without any of us, we seek not here to waste time and space by gossiping over them. We wish merely to state to all whose tastes run in diatomizing directions, that in the arms of the sea running into the island and in its fresh-water lakes they will find splendid hunting-ground. About the sides of the fresh-water lochs in summer the gadflies certainly swarm, and as certainly, so soon as a stranger enters their territories, the "Fiery Cross" is sent round to warn the clans that a full-blooded victim has arrived, and to invite all to the feast. We learned beside one of these lochs why the natives never appear in the kilt, and how Pharaoh felt long ago by the Nile. We had actually to cover our necks, ears, and faces when gathering our various kinds of game from the lochs. Even then the pests would not be said Nay. They bit our hands till, in my friend's case, who is thinner-skinned and, it may be, sweeter-blooded than I am, the blood was running from half-a-dozen punctures; and, just when I thought I had secured a splendid spoonful of diatomaceous stuff, a villain had crept round to and into my ear. To preserve the stuff and kill the enemy my feelings instinctively declared to be impossible. What was in that spoonful I do not know. I belong to the "Society for the Prevention of Cruelty to Animals" when I can honestly count myself one of these animals. Other spoonfuls of stuff were however got, rich in such things as *N. serans*, *N. crassinervia*, *N. rhomboides*, and *Ep. Hyndmanii*, along with a lot of curious things apparently not yet given in any of our ordinary books. Among these curious things there are several *Surirellas*, a drawing of one of which I send you. We have named the thing *S. rhombea*, as there is already a *S. rhomboidea* well known, as obtained from the chalk-marl of Caltanisetta, and which from the organisms there associated with it is evidently a salt-water species. Perhaps some of our fellow-readers can tell us whether the outline forms of *S. rhombea* and *S. rhomboidea* stand in anything like the same relation to each other as do those of *N. rhombea* and *N. rhomboides*, as figured in Kützing and Rabenhorst. Our plant, you will observe, has along its margins much the same arrangement as is seen in *S. splendida* in Van Heurk's Atlas. The whole median space is, however, occupied by punctæ radiating from the centre, there being about three punctæ in each radius. Let me just add that those who care for *N. Hitchcockii* will find it in abundance in Loch Vennachar, along with other things perhaps as good as any found in the far-away Skye.—*X.*

A VERY BEAUTIFUL ACCIDENT.—While sitting at my window, which faces east, one morning in June, viewing a slide of *Funaria hygrometrica* capsules, I experienced the following:—My slide was illuminated by a white cloud, which, as the sequel will show, came directly between the sun and the object under view. After watching for some few minutes, suddenly the cloud moved away from between the sun and the condenser I was using, thereby condensing the direct rays of the sunlight upon the capsule, causing the peristome, by the condensed heat, to open in all its splendour, disclosing the interior of the capsule with its beautiful golden spores. Almost as quickly a cloud came between the sun and object, when the peristome went back to its normal condition. I do not remember ever witnessing so magnificent a spectacle, and which was the more striking because unexpected. My instrument was a binocular with 1-inch objective.—*John A. Howe, Bath.*

ZOOLOGY.

CROWS IN NORWAY.—Birds of the crow-tribe, especially the raven, the carrion-crow, the hoodie, and the magpie, are in ill-repute in England for stealing eggs, and, when opportunity serves, for murdering chickens, ducklings, &c.; but in the north of Norway these depredators are much bolder. They will even attempt to carry away the eggs and the young brood of the eider-duck, and too often succeed in their foray; but if the drake is near at hand, they are frequently defeated. He seizes the crow by the wing or the neck and plunges down with him into the sea. Being a good diver he feels no inconvenience, whilst the carrion-crow, however brave and strong in the air, is helpless in the water, and the end of the struggle is soon shown by his lifeless body floating on the surface. Sometimes even the raven is disposed of in the same manner. It is a curious fact that young sea-fowl, when swimming or diving in waters which literally swarm with cod, halibut, and other greedy and hungry fishes, are not often snapped up and swallowed. Yet veteran lobster fishermen, no small part of whose life has been spent in disembowelling such fishes, declare that they never find a young bird in the stomach of their prey.—*J. W. Slater.*

CORONELLA LÆVIS IN HAMPSHIRE.—Respecting Mr. Cockerell's note on the occurrence of *Coronella lævis* in Hampshire, I am in error, the snake being too common for special notice. I should not have recorded it, but I thought the species rarer than it really is, owing to the fact that I have frequently looked for it in Hampshire myself without finding a single specimen. I hear now that this snake sometimes occurs in great numbers. One specimen recorded in a recent number of SCIENCE-GOSSIP, is distinct from that recorded in 1887. As to *Lacerta viridis* being found at Margate, I can only repeat what I said in "The Naturalist's World" for November 1887:—"A friend of mine states that he found this beautiful lizard several times during his stay at Margate." Perhaps he may have been mistaken, as Mr. Cockerell has not seen it there. He may have confused the *L. viridis* with the green varieties of *L. agilis.* However, on the 4th September, 1886, I caught a specimen of *L. viridis* in the neighbourhood of the London Road, St. Leonard's-on-Sea, which was recorded in "The Naturalist's World" for October 1886. This may have been an imported or an escaped specimen. Be the explanation what it may, one or two of these lizards have been caught in England during the last few years.—*A. J. Field*, 43 *Medina Road*, *Finsbury Park*, *N.*

ABNORMAL HELIX ASPERSA.—Mr. G. W. Mellors, of Nottingham, has sent me some shells for inspection which he collected at Tenby last year, and in the batch occurs a specimen of *Helix aspersa* of an abnormal appearance. Above the periphery of the body-whorl there runs throughout its whole length a roughened sulcus, devoid of periostracum, marked on the inside of the whorl by a thickening of the nacre. Where the sulcus ends at the peritreme the periostracum is present, and the peritreme at this point has a sinuous outline and shows evidence of reparation. I attribute the abnormal appearance to fracture not involving the mantle-edge in the injury; and as occurs in these cases the calcareous layers of the shell are repaired by the animal, not the periostracum, except at the peritreme.—*J. W. Williams*, *Mitton*, *Stourport.*

THE DARTS OF THE HELICIDA.—It was with some amazement that I read Mr. J. W. Williams' remarks upon Mr. Standen's article on darts which recently appeared in "Life Lore." I had read the article with very considerable interest, and derived, what I thought, a large amount of reliable information therefrom; now, however, Mr. W. seems to throw doubt upon the whole matter. In the first place he coolly designates the article as "fairly good and accurate," and then goes on to say that, "so far as I know, Mr. Standen's article is trustworthy, except when he goes a little way from his subject and mentions that some 'crystalline stylet' is found in the stomach of some snails, and he is afraid Mr. Standen means *Anodonta cygnea* and other lamellibranchs, which can scarcely be classified as snails." Permit me to observe that Mr. Standen has a reputation in this district for not only "accurate" but for much more than fairly "good" work; after a reperusal of Mr. Standen's article, I can only come to the conclusion, after carefully weighing Mr. W.'s remarks, that either he has not read the article, or else deliberately intends to misrepresent Mr. Standen, who, I find, does not mention "snails" at all. What he distinctly and clearly says is this: "There is an organ known as the 'crystalline stylet,' found in or near the stomach of certain slugs, which bears no relation to the Helix dart, and must not be confounded with it." From this, which is all that is said about the matter, your readers can form their own opinion as to how far Mr. Standen has gone away from his subject; the reference to the crystalline stylet is perfectly appropriate, and I presume very few, even moderately informed conchologists, are ignorant that such an organ is to be found in the stomach of various slugs, *e.g.* Parmacella, and I venture to say that Mr. Standen is too good a conchologist not to know the difference between a slug and an Anodon! I will only add that if there are any other observations of Mr. Williams' on record, it is to be hoped they are much more fairly good and accurate than this his last one.—*J. Hart*, *F.C.S.*

VARIATION IN THE GENUS ARION.—Mr. J. W. Williams has referred to me by name twice in his article on "Variation in the Mollusca," published in the July number of SCIENCE-GOSSIP; and as in both cases he is wrong as to matters of fact, I shall be glad if you will allow me to point out how the facts really stand. First, Mr. Williams has accused me of describing a var. *brunnea* of *Arion ater*, when there was already in existence the *Arion brunneus* of Lehmann. Evidently Mr. Williams has not given the subject careful attention, or he would have known that Lehmann's *A. brunneus* has nothing whatever to do with *A. ater* at all, and is simply a synonym for the bandless form of *A. subfuscus*, a quite different species. I have before me Lehmann's original description and figure (of anatomy), which were published in the "Malakozoologische Blätter," 1862, vol. ix., pages 165–167, and plate 3, fig. 2, and the author's words and figure leave no doubt whatever as to the relationship of the form he there described as new, and in his opinion specifically distinct. Subsequent authors have relegated it to the synonymy of *A. subfuscus*. In the second place, I may say that I have never described a var. *pallescens* of *Arion ater*, and whenever I have referred to that variety I have simply been speaking of the long-known var. *pallescens* of Moquin-Tandon. It is to be hoped that the author, before making use of names in the manner in which he has done in this case, will devote some care to ascertaining that he is correct in his statements.—*William Denison Roebuck*, *Sunny Bank*, *Leeds.*

VARIATION IN THE MOLLUSCA.—Mr. Roebuck has written me regarding the two references I have made to him in the first part of my paper published in these pages, on "Variation in the Mollusca, and its probable Cause." These I wish in this note to place in a good light. It seems, in the first place, that I was under a decided misapprehension when I stated that a var. *pallescens* had been described by Mr. Roebuck, for in his letter he says: "I have never described a var. *pallescens* of *A. ater* at all, and that the old and well-known one of that name described by Moquin is always what I refer to when I use the name '*pallescens*.'" In the second place, with regard to what I have called *Arion ater*, var. *brunnea* (Lehm.), I stated that the name had been "appropriated" by Mr. Roebuck for an identical form to what Lehmann had called *Arion brunneus*. This, it seems, is wrong. Mr. Roebuck writes: "I have before me the original description of Lehmann's *Arion brunneus* ('Mal. Blatt.,' 1862, p. 166), with figure of anatomy . . . . *A. brunneus*, of Lehmann, is a very different thing from any form whatever of *A. ater*. It is simply a synonym for the unbanded form of *A. subfuscus*." The ground on which I based the assumption that Lehmann's *Arion brunneus* should be located under *A. ater* was, that Westerlund, in his "Fauna Europæa," so places it, and Westerlund I considered a good and reliable authority. Westerlund's description is "caffeatus vel ferrugineus, dorso obscuriore" (by this I considered he meant that it so differed from a typical *Arion ater*), and it seemed to me that this description fitted in exactly with what Mr. Roebuck had described as var. *brunnea* ("animal dark brown, unicolor"), and in some sense with his MS. sub-variety of *Brunneo-pallescens*. Since sending to press the corrected proof of the first part of my paper, I must say that I accidentally came across the original description of Lehmann's *Arion brunneus*, and have had my doubts since that of the identity of that form with *Arion ater*, var. *brunnea*, Roebuck. Mr. Roebuck's letter lends no doubt that a misapprehension has taken place, and I hasten to express my sorrow that these two errors should have unwittingly crept into my paper.—*Joseph W. Williams.*

Foraminifera.—I fail to see how the words "curious facts," referred to in my note in the April number, are affected by misquoting "expounder" for "recorder." Regarding the figure named *Entosolenia squamosa*, I notice Mr. Robertson now calls it var. *hexagona*, which, of course, is correct, according to Professor Williamson's figure. Also do I regret that by pointing out a few little matters like this, I have deserved the qualification of aggressive dogmatism. May I also venture to say that I am inclined to think the safer plan is to follow the dictum of latest editions? —*F. Chapman.*

BOTANY.

Early Flowering of Potentilla Tormentilla.—The time given for the flowering of this plant is from June to September (Hooker's Student's Flora). On May 30th, however, I found it in full bloom on Wimbledon Common, and in many cases the petals fell off on my touching them. I suppose, however, that this rather forward state was owing to the hot weather that prevailed from the 18th to the 25th of May, added to the fact that the part of the common on which the plant grows so abundantly is exceedingly open and exposed, there being no trees or shrubs for some distance around.—*A. L. Clarke.*

Botanical Notes from West Cork.—As an interesting district for the botanist, West Cork is well known. During the third week in July last, while paying a visit near that beautiful and romantic inlet of the sea known as Loch Hyne, situated between Skibbereen and Baltimore, I was struck by the very varied flora to be seen even within the circumference of a mile or two. Loch Hyne is surrounded by well-wooded hills and partly cultivated slopes; in its midst is a small island on which are the ruins of an ancient castle. From the north it is looked down on by the lofty and solitary, but well-wooded mountain of "The Crooked Hill." Mounting this hill one passes by luxuriant patches of Irish spurge (*Euphorbia hiberna*) and beds of large ferns (*Lastrea*, *Polystichum*, &c.), and, drooping from the rocks, graceful clusters of that beautiful fern, *Asplenium acutum*. Higher up large masses of rock are seen covered with the evergreen foliage and pretty pink flowers of London pride (*Saxifraga umbrosa*), while from the trees hang festoons of woodbine and ivy. From an eminent point called the "Look Out," the view is singularly wild and romantic-looking: on one side are barren-looking hills and grey rocks, interspersed with green pastures, turf bogs and small lakes; and on the other side, outside the loch, the Atlantic dashes its spray unceasingly against the steep cliffs and rocks. Descending the hill and going eastward, the most common and striking plants along the banks and wayside are *Thymus serpyllum*, *Sedum anglicum*, *Anthemis nobilis*, and here and there, though not so common, *Malva moschata* and *Erodium moschatum*. Through the damp fields and pastures I met with *Veronica scutellata*, *Hypericum elodes*, *Linum catharticum*, *Habenaria bifolia*, *Orchis maculata*, and *Narthecium ossifragum*, the two latter most abundant. In a wet gully among the hills I came upon large and luxuriant patches of that local butterwort (*Pinguicula grandiflora*), in company with its more humble-looking relation, *P. lusitanica* and *Drosera rotundifolia*. Common on the hills are *Ulex nanus*, *U. Europæus*, *Erica cinerea*, *E. tetralix*, *Salix repens*, and *Rosa spinosissima*, the latter close to the sea. The shallow parts of all the lakes and bog-holes here are covered with thousands of white and yellow waterlilies (*Nymphæa alba* and *Nuphar luteum*), and the banks of streams and ditches are richly lined with the royal and female ferns (*Osmunda regalis* and *Athyrium filix-fœmina*). On the roadside close by the sea I got specimens of that western rarity (*Cicendia filiformis*), and farther on a sandy field was almost covered with the yellow flowers of *Viola Curtisii* and *Galium verum*. By the rocky shores were to be seen in plenty *Euphorbia Portlandica* and *Crithmum maritimum*, while the rocks produced *Plantago maritima*, *P. coronopus*, *Cotyledon umbilicus*, and *Asplenium marinum*. Farther east a gravelly beach called Tralispeer was covered just above the water-mark with large patches of the delicate pink flowers of *Convolvulus sardanella*, and the showy glaucous leaves and blue flower-heads of the sea-holly (*Eryngium maritimum*), and carpeted here and there with *Sedum acre* and *Arenaria serpyllifolia*. Near this strand is a large bog, close to which grew in plenty *Radiola mellegrana* and *Samolus Valerandi*, while in the bog most conspicuous were *Polygonum amphibium*, *Sparganum minimus*, and *Typha latifolia*. But a much longer paper than this would not exhaust the list of interesting plants to be seen and gathered here. The naturalist with time and inclination to go through West Cork will find no district more worthy of a visit, for in its very varied flora there is ever to be found something new and worth having.—*R. A. Phillips, Cork.*

Botanical Notes.—Looking over the herbarium of Mrs. M. E. Cusack, I find several things of interest. The winter greens we get here are *Pyrola secunda* and *P. rotundifolia*. The latter has leaves orbicular, or nearly so, and flowers dull crimson; I call it var. *intermedia*—it is probably what was recorded from here by Porter and Coulter as *uliginosa*. *Spiranthes Romanzoffiana* is represented by good specimens, also *Epilobium palustre* (var. *albiflorum*), *Amaranthus retroflexus*, *Mimulus luteus*, *Gentiana amarella* (var. *stricta*), and other species known to the British botanist. We can also record a new white variety, *Geranium cæspitosum* (form *albiflorum*), with white flowers. The brambles are *Rubus strigosus*, and not very variable; but the roses present any number of forms. In this herbarium I find two forms of *R. blanda*. One I call *aciculata*, stem prickly; stipules dilated, entire or slightly toothed at apex; leaflets five or seven, usually subcordate at base, shortly petiolulate or almost sessile, simply and coarsely toothed, pale beneath; flowers vivid pink; sepals entire, hispid. The other may be termed var. *sublævis*, sepals scarcely hispid, pale-margined, sometimes with one or two linear lateral lobes, flowers rather small and pale. All the above-mentioned plants were collected in Western Custer Co., Colorado. In a note-book I find notes of two varietal forms of English plants, which I may as well record. *Rubus rusticanus* (form *incisus*), leaves three-parted, with the segments deeply incised. Found at Chislehurst: a specimen is in the herbarium of the South London Entomological and Nat. Hist. Society. *Centaurea nigra* (form *albiflorum*), flowers white; not very unusual; my specimen was from Sevenoaks, September 1883. This, by the way, is on the chalk. In an interesting list of plants collected at Swanage in 1888, sent me by Miss A. S. Fenn, white-flowered varieties of *Origanum vulgare*, *Prunella vulgaris*, and *Geranium molle* are enumerated.—*T. D. A. Cockerell, West Cliff, Colorado.*

Luzula albida in Sussex.—This plant has hitherto occurred only in Surrey and Perthshire. I have now noticed it for two years on an embankment on the border of Sussex and Hampshire, between Emsworth and Thorney Island on the Sussex side. It is a very graceful woodrush of a peculiar shade of light green, which makes it very conspicuous when growing in tufts or rather patches in May, but now, June 6th, when overtopped by *Festuca arundinacea*, *Aira flexuosa* and other grasses, it is not readily discernible. It is considered an alien, but grows here a mile from any habitation. Can any one give me information as to its situation when found elsewhere, and as to the manner of its supposed introduction?—*F. H. Arnold, LL.B., Hermitage, Emsworth.*

The Bee and the Willow.—In Mr. Bulman's interesting paper on this subject, he seems to assume that the upholders of the insect selection theory consider the willow to be almost entirely fertilised by "the bee" (presumably *Apis mellifica*). Müller has observed over eighty-six species of insects on *Salix cinerea*, *S. caprea*, and *S. aurita*, including forty-six Apidæ (twenty-eight of which were Andrenæ), various Ichneumonidæ, etc., eighteen Syrphidæ, *Vanessa urtica*, abundant, etc. etc. Of course I do not mean to say this shows that *Apis mellifica* performs only $\frac{1}{86}$th of the work of cross-fertilisation, or anything like so small a fraction; but it does show, I think, that the Salices, if entomophilous, are dependent upon a very wide circle of insect visitors, many of which are unspecialised. Mr. Bulman's charge against the upholders of the theory of natural selection is certainly to a certain extent justified, and his citation of Virgil is ingenious, but the foregoing facts entirely account for the maintenance in Salix of a primitive form and primitive colour. It is evidently one of those genera which have found it advantageous to lay itself out for a large circle of insects (cf. Umbelliferæ, many Ranunculaceæ and Rosaceæ). As to whether Salix is really entomophilous or anemophilous, it would no doubt be a very strong argument for the latter hypothesis, if nearly all the species of insects came only to collect pollen, and therefore only to the male plant; but the fact is exactly the reverse. Of Müller's list forty-two came only for honey (this is omitting fourteen male Andrenæ which came for honey alone); thirty-eight for both honey and pollen (including nearly all the Andrenæ), and one only for pollen alone. Besides this, as is well known, lepidopterists visit sallows on spring nights for the Noctuæ which frequent them in great abundance; and these are all honey-suckers. With such a list as the foregoing, I leave your readers to judge whether cross-fertilisation would not be amply effected by the insect visitors. I think there is no doubt that Salix is an exception to the very general rule that diclinic entomophilous flowers are descended from hermaphrodite ancestors; Salix has inherited its diclinism straight from the primitive anemophilous phanerogams, having simply become entomophilous, without developing a perianth. —*A. G. Tansley.*

Artemisia vulgaris in Colorado.—Last year I found an *Artemisia* growing in some profusion by Brush Creek, Custer Co., Colorado, and although resembling *vulgaris* it did not occur to me that it could really be that species, as its facies differed a little from that of the English form, and *vulgaris* has never been recorded from this region. Recently, however, I sent a specimen to Dr. Coulter, and he informs me that he cannot make it out to be anything but *vulgaris*, adding that it must have been introduced in some way. The plants had every appearance of being native, but in any case the species is an interesting addition to our local flora. Another recent find here, which is certainly an introduction, is *Capsella bursa-pastoris*, growing by the roadside in West Cliff. *Potentilla anserina* is truly native here, and very abundant; the leaves of the form we get often have as many as twenty-four well-formed leaflets giving the plant rather a different appearance from the type. A "tiger-lily" (*Lilium Philadelphicum*) is quite common in Custer County, and an interesting variety, var. *pulchrum* (Aldrich, MS.), was shown to me the other day. It was found by Mrs. Aldrich, near West Cliff, and has the flower pale orange, without any of the dark spots of the type.—*T. D. A. Cockerell, West Cliff, Colorado.*

MONSTROSITY OF PLANTAGO LANCEOLATA.—Among the monstrosities of the Plantaginea, I believe the specimen of *Plantago lanceolata* that I found near here on the 6th of June to be of an unusual form. Each spike was made compound by the development of the individual flowers into spikes, so as to present the appearance of a densely-packed mass of small spikes.—*A. G. Turner, Faversham.*

BOTANICAL NOTES FROM THE SWISS HIGHLANDS.—*Erratum*, p. 152, second column, last lines: after *nigrescens*, insert "(Lam.)"; and instead of *varia* read "and." Erase the comma.

VINCA MINOR.—I notice that your correspondent, Archibald T. Clarke, considers *Vinca minor* as rare in the neighbourhood of Tunbridge Wells. May I say that it grows plentifully in at least four localities in the (civil) parish of Brenchly, which borders on that of Pembury, growing on the Weald clay, or the Hastings sand. It grows also near Tovil, I think, on the Kentish Rag. I should call it a local, but not an uncommon plant. Where it grows in any quantity, it seems to take possession of the ground. It is probably indigenous in four of the places I mention.—*M. E. Pope.*

NOTES AND QUERIES.

CLUTCHES OF EGGS.—Your correspondent, J. A. Wheldon, says, "In passing, I may say I have no belief in this theory of some relation between the colour and fertility of eggs." With all due respect for his unbelief, I rather think, if he saw the 270 perfect clutches or 1170 eggs of the common sparrow now before me, which have been collected during the past four breeding seasons, and which have been carefully arranged and their fertility noted, he would no longer talk of "this theory," but this fact. I have no wish to enter into a controversy on this subject, but it would be exceedingly interesting to know the opinions of those who have taken the trouble to investigate, leaving the opinion of those who have "No belief" for what it is worth.—*Joseph P. Nunn, Royston.*

BLACKBIRDS' EGGS.—This morning I took from a blackbird's nest which contained one young bird about a week old, two eggs which I supposed were addled, one of them being so much larger than the other that I thought it quite possible it might contain either two yolks or two young birds. Carefully opening the large shell, my supposition proved to be correct, for I removed from it two almost fully developed chicks which were dead; the other egg was a typical rotten one. These eggs measured $1 \cdot 35 \times \cdot 92$; $1 \cdot 20 \times \cdot 90$, and weighed 125 gram. and 101 gram. I have but once previously met with a "double egg" amongst the eggs of wild birds, and that the egg of a robin which contained two yolks. I have preserved these shells, and also placed the two chicks in spirits.—*Joseph P. Nunn, Royston.*

ANODONTA CYGNEA.—I see there has been a discussion on this mollusc in your magazine. I should feel obliged if some one would tell me why it is called *Anodonta* "*cygnea*" (the "swan" mussel). What has the bird to do with the shell? The dealers speak of the smaller specimens as "duck" mussels. Perhaps there is some superstition about it similar to that connected with the barnacle (*Lepas anatifera*) and the goose.—*F. P. Perks.*

A CURIOUS ANIMALCULE.—The rotifer of which a rough description and outline-sketch is sent by Mr. W. S. Smith, of Antrim (page 154, SCIENCE-GOSSIP, "A curious Animalcule"), is most probably, as well as can be judged from the particulars given, a *Furcularia*, either *F. æqualis* (if the toes are of equal length), or *F. longiseta* (if of unequal length). The curious postures assumed by the animal upon its long stilt-like toes seem very characteristic, and are referred to by Mr. Slack, in his "Marvels of Pond Life," page 78, though the name of the creature was not known to him.—*P. Thompson.*

SQUIRRELS AND THEIR NESTS.—A sportsman-naturalist, who has for several years enjoyed exceptional opportunities for observation in the extensive woods of "The Dukeries," tells me that squirrels never leave the nest during the summer in which they are born. Old men, who have spent their lives employed in the woods, also say they have never seen a young squirrel except in the nest. Can any reader give information on this point?—*W. A. Gain, Tuxford, Newark.*

THE ZAARAHS OF DARKNESS.—I once heard that a gentleman desirous of visiting Palestine was strongly advised by a friend to omit to do so; and if any proficient in prophecy should seek to discover what the ancients knew concerning cycles of time, let him forbear, lest peradventure he associate with Colenso and not with Cumming. Imprimis, he will glean that the people of Egypt, having no leap year, were considerably out in their calculations, and that instead of anticipating the longest and shortest days, as is usual in country parts, they endeavoured to ascertain that happy period when the seasons would come right again: which long-expected event they were pleased to call the return of the Bait or Phœnix, the bird, the moth, or very black beetle. Secondly, eighteen years is not the exact time when the eclipses of the moon recur, as the astronomers of Sargon, Thales, and others of the Grecian schools were more or less aware, nor is it nineteen or seventeen years. But what wonders have we here? Only multiply eighteen by two hundred and we have the saros, which divided by six represents the neros or twelve jubilees of the antediluvians; or multiplied by twelve, adding naughts to taste, becomes the approved cycle of the Brahmins. To find the deluge and conflagration years of Aristarchus, we must multiply eighteen by one hundred, but to find the same epoch of Herodotus and Sinus, six hundred is our factor; whereas to attain to that of Cassandrus, we must multiply seventeen by six thousand. These numbers, and many more, may however be fortunately referred to one idea, namely an endeavour to calculate the time the earth takes to sway to and fro, called the procession of the equinoxes, which with the change in its course round the sun, known as its ellipticity or eccentricity, is now employed by geologists to account for eras of ice with a golden age between them. The modern astrologers took their cue from physicians such as Hippocrates, and imagined that the seasons hastening on in their sevens and nines must impart to a man's life an impetus to journey on independently in like fashion, with a stress upon the seven times nine, and seven times ten of Daniel the prophet; so that now the heir must come of age at one-and-twenty, and the family cat must have its nine lives, although the fundamental laws are far more evident, perchance in the periods of utero-gestation, incubation, and pupation, than marked in tables of assurance. The little cycles of the seasons may also be referred to as golden ages, and compared with the average sunspot series of eights and threes. Pliny thus mentions cycles of four and eight years; and the saros computed at the Druidical nineteen, or the twelve-year cycles of Turkistan presided over by bird and beast, at the moment occur. The Chiapenec language is akin to the Hebrew—*votan* is "to give," and *ben* a "son;" consequently the fifty-two-year cycle of the Mexicans may claim common derivation with the jubilee, and be referred to Joseph and the Nile banks: but the jubilee series being lunar, counts its fifties as forty-nine, and to all intents and purposes was an even series of seven years; whereas the Mexican eras look like a mistake. Finding that the labels to certain Assyrian tablets read much like the items in the Bibliothecæ Sloanianæ,—"Blessing which follow the sun and moon being together on the tenth; Portents from the flight of locusts,"—I ventured to inquire of Mr. Pinches whether a translation of this ancient sun lore was available, when he good-naturedly gave me to understand that the mysteries of the saros had in a measure floored the staff of Orientalists, so that possibly the Assyrians, like others, were most bewitched when they least understood.—*A. H. Swinton.*

Cocoa-nuts and Seeds.—On examining the fruit of a germinating cocoa-nut a few days ago, I observed that a number of small fruits (seeds) were entangled within the fibres at the base of the cocoa-nut, near the point from which the young shoot springs; around this spot the outer skin is slightly broken. Some of these seeds, amongst which I recognised millet and hemp, whilst still within the husk, have germinated. The occurrence of these seeds in this position may, of course, have been accidental; but if frequently occurring, it appears possible that seeds may thus be transported from one spot to another. I do not remember any reference in the works of Darwin or of any other writer to this particular mode of transportation and preservation of seeds.—*The Infirmary, Southampton.*

Collecting Birds' Eggs in "Clutches."—In Science-Gossip for June, Mr J. P. Nunn appears as a champion of the clutch collecting cause, and another correspondent inveighs against that cause, but does not go into the question at all. As the subject is now brought before the readers of Science-Gossip, I should like to see it thoroughly thrashed out. Mr. Nunn does not produce a single argument in favour of clutch collecting; his letter consisting chiefly of reflections upon the variety collector. First let me state plainly that I protest against making a collection of clutches, but not against ever taking the whole clutch of eggs from a nest. In many cases it is the best course for the collector, and even for the bird too, that all the eggs should be taken: it is best for the collector, because in some cases he can, without really doing any harm to the avifauna of his district, considerably increase the value of his own collection, and perhaps that of his friends' collections also, by taking all the eggs; it is best for the bird because in some cases, *e.g.* early in the season, she will, if robbed of her first set of eggs, set to work to produce a second, and in due time bring forth a whole brood of young, instead of half, which would have been the case if half only of her first set of eggs had been taken. The collector must use his own discretion according to the particular circumstances of each individual case. I maintain that egg-collecting is of great use to the student of ornithology; it increases his interest in and knowledge of the birds he is studying. What man has ever become a naturalist of authority without having at some period of his life collected specimens of that branch of Natural History which he studied? There always will be men who will collect birds' eggs, and humanitarian naturalists would do better by trying to keep the collectors within due limits, than by trying to prevent their collecting at all, as some attempt to do. To return to Mr. Nunn's letter: he says that a collection of eggs not in clutches "serve no purpose in showing what eggs really are." This is quite ridiculous,—eggs are eggs whether they are single specimens or in clutches, and I hold that a series of twelve eggs of one species of bird, showing so many different varieties of the egg of that bird, is far more interesting and instructive than that number composed of, say three clutches, showing probably only four or five varieties of the egg. In order to show twelve distinct varieties of an egg, the clutch collector would have to keep about forty or fifty pecimens. This illustration shows plainly whether clutch or variety collecting is most beneficial to the birds themselves. Mr. Nunn is no doubt correct when he says that a pair of birds can just as easily rear a full brood as a part only, but at the same time we must not overlook the fact that when the whole set of eggs is taken late in the season the birds will not nest again; had only half the eggs been taken, there would, at any rate, have been half a brood of birds brought in the world. Mr. Nunn then proceeds to recommend collectors who are not of his style of collecting, to content themselves with plates of eggs and "leave the birds in possession of their jewels." Apparently unless we are greedy enough to want the whole clutch of eggs we ought not to have any at all! It is true, as Mr. Nunn says, that in the same clutch two or even three types of eggs are frequently found; but the two or three types, in a collection, would represent the egg of the particular species quite as well as the whole clutch would. I contend that clutch collecting is very selfish and quite useless: selfish because the clutch collector keeps a superfluous number of specimens, and, instead of dividing the contents of a nest with an ornithological friend, keeps the whole for himself; useless because clutches do not represent eggs of a species so well as individual specimens taken from different nests do. It is really ludicrous to suppose that any one can think it serves any useful purpose to keep clutches of say, eight swan's eggs, thirteen pheasants, eleven wild ducks—each egg probably similar in colour and shape. Clutch collecting does much to prevent the increase of our rarer birds; if collectors were content with a few single specimens, half the number of eggs that are now taken annually would satisfy the demand for them. Of course Natural History dealers are interested in keeping up the craze for clutch collecting, as they can get more money for, say, five eggs than for one. Pecuniarily the collector will find it very much to his advantage to collect single specimens rather than clutches, both on account of cabinet room and also price of specimens, if he buys at all. I hope I may induce some beginners, at any rate, to steer clear of clutch collecting. Egg collectors should have some thought for the parent birds; if they have not, they had far better content themselves with plates of the eggs and leave the real jewels alone, as Mr. Nunn says. Undoubtedly the price which is set upon clutches of eggs of our rarer birds does very much to make those birds rarer still, and unless oologists will put some limit to their greed, they will before long find the provisions of "The Wild Birds Protection Act, 1880," extended to include the eggs of birds as well as the birds themselves. Finally, can Mr. Nunn, or any other champion of the clutch cause, show what greater advantages there are in a collection of clutches than in a collection of single specimens chosen out of different clutches for the sake of variety in shape or markings?—*E. W. H. Blagg, Cheadle, Staffs.*

THUNDER AND LIGHTNING.—I have always understood that a thunder-clap was a necessary result of the electrical discharge which caused a lightning flash, but last night, while watching those splendid natural fireworks—a thunderstorm—I thought there seemed to be many more flashes than thunder-claps. So, at the height of the storm, as indicated by the loudness of the thunder, and the position of the lightning nearly overhead, I began to count them, and while there were thirty-nine flashes there were only fourteen claps. Still unconvinced, I, with a pencil and paper, recorded each as it occurred—fifty-five flashes to nineteen claps; and again, during five minutes, there were fifty-six flashes to twenty-three claps, and yet I tried to favour the thunder. It was not the distant "summer" lightning, but "forked" lightning, some flashes consisting of as many as 4075 simultaneous zigzag cracks in heaven; indeed it seemed to be steadily lightning all the while, yet the thunderings, though loud, were not prolonged. I would be obliged if some one would explain this, or show me my error. Many of the flashes were behind some clouds, for they lighted up their background and left them in relief; could it be that these clouds reflected the sound so that it did not reach me?—*T. A. Dukes.*

CATERPILLARS AND CAYENNE PODS.—A friend of mine, a chemist, had consigned to him last Christmas a bottle (1 lb.) of the best Natal Cayenne pepper, properly sealed, and it has never been opened. A short time ago several caterpillars made their appearance. They were about half an inch in length, and almost transparent. Coming from the bottom of the bottle, they ate their way through to the top, tunnelling the pepper in all sorts of upward directions. At the top the cocoons appeared, and in a few days moths, similar to our common silver moth, but rather larger and of a French grey colour, were flying about, but lived only two days, no doubt perishing for want of air. This occurrence my friend thinks is unprecedented, and wishes to have your readers' opinion about it.—*J. B. Beckett.*

H. LAPICIDA.—Mr. J. W. Williams, in his "Shell Collectors' Handbook for the Field," gives "calcareous districts" as the habitat of this shell. The same statement appears in Gray's edition of Turton. I have, however, found several specimens of *H. lapicida* in this neighbourhood, which is decidedly sandy, the nearest chalk being at least eight miles distant. Will Mr. Williams, or someone else, give an explanation of this fact?—*Chas. Pannell, jun., Haslemere, Surrey.*

THE HENBANE.—In the month of July I was looking for unconsidered trifles on the rocky sides of the Great Orme's Head, N. Wales, when I happened to find several plants of the henbane (*Hyoscyamus niger*), a narcotic with which I am not very familiar. The characters of the plant are clearly marked. It is of stout, herbaceous growth, with prominent alternate leaves, which are curiously cut into several sharp points; the flowers are cream-coloured, veined with purple, and the centres are deep purple. A double row of capsules grows on the opposite side of the stem to the leaves. I daresay many readers of SCIENCE-GOSSIP know the plant perfectly well. The peculiarity which struck me about the hairy and viscid henbane was, that hundreds of small aphidæ, or winged insects of some kind, were hopelessly ensnared by the sticky hairs. As I write, there are numberless dead bodies on the leaves, stems, and capsules; it might be a huge drosera plant. Are we to consider the hyoscyamus insectivorous, or is this merely a coincidence? The henbane is firmly rooted, with exceedingly tough stems; it does not look like an insect-feeding species. Yet, if it is not, and the flies are still habitually captured, does not the habit throw some doubt on the carnivorous propensities of other genera? I should add that silicious particles also adhere to the sticky glands of the henbane. Perhaps some of your correspondents will give their experiences of this deadly plant.—*C. Parkinson.*

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.

G. HALL.—The mineral from the Neocomian limestone is grey iron pyrites (ferric sulphite).

E. WHEELER.—The objects are fungi, evidently a species of Spheria; see Cook's "Handbook of British Fungi."

MR. GEO. WESTERN writes:—"In your July No., Mr. W. J. Simmons, Calcutta, gives a sketch, Fig. 112, which I recognise as *Œcistes Ptygura*, the *Ptygura Melicerta* of Ehrenberg.

I remember that the first time I met with it, it presented the appearance shown, and for hours obstinately refused to unfold its corona. Dr. Hudson, with his usual kindness, identified the specimen for me. I think a reference to Hudson & Gosse's 'Rotifera' would also have enabled Mr. W. S. Smith to have identified his curious animalcule as a furcularia."

W. A. TOWNER.—The fragment of rock with enamelled surface is either a portion of some old Roman pavement, or else of an ancient mass of slag.

EXCHANGES.

WANTED, Wilson's "Larvæ of the British Lepidoptera" (coloured plates, royal 8vo), and Walker's "Diptera," 3 vols. —John H. Knowles, 4 Carfax Square, Clapham, S.W.

MICRO-SLIDES.—Insect and spider sections, and other good mounts. Wanted, other micro-slides, and lantern slides of Scripture scenes, &c.—Green, 24 Triangle, Bristol.

WANTED, rock sections for the microscope (approval). Would give in exchange books, specimens, autographs, &c.—C. Carus-Wilson, Althorne, West Bournemouth.

WANTED, SCIENCE-GOSSIP for 1876 and 1877, bound or unbound. Offered, micro-material, unmounted or mounted Australian objects, varied and good.—W. B. Poole, Savings Bank, Adelaide, South Australia.

Bulimus decolletus (living) offered in exchange for foreign shells not already in collection —Miss F. M. Hele, Fairlight, Elmgrove Road, Cotham, Bristol.

WANTED, Hooker's "Student's Flora," and other botanical works, particularly on the Gramineæ, in exchange for Cassell's "Butterflies and Moths," complete in sixty parts, unbound.—W. B., 60 St. James's Place, Plumstead, S.E.

WANTED, Master's "Teratology;" Newman's "British Ferns" offered in exchange.—Rev. F. H. Arnold, Hermitage, Emsworth.

WANTED, Huxley's "Anatomy of Vertebrated Animals," also Darwin's works. Good exchange given.—Parrit, 103 Camden Street, London, N.W.

A BARGAIN.—Thirty-one weekly, nine monthly numbers (unbound), vols. vii. and viii. (bound), "Great Thoughts," and "The World's Inhabitants" (complete, unbound), offered for Huxley and Martin's latest edit. "Biology," and twelve stamps for carriage.—M. M., 76 Clifton Street, Lytham.

LINGUAL ribbons of *Patella vulgata*, *Trochus zizyphinus*, *Littorina littorea*, *L. rudis*, *L. obtusata*, &c. The complete ribbons, and not fragments, only are offered, unmounted, and in glycerine. Send tube. Desiderata, miscellaneous mounts and lepidoptera.—C. H. H. Walker, 12 Church Street, Liverpool.

EGGS of coot, partridge, jackdaw, magpie, yellow-hammer, red-backed shrike, landrail, tree sparrow, garden warbler, sand marten, linnet, in exchange for natural history specimens, star-fish or echini preferred (not necessarily British).—Hugh B. Preston, 54 Lexham Gardens, Kensington, W.

THE writer will be pleased to hear of one or two gentlemen who would join him in a week's geological trip (I. of W.) about the middle of August.—Geo. E. East, jun., 241 Evering Road, Upper Clapton, N.E.

WANTED, foreign shells, insects and butterflies, in exchange for choice microscopic slides, anatomical, double-stained botanical, parasites, diatoms, &c.—R. Suter, 5 Highweek Road, Tottenham, London.

WHAT offers for "Nature," vols. 28, 35, 36, 37, bound in cloth, vols. 38 and 39 unbound; SCIENCE-GOSSIP, 1884–7, bound in two vols., cloth, 1888 unbound?—G. A. G., 1 Lansdowne Road, Sheffield.

Rissoa inconspicua, *R. cancellata*, *R. striata*, *R. parva*, *V. interrupta*, *R. semistriata*, *R. cingillus*, *R. membranacea*, *R. costata*, *R. punctura*, *R. cimicoides*, *R. fulgida*, *Lacuna pallidula* (fine), *L. puteolus*, *Lachesis minima*, *Eulima polita* and *distorta*, *Scalaria clathratula*, *Cerithium perversum*, *Odostomia nivosa*, *Cerithium adversum*, *Cerithiopsis tuberculare*, and *C. Clarkii*. What offers?—A. J. R. Sclater, M.C.S., 23 Bank Street, Teignmouth.

WINTER-MOTH (*Cheimatobia brumata*) and American blight (*Schizoneura lanigera*). The undersigned would be extremely grateful for any information about these insects from apple-growing districts.—Charles A. Whatmore, Much Marcle, Gloucester.

ODD numbers of "Annals of Botany" wanted, also other botanical works, especially those on freshwater algæ.—Chas. A. Whatmore, Much Marcle, Gloucester.

WANTED, to exchange a good $\frac{1}{8}$ objective for a Zeiss D D $\frac{1}{8}$; also a $\frac{1}{4}$ for a $\frac{1}{4}$ or a $\frac{1}{5}$.—E. B. Fennessy, Pallasgreen, co. Limerick.

WANTED, physiological micro-slides in exchange for others. Lists first to W. E. Watkins, 32 Huntingdon Street, Barnsbury, N.

WANTED, a copy of Morris's "Birds," in six volumes.—Dr. C., 6 Walker Street, Edinburgh.

WANTED, to complete set, "Journal of the Royal Microscopical Society," No. 63, Feb. 1888.—F. B. Bessell, 8 Elmgrove Road, Bristol.

OFFERED, long-eared owl (this year's), for birds' eggs not in my collection, or offers —E. Larder, 33 Mercer Row, Louth.

WANTED, Rye's "British Beetles;" must be perfect copy. State requirements to Jas. E. Black, 10 Exchange Street, Jedburgh, N.B.

WANTED, to exchange Lyell's "Principles of Geology," Berkeley's "British Mosses," Plue's "British Grasses," and other works on general botany. What offers?—J. W. B., 56 Vine Street, Liverpool.

FOR exchange, fine specimens of *Terebratula elongata*, *Producta horrida*, *bakevellia*, *schizodus*, &c., from magnesian limestone, and *Goniatites reticulatus* from Yoredale shales. Wanted, fossils from all formations, especially Silurian, Cambrian and Devonian limestone, also recent marine shells.—W. F. Holroyd, Greenfield, near Oldham.

COULD any reader supply me with one good specimen of the following:—*Productus horridus*, *Turrilitis catenatus*, *Hamites attenuatus*, *Anodonta Jukesii*, Cystidian, Myalodon, *Unio valdensis*, or *Nautilus centralis?* I will give two or three good specimens from carboniferous system for any of them.—Peter J. Roberts, 4 Shepherd Street, Bacup.

WANTED.—"Transformations of Insects," by Dr. Duncan. W. F. Kelsey, Maldon.

WANTED, complete volumes of SCIENCE-GOSSIP, bound or unbound, for the years 1877, 1880, 1881, 1882, and 1884. Good microscopic slides in exchange.—John Collins, 147 Muntz Street, Birmingham.

OFFERED.—Micro-slides and floated specimens of *Nitella tenuissima*, *Draparnaldia glomerata*, and *Cladophora flavescens*. Wanted: Freshwater algæ, &c.—F. C. King, Bank Villa, Fulwood, Preston, Lancashire.

HERBARIUM.—Offered (all British) L. C., 3rd ed.:—3, 36*b*, 43, 182, 186, 322, 353, 415, 443, 495, 574, 576, 620, 626, 783, 974, 978, 981, 1070, 1255, 1287*b*, 1302, 1331, 1355, 1365, 1367, 1424, 1412, 1413, 1510, 1588, 1658, 1669, 1605, 237, 256, 342, 621, 1577.—E. C. Robinson.

WANTED, fossils from any of the Eocene formations, not in collection;—offered in exchange fossils from American Eocene, Paris Basin, and British Eocene formations. Send list of duplicates.—Geo. G. East, Jun., 70 Basinghall Street, E.C.

WANTED, sideblown one-hole eggs of hawks, jays, plovers, warblers, larks, grebes, buntings, herons, and other common kinds, in exchange for other rare species.—J. Ellison, Steeton, Heighley.

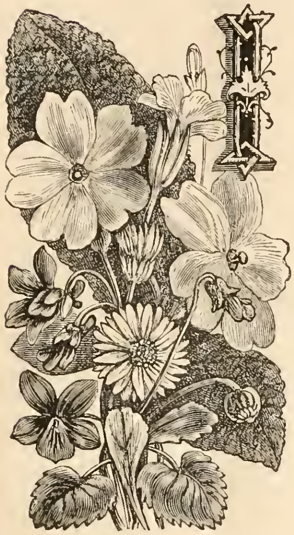
WANTED, living viper. Will give in exchange samples of Yerba or Paraguay tea; and rare shells from Buenos Ayres, viz.: *Helix punctata*, *unios*, and an hitherto undescribed *Ampullaria* (*Georgii*): see "Annals & Mag. Nat. Hist."—W. D. George, Victoria Road, Charlton, Kent.

BOOKS, ETC., RECEIVED.

"Alphabetical Index to the Collection of Minerals in the Derby Public Museum," compiled by H. Arnold-Bemrose.—"Technical Educator."—"The Land and Fresh Water Mollusca of North Staffordshire," by J. R. B. Mosefield.—"The Philosophy of Light," by A. Tournet.—"Optical Magic Lantern Journal."—"The Microscope."—"Canadian Entomologist."—"Wesley's Nat. Hist. Catalogue," No. 96.—"Proceedings of the Geologist's Association."—"Research."—"Transactions of the Hertfordshire Natural History Society."—"The Entomologist."—"Wesley Naturalist."—"Annals and Magazine of Natural History."—"Knowledge."—"Book Chat."—"Journal of the Quekett Microscopical Club."—"Nineteenth Annual Report of the Entomological Society of Ontario."—"Proceedings of the Liverpool Geological Society."—"Report of the Botanical Exchange Club."—"Names and Synonyms of British Plants," by G. Egerton-Warburton (London: Geo. Bell and Sons).—"Report of Botanical Exchange Clubs for 1888."—"The Century Magazine."—"The Amateur Photographer."—"The Garner."—"The Naturalist."—"The Botanical Gazette."—"Belgravia."—"The Gentleman's Magazine."—"American Monthly Microscopical Journal."—"The Midland Naturalist."—"Feuille des Jeunes Naturalistes."—"The American Naturalist," &c. &c.

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

LEPROSY.



IF we come to consider leprosy from a scientific and medical point of view, we find our information upon and present knowledge of the subject very slight indeed. No disease is less easy of comprehension, less impossible to heal, or less revolting in its nature than is leprosy. What it is, how it communicates itself, what is its cause, it is perhaps impossible to determine.

Æschylus describes it as producing "lichens coursing over the flesh, eroding with fierce voracity the former natural structure," as acid eats into and decays metal.

Others suppose it to be a microscopic parasite, or, more accurately, to be caused by living and self-propagating animalculæ. This view explains the allusions in Scripture to leprosy on a wall and in the warp and woof of garments.

Again, it has been said that leprosy is an exaggerated species of scurvy; and though the symptoms are not altogether the same, we may find a certain amount of truth and good sense in this suggestion, for both diseases are aggravated by the same causes, i.e. want of vegetable diet, want of cleanliness, and exposure to cold and damp.

Whether it be a parasitic lichen, a species of self-propagating animalculæ, or merely a skin disease of an exaggerated type, caused by want of proper nourishment and neglect, we cannot say. All three views appear to us reasonable, but all three cannot be correct. Certainly the view of Æschylus has the merit of being no new idea, but a time-honoured theory, with much about it that is credible; the erosive nature of the disease is without a doubt, and may not the thickened state of the skin, the dusky red or livid tubercles, the falling off of the hair (all three prominent symptoms of leprosy) be caused by the crescent lichens as they draw their sustenance from the flesh which affords them a home?

This view appears to us more reasonable than that which describes the disease as being due to self-propagating animalculæ, because we, now-a-days, never meet with cases of leprosy in wood, stone, or mortar, the warp or the woof. Animalculæ would be less likely to become parasites upon inorganic matter than would lichens.

We are unable to determine whether or no leprosy be contagious; it is certainly hereditary, though the symptoms do not always show themselves at birth. Some consider contagion possible from contact with matter discharged from leprous sores, and, in this case, we may suppose that the lichens, or perhaps their seed, communicate themselves from the victim to the clean man, and so fasten themselves upon him and erode his flesh that it becomes impossible for him to free himself from their destructive influence.

We have in England an exceedingly small red insect, known among country folk as the harvest bug, which attacks human beings and eats its way under the skin. Somewhat similar, also, is the tick, whose habits are well known to all naturalists. May we not compare this with the leprous lichen, which, after having eaten its way under the skin, grows and thrives, increases and multiplies? This comparison at first sight seems more to favour the view of leprosy being the cause of living animalculæ. But on looking closer we observe the following fact: that, whereas the harvest bug and the tick continue to live and to nourish themselves when under the human skin, they have then no propagating power, whereas the leprous lichen has.

There are no less than six distinct species of leprosy, viz.:—(1) *Lepra Mosica* (predominant in Scripture); (2) *Lepra Alphoides* (characterised by minute and very white scales); (3) *Lepra vulgaris* (this species very rarely heals); (4) *Lepra simplex;* (5) *Lepra subfusca;* (6) *Elephantiasis.*

The most prominent symptoms of leprosy are:—(1) dusky red or livid tubercles, varying in size, on the ears, face, and extremities; (2) coarseness and thickness of the skin; (3) diminution of the sensibility of the skin; (4) swellings; (5) ozœna; (6) hoarseness; (7) loss of voice; (8) falling off of the hair, excepting on the scalp; (9) change of the hair to white or yellow; (10) scales; (11) general decaying of the body by degrees; (12) tubercles; (13) disappearance of the nails and teeth; (14) coarseness and wiriness of the hair; (15) general depression.

The chief haunts of leprosy are:—(1) Palestine; (2) Iceland and Scandinavia; (3) Faroë Isles; (4) the Indies.

It is not now a usual practice to compel lepers to dwell without the city, and in some cities they have a special quarter assigned to them.

It is a curious fact that men are more liable to leprosy than women,—why, we cannot tell; but the fact that men are more usually exposed to cold and damp, two constant attendants of the disease, may perhaps account for it in some measure.

MEDICA.

CONCERNING CERTAIN FRUIT TREES.

No. I.—The Cherry Tree.

THE art of gardening has been brought to so great a perfection, by dint of science, keen observation, and careful practice, that the casual visitor to a garden or an orchard, or the fastidious connoisseur at a *recherché* dessert, who delights only in the choicest specimens of fruit produced in our own country, or, it may be, imported from some far distant region, alike need to be reminded of the earlier days of this "sweet gardening labour," ere they can appreciate, at anything like their full value, the arts of cultivation, by which, at length, our tables are daily supplied with the splendid fruits now so abundantly produced.

Very far indeed must we go back to find a time when fruits and fruit trees were not. Adam's story involves us, alas! too closely, for us to forget that in a garden he dwelt ("Of God the garden was") where grew—

"Groves whose rich trees wept odorous gums and balm;
Others whose fruit, burnished with golden rind,
Hung amiable."

Driven thence, as the result of his own ill-fated deed, henceforth man has been compelled to till the ground for food. Since, then, it is our lot to cultivate, not to gather, such as grow "of themselves," we will jot down a few scraps, which may be of interest, about the commonest of our present fruit-trees, and whence they came to our gardens and orchards.

Of the very early history and migration of plants and trees, many curious facts have come to light by the deciphering of Assyrian inscriptions, which, until of late years, were to us as sealed books.

One of these, written by Tiglath-pileser I., an Assyrian monarch, who was carried captive to Babylon, B.C. 1110, runs thus: "The pine-tree, the likkarina-tree, and the algum (almug) tree, these trees, which none of the former kings, my fathers, had planted, I took from the countries which I subdued, and I planted them in the groves of my own country, and I called the plantation by the name of Groves; whatever was not in my own country, I took and planted in the groves of Assyria."

Kushami, a Mendaite writer, in the fourth century A.D., tells us that the kings of Assyria were accustomed to bring back from their campaigns in foreign lands any plant or tree which they thought would prove valuable or useful, and that in this way the cherry was transplanted from the banks of the Jordan to Nineveh and Babylon.

The cherry-tree seems to have been very early a favourite in Europe; its introduction into Italy being attributed to the Emperor Lucullus, who brought it from Pontus at the period of his victory over Mithridates, B.C. 64. "This country was so well stocked," says Pliny, "that in less than twenty-six years after, other lands had cherries, even as far as to Britain, beyond the ocean." If this were so, cherry-trees were brought to England as early as B.C. 38, though it is usually thought that they were not introduced into Britain until the early part of the reign of the Emperor Nero, about A.D. 55; and this date agrees better with the statement of Pliny, where he says, "From the year of the city 680, now in 120 years it has arrived in Britain even."

De Candolle maintains that it is an error to suppose that the cherry was unknown in Italy till Lucullus. "This rich Roman," as he calls him, brought it; but the great botanist would credit him with having introduced a better sort than had hitherto been known, probably the bigarreau, which his compatriots would hail as a welcome substitute for the little gean, which appears to have been the kind previously known.

Recent research can scarcely be said to have confirmed the opinion of some persons that the cherry existed in pre-historic times: for, although cherry-stones have been found (those of the *Prunus cerasus*) in the remains of the Lake dwellings of Switzerland, they are said to have been discovered in a tumulus above the deposits of the Stone age. Some are reported to be in existence from the Lake of Neuchatel also, and from the "terramare" of Parma, but their date seems to be uncertain.

The cherry-tree has been found wild through many countries of Europe, Asia, and Africa, though Pliny's assertion is, "The cherry, as we have already stated, in spite of every one, it has been found impossible to rear in Egypt."

Speaking in general terms, it may be said that the *Prunus avium*—whence come geans, merries, bigarreaus (all tall trees)—has been found wild in Asia, throughout Northern Persia, in the Russian provinces of Southern Caucasus, and in Armenia; in Europe, from the South of Sweden to the mountainous parts of Greece and Spain; in Africa, in Algeria: whilst the *Prunus cerasus*, comprehending the Morello and many short-growing varieties of similar habit, has been met with wild in Asia Minor, on the shores of the Caspian, in Greece, and in the mountainous districts of Italy and France (but farther west only in a cultivated state), and likewise in Southern India.

The mode of the propagation of the cherry appears to be by seeds, which are dropped by birds at a short distance from the plantations.

The last-mentioned species was well known in ancient times, and is described both by Theophrastus and by Pliny, who writes of nine kinds of cherry, and strongly recommends the fruit as profitable to the grower. He says, "The cherry is one of the first trees to recompense the cultivator with its yearly growth; it loves cold localities and a site exposed to the north. The fruits are sometimes dried in the sun and preserved like olives in casks."

The inhabitants of the ancient city of Pompeii must have been familiar with the species of cherry now under consideration, since, amongst the treasures revealed in the exploration of its ruins, at least two paintings have been found which plainly portray the *Prunus cerasus*.

Whatever may have been the kind of cherry introduced into our country at the early period above mentioned by our Roman invaders, there is reason to believe that but little care was taken to preserve or cultivate it, or, indeed, any other fruit trees; and though gardens, orchards, and vineyards are mentioned in William the Conqueror's Survey, it was not until the skill of the monks, who came over under his auspices, had achieved a great improvement in the science and art of gardening, that England had much to boast of in the way of orchard fruits. These indefatigable men transplanted with them from their own fruitful Normandy, both the trees wherewith to stock our orchards, and the practical knowledge wherewith to tend and foster their growth. From this period, for a time, the art of gardening flourished, then fell back sadly when civil wars and disputes devastated the land, no great revival taking place until the sixteenth and seventeenth centuries.

Very early in the reign of Henry VIII., in a list of fruits and vegetables then introduced from the Netherlands, we find amongst others "the cherry." This was probably the kind which we still call the Flemish cherry, of which old John Gerarde says: "It differeth not from our other English cherries in stature or form of leaves or flowers; the only difference is, that this tree bringeth forth his fruit sooner and greater than the other, wherefore it may be called in Latin, *Cerasus præcox*."

This author describes with care at least a dozen kinds of cherries, of whose virtues and properties he duly descants, though, verily, his experience of the kind he here describes seems to have been stolen from him. His account leads us to suppose that at least he would fain have shared it with his greedy friend. "We have," says he, "another that bringeth forth cherries also very great, bigger than any Flanders cherrie, of the colour of jet, or burnished horne, and of a most pleasant taste, as witnesseth Mr. Bull, the Queen's Majesty's Clockmaker, who did taste of the fruit (the tree bearing onely one cherrie, which he did eate, but myself never tasted of it), at the impression hereof."

Gerarde records, too, a use of the Morello cherry, which, I believe, is little known at the present time. He says, "When they be ripe, the Frenchmen gather them with their stalks and hang them up in their houses in bunches or handfuls against winter, which the Physitions do give unto their patients in hot and burning fevers, being first steeped in a little warm water, that causeth them to swell and plump as when they did grow upon the tree." After recording the various medicinal uses of the cherry, which however seem to be but few, he recommends the gum of the cherry-tree, with wine and water, as "a remedy for an old cough;" and, says he, "Dioscorides added, that it maketh one well coloured, cleareth the sight, and causeth a good appetite to meat."

Several kinds of cherry are used to make liqueurs. The species called *Prunus marasca* is found wild in Dalmatia; from it is distilled the liqueur we know as Maraschino.

Although the cherry is in nowise associated in our minds with revelry and mirth as the vine is, German records relate a custom in which this fruit has been made the emblem of rejoicing. The account given of an ancient festival runs thus:—There is a feast celebrated at Naumberg, called the feast of cherries, in which troops of children parade the streets, holding green boughs ornamented with cherries, to commemorate a triumph obtained by their ancestors in the following manner. In the year 1432 the Hussites threatened the city of Naumberg with immediate destruction, when one of the citizens named Wolff proposed that all the children in the city, from seven to fourteen years of age, should be clad in mourning and sent as suppliants to the enemy. Procopius Nasus, chief of the Hussites, was so touched with the spectacle that he not only received the young suppliants, but regaled them with fruits and promised to spare the city. The children returned, crowned with leaves and bearing bunches of cherries, crying as they passed along, "Victory, victory!"

The wood of the cherry-tree is not extensively used in this country, perhaps partly owing to the comparatively small size it attains, though Evelyn remarks that in his time, in Buckinghamshire, the trees were adjudged to be timber, and as such were tithe free. "The black cherry-wood," says he, "grows sometimes to that bulk that it is fit to make stools with, cabinets and tables, especially the redder sort, which will polish well, also pipes and musical instruments; the very bark is employed for beehives."

A large species is found in America, *Cerasus Virginiana*, the choke cherry; according to Sir Wm. Hooker, this tree sometimes attains a height of eighty or one hundred feet. Its fruit is scarcely edible in its fresh state, but dried it forms a valuable addition to pemmican. The wood is esteemed amongst the best by American cabinet-makers.

MARY B. MORRIS.

MY WINDOW PETS.

By E. H. ROBERTSON.

IT is very commonly stated, in works on natural history, that two male robins are never to be found dwelling in the same garden: a statement not in invariable accordance with fact, I having daily evidence to the contrary, since no less than three pairs have frequented my garden and orchard, and therein nested, for certainly the past two or three years. 'Tis true that they usually give one another a pretty wide berth—except about feeding time—they, nevertheless, frequently, at the same moment, hop about my lawn in search of worms and scraps.

One is a bird of most unusual size, so beautifully soft plumaged that he more nearly resembles a painted than a naturally feathered robin. His companions are ordinary pugnacious specimens of *Erythaca rubecula*, who generally indulge in a set-to somewhere about dinner-time, the anticipation of a shared feast stimulating them into pugnacity. After their daily scrimmage, and the scattering of a few feathers, they almost invariably alight on the pathway in front of my window. Here, *vis-à-vis*, at a distance of about two feet apart, they contemplate each other with widely gaping beaks, emitting most peculiar sounds, which appear to be cries of distress. Meanwhile, my soft plumaged favourite makes the most of his short opportunity, and bolts with incredible celerity the choicest morsels, varying his performance occasionally with a few flourishes of defiance. This is too much for the already disturbed equanimity of the combatants, who, animated by a common impulse, unite to drive from the scene this jubilant onlooker. He is a wise as well as a beautiful bird, and evidently his feelings are in entire accord with the sentiment so tersely expressed in the proverb, "Discretion is the better part of valour," for he beats a most precipitate retreat, chased by his temporarily united foes, but soon returns to pour forth a few sweet triumphant notes, and—finish his repast.

As one instance out of many of this bird's tameness: a short time since he was hopping and flitting most unconcernedly about my drawing-room, at the same time that a performer, with greater vigour than skill, was extracting anything but harmony from a harmonium.

Not yet have I succeeded in inducing him to take food from my hand, although a short time since he alighted on the edge of the plate of scraps I was conveying to the window-sill, its slipperiness so scaring him that he has not since cared to repeat the experiment.

Knowing full well that a friendship forced is not worth possessing, I strive, with gentlest arts, to win the confidence of my pets, and well has this my most trustful friend rewarded me by his remarkable attachment to my person, being almost never absent when I am in my garden. His favourite station is a cross bar of a rustic archway spanning the path which intersects my lawn. Here, when I am near, he warbles forth in sweetly subdued notes his cheerful song, evidently thinking it unnecessary to sing his loudest when his hearer is so close. 'Tis the same when I am gardening, and whilst, from some clod hard by, he watches with keenest interest my several operations, cheers me with his softest music. When planting out, so persistent is he in his examination of the contents of my trowel, that scarcely can I pursue my work for fear of injury to his small personality.

During the summer months my garden near the house appears alive with young robins, and 'tis ever a mystery to me that the several broods do not get mixed up as they flit from tree to shrub, and from shrub to tree. The incessant labour involved in the providing for the inexorable demands of their voracious offspring must severely tax the energies of the old birds, for long after the young seem quite able to shift for themselves they are still supplied with food by their assiduous purveyors. I, last summer, felt quite concerned for one poor mother, during the period of incubation; so weak did she become as to be quite unable to stand upon the window-perch, having, as it appeared, entirely lost the use of her legs; the poor dilapidated little wretch presenting, I should imagine, an exact counterpart of the Jackdaw of Rheims after the anathemas of the pious abbot had taken full effect upon his devoted carcase. Yet, after the hatching of her brood, this bird rapidly recovered.

How the robin delights in a bath; and be the weather never so cold, water-butt, drain, or trickling pump-spout are in turn eagerly laid under contribution.

One small bird have I omitted to mention, as not exactly falling under my designation of window pets; and yet, as he yearly builds his nest in a vine under one of the upper angles of a false window over my sitting-room, and is almost always before my window, I bethink me that he too deserves to be classed with my feathered friends. I allude to the spotted flycatcher (*Muscicapa grisola*), which, year after year, builds in precisely the same spot. Early and late, the business of his and her life seems to be the supply of the commissariat department. Their keenness of vision is marvellous, and from a favourite station, an upright of the same rustic archway before alluded to, they discover and dart upon the insects which alight upon the leaves of a plum-tree some fifteen feet distant, returning to their post to spring aloft, some foot or more, to catch with the well-known snap some unfortunate fly coming within their ken. And when the late afternoon sun-rays are glinting through the

Fig. 121.—Spotted Flycatcher (*Muscicapa grisola*).

hazel bushes surrounding my orchard, how the pair delight to take their station on some stake, or flit from tree to tree, to snap the winged atoms sporting in the golden beams, sometimes gracefully hovering for many seconds over the feathery grass heads ! Nor do they fail, when smaller cheer is scarce, to lay my apiary under contribution, waylaying the tired homing bee, and carrying him off to the branch of an apple-tree, there carefully extracting the sting before venturing to swallow the toothsome morsel.

The flycatcher is one of the members of the Peace Society, and only when driven by aggressive acts on the part of others does he ever show fight, in defence of all he holds dear. This summer a pair—should I not rather say " the " pair ?—had but just completed their nest, when a band of those noisy marauders, *Passer domesticus*, in an evil hour made a descent, and nearly demolished the nest. The little builders uttered the most plaintive cries, and that day returned no more ; but I was most agreeably surprised, on the day following, to find them busily repairing the damage—ultimately safely rearing a brood. The male bird, however, became so fierce that he attacked with utmost fury every sparrow that put in an appearance within many yards of his home, even when not on evil intent bound ; and quite ludicrous was it to see how the beetle-browed robbers cowered as he dashed down upon them to chase them from his domain. The pair, for a long time after the attack, always uttered the most pathetic cries when I appeared in the garden, either to distract my attention or to engage my sympathy. They are a most trustful pair, and often catch flitting insects within a few inches of my face. Seldom, however, will they enter their nest whilst one's attention is directed towards it, but after a while fluttering before it return to their station on post or branch, repeating this manœuvre several times, before finally, yielding to their parental impulses, they at last dash in.

Apropos to nests, what curious situations my pets sometimes select for their construction ! For the past four or five years I have suspended under the overhanging thatch of my kitchen, etc., a small square box, having a circular hole cut in the front. This, I hoped, would be taken possession of by some small bird, the magnificent foliage of a luxuriant *Hedera dentata* almost hiding it from view. It, however, remained untenanted and unused until the past summer, when, to my great surprise, a pair of blackbirds built their nest upon its exposed top, and this notwithstanding that it was within reach of hand, and, although sheltered from the rain, exposed to the full glare of the sun and the view of every passer-by. Added to this, it might reasonably have been expected that the frequent "banging" of the scullery door, within a yard of it, would have scared a far less timid bird than the blackbird. Unfortunately, seeing the evil eye of a prowling cat fixed upon it, I injudiciously placed beneath the box a long stretch of wire netting—with just the result that I might naturally have looked for—the nest was deserted, another being constructed in some ivy clothing the trunk and branches of an apple-tree hard by.

"It wins my admiration
To view the structure of that little work—
A bird's nest. Mark it well within, without ;
No tool had he that wrought ; no knife to cut ;
No nail to fix ; no bodkin to insert ;
No glue to join ; his little beak was all ;
And yet how nicely finished ! What nice hand,
With every implement and means of art,
And twenty years' apprenticeship to boot,
Could make me such another ?"

Hurdis.

Prolongation of the Tadpole Condition.—Do the tadpoles of the common frog ever go through two seasons before their metamorphosis ? Last year I had one alive and healthy in an aquarium up to 9th of January, when unfortunately it was injured and killed.—*Henry Ullyett*, *Folkestone*.

THE WOOD ANT (*FORMICA RUFA*).

By Jos. Bowman.

WHAT a misfortune it is that Providence or Nature has not provided a universal language, a means of communication between man and beast, between man and insect! Then we should have no controversies. The perplexing mysteries of nature would be open before us, and, what is of immediate importance to me, I could step peacefully up to my nest of *Formica rufa*, and inquire of my favourites what they thought of Mr. Whatmore's attempt to rob them of their organs of hearing.

Perhaps there are those, however, who would object in a decided manner to being robbed of the glorious pleasure experienced in the unravelling of those mysteries; and if so, I shall not quarrel with them.

Perhaps I, myself, would live to repent the time when my wishes were realised.

That the theory propounded in the May issue of Science-Gossip raised a conflict of doubts in my mind, I at once admit; but I must add that these were speedily dispelled in the light of a few simple experiments.

It is my usual practice to provide my ants with a liberal supply of honey immediately on visiting them at night, and it was while they were absorbed in their luscious feast that I proved to myself, beyond doubt, that they possessed organs of hearing of a very acute nature.

The honey is placed under cover of the glass. The ants are busily engaged in sipping it from the paper on which it is smeared, and I approach the cover with a tumbler glass in one hand, a hammer in the other. I make a feint as if about to deal the cover a severe blow with the hammer, and make it (the hammer) pass close to the glass and the ants without touching either, and without producing any noise. This feint I repeat again and again, and the ants take not the slightest notice. Next, I take the tumbler, and touching it lightly with the hammer, which action produces a low ringing noise, I find instantly that the ants are on the *qui vive*, raising themselves on their hind legs, and exhibiting every sign of being startled by the sound. This experiment I repeated, with a like result, again and again.

In this instance, I presume, the vibration in the air would be the same when no sound was produced, as when it was produced.

I next experimented with a common bluebottle fly, which I placed under cover of the glass a short distance away from any ants that were prowling round. Mr. Bluebottle seemed to take matters quite unconcernedly, and the ants on their part seemed entirely unconscious of the intruder's existence. One of them, however, by accident happening to get near the fly, at once seized it by the leg, and of course the fly immediately began to buzz its wings in a vain endeavour to escape. A group of ants, quietly feeding upon the honey at the further side of the glass, undoubtedly hearing the buzz-buzz of the fly's wings, at once rushed to the scene of conflict, and the victim's fate was sealed. Now, I would ask, if it was merely the ants' sight that led them to the fly, how was it that they had not moved before, whilst the fly was creeping about, not more than six inches away from them? Their movement was not erratic, but simultaneous and combined.

I am perfectly aware that this theory is a direct antithesis to the theory of Sir John Lubbock, as expounded in his learned and interesting book on Ants, Bees, and Wasps; but in the light of my own experience, and of the experiments which I have here detailed, I must still cling to my opinion.

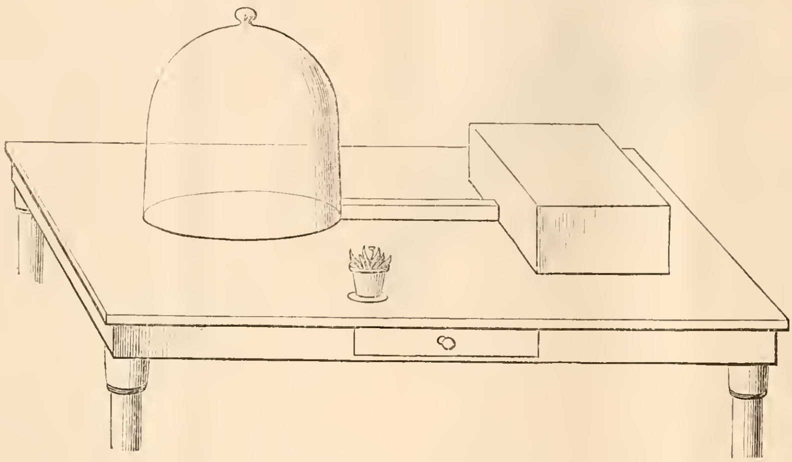


Fig. 122.—Home of *Formica rufa*.

That their range of sight is extremely limited may be easily seen by the fact that they failed to see an object much larger than themselves, moving only a few inches away: as in the case of the bluebottle fly.

I secured the nest of *Formica rufa* which is in my possession now in the early part of spring of this year. I had previously visited the same nest, in its native place, on the Christmas Day of 1888, and I found them then in an almost dormant condition, huddled in a mass deep down in the nest material. No female ants were visible, and I could find no pupæ.

I paid them another visit in the latter part of April 1889, and I then found them stirringly busy; and in the nest were some sixty or seventy pupæ, and six or seven female ants: all of the females were winged. I carried the nest away, and in a fortnight from that time the whole of the pupæ had undergone transformation, and the empty cases were carried out of the nest. From this batch of pupæ there emerged some twenty females, and out of this number five or six were stripped of their wings by the workers.

Another batch of pupæ were produced, and the process of hatching was most interesting. The pupæ themselves are incapable of breaking through the tough encasement in which they have almost completed their wonderful transformation, but the watchful workers, by some species of instinct, wondrous in itself, assist at the right moment in releasing the baby ants, by biting through the covering. In an incredibly short space of time the soft-bodied, limp-looking youngster becomes hardened and perfected, and soon, should it be a worker, mingles with its co-workers, and takes its place as a unit in the vast community. And what a community! a seething mass of life governed by almost infallible laws of instinct, which keep them moving and living with clock-work regularity.

The perfect insects themselves derive their sustenance from the honeyed juices (the deposit of numerous aphides) which they find plentifully besprinkling the leaves and branches of various trees and plants, the many insects which are captured and conveyed to the nest serving as food for the larvæ. I have often thought that a sense of smell must lead, the ants in the direction of the sweet juices they consume. I have not, however, been able to determine to my own satisfaetion whether this is so or not.

Sir John Lubbock, however, writes definitely on this question, saying, on p. 235 of his book on Ants, Bees, and Wasps: "There can be no doubt whatever that in ants the sense of smell is highly developed." This theory he substantiates by a number of interesting experiments.

I have noticed, certainly, that when I have placed their food (honey) under the glass cover, in a short time the paper was covered with ants, whilst only a few were noticeable when I put it in.

On one occasion I counted not less than two hundred ants feeding at once. That such a large number could not have arrived at the honey by mere chance is certain; but whether their sense of smell or some other means of communication led them to the spot, I could not in this instance determine.

I am inclined, however, to believe that the ants inside the nest were made aware of the fact that a kingly feast was awaiting them, by their comrades who had already partieipated in it.

An instance of their mode of communication was afforded me when I at first secured the nest. From the box in which the nest was enclosed, I made a passage communicating with the glass cover, as seen in the illustration. At first the ants seemed afraid to venture along the passage, and even after they had done this only one of them ventured into the glass. This adventurous individual moved about a little as if exploring a new country, and then rushed back to its friends in the passage.

I watched it as closely as possible, and found that it went from one friend to the other, stroking the friend's antennæ with its own, undoubtedly, as it proved, informing them that they might with safety venture into the glass. This advice they acted upon at once, and soon quite a number of them were in the glass, creeping in all directions. It is quite a common oecurrence to see two ants thus engaged in having a friendly chat. In fact, the uses of the antennæ seem to be unlimited.

Once I was cruel enough to cut off the abdomen of one of my favourites, and, seeing that it was in the interest of Science, I suppose I need not crave pardon. By-the-way, what a selfish master Science is! Nothing can satiate its voracious appetite. Bird, beast, and insect fall a prey to its rapacity. But its shadow covers a multitude of sins. The operation on my ant, however, caused or seemed to cause it little pain, as it moved about as rapidly and as easily as ever. I placed it near to a drop of honey, and it immediately began to feed as though it had not, recently, been cut in two. In fact, it rather seemed to enjoy being rid of such an incumbrance as a bulky abdomen. Soon the honey that it was imbibing began to ooze out from behind its abdomen, and it fed on and on, never of course feeling satisfied. I placed it again in the nest, and next day I saw it again, and then I lost sight of it entirely.

I am aware that this is only one link in the chain of evidence proving that insects do not feel pain, yet I hope it is worth recording.

It is strange that in such a large community, confined to comparatively narrow limits, there should be any lack of regard for the safety of each other. Yet such is undoubtedly the case. And it is here we can trace such a wide difference between the human reason and the instinct (we must call it thus for want of a better name) of the weaker creation.

True it is that amongst ants there is a governing bond of unity which tends to the welfare of the community as a whole. Should, however, a single member of that community fall into danger, it receives no assistance from its comrades, although it may have the poor consolation that, should it lose its life, its dead body will be carried to the nest. Sir John Lubbock has instanced this, in the case of one of his ants, which, having fallen into some honey and being unable to extricate itself, was left to perish. Similar instances have come under my notice time after time: many of my ants having suffered a lingering death, whilst scores of their companions have been quietly sipping the honey close to them. Wondering whether this lack of sympathy was due to the fact that, not having experienced a similar danger, the ants feeding in safety were utterly unconscious of the danger in which their comrade was placed, I resolved to try another experiment.

I took a small jar half full of water, and placed it under the glass cover. In the jar I placed a piece of stick, one end of which was resting on the bottom, and the other against the top, thus providing a safe escape for any ant that might fall into the water and was fortunate enough to reach it. In a short time there were some six or seven unfortunates struggling in the water. Out of this number, four succeeded in reaching the stick and in climbing into safety. These did not at once rush away from the dangerous place, but rested for a while on the stick, while their less fortunate fellows were left struggling for life. Now, it would have been quite an easy matter for those on the stick to have lent some assistance to those in the water.

Assistance, however, was not forthcoming; and although they were several times almost touching the stick, they would have perished miserably had I not gone to the rescue.

Perfect in industry, yet lacking sympathy.

It is a curious fact, that although the little country town of Morpeth is nestled down amongst woods—woods right and woods left—in only one of these, the Lady's Chapel wood, or Bothal wood, as it is commonly called by visitors, can *Formica rufa* be found. Other woods present little difference to the eye of man; yet you may traverse mile upon mile, inhaling the fragrant scents wafted by pleasant breezes, and enjoying the rich sylvan scenery of which there is abundance, without seeing a solitary specimen of the wood ant. Once, however, you have struck the delightful riverside path leading to the village of Bothal, you find yourself literally in the home of the ant. They appear here, there, and everywhere, all intently busy, all setting a rare example of industry.

Each year their nests increase in number, yet they are always confined to the same limit. For a stretch of half a mile, you will find the woody banks dotted here and there with their hillocks, yet they never seem to cross the boundary-line, east, west, north, or south. And it would seem as though at some future time this space will be one mass of ants' nests.

One nest in particular I noticed, of an extraordinary size, whilst only a few feet distant was a small colony which was evidently an offspring of its huge neighbour; it evidently having been populated by a queen from the older nest. The ants, too, must have recognised the relationship, as there were no signs of any pugnacious feeling amongst them.

Anxious to ascertain whether or no there was a similar good feeling existing with members of the other communities in the immediate neighbourhood, I secured a few specimens from three other nests, and bringing them home with me, I turned them loose into my nest, which, as I have said, I brought from the same locality. The result was that the strangers were almost immediately set upon and killed.

As this article is already assuming too large dimensions, I shall again leave further observation for a future article.

VARIATION IN THE MOLLUSCA, AND ITS PROBABLE CAUSE.

By Joseph W. Williams.

Part III.—Preliminary Remarks to a Chapter to succeed on the Probable Cause of Variation.

I HAVE in the first part, and more especially in the second part, discussed the good and the bad of an extensive variety-naming, and accorded some limits farther than which, in my thinking, variety-namers should not trespass. It now remains for me to consider the other portion of my subject—the Probable Cause of Variation—which I stated would discuss heredity as the main factor in producing what I shall call "congenital variation;" and since this brings in to our notice all recent work on the cell-theory as directly bearing on the point at issue, and since many of my readers do not pretend to any extensive physiological and anatomical knowledge, I must leave the question of heredity to a future part, and discuss here almost in its entirety the cell-theory for their benefit in understanding what I shall have to say hereafter. For the drawings I am indebted to my friend Mr. Frederick Lambert-Siggs, B.A., the librarian at the Middlesex Hospital Medical School. Throughout I accept it as a truism that the cause of variation in all animals is the same—perhaps, ultimately, referable to a "mode of motion."

Lying in the substance of the hepato-pancreas (*Mitteldarmdrüse* of Frenzel) in all snails is an acinous gland—the hermaphrodite gland or ovotestis in which both ova and spermatozoa are produced from the same kind of germinal epithelium, the ova from the peripheral portion, the spermatozoa from the more central portion of each acinus. These ova and spermatozoa are essentially of the nature of cells, —germ-cells and sperm-cells. It is with the ovum or germ-cell that we have here principally to deal, with its structure and the changes previous to, during, and immediately succeeding fecundation, of which it is the seat. The nucleus of a cell is represented by its germinal vesicle, the nucleolus by its germinal spot, and the protoplasm by its vitellus. Fecundation is accomplished by the union of a sperm-cell with a germ-cell.

Previous to fecundation a very remarkable phenomenon occurs in the ovum, which was first noticed

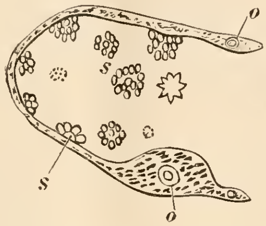


Fig. 123.—Follicle of the hermaphrodite gland of *Helix hortensis*. *oo*, ova; *ss*, spermatoblasts (cells producing spermatozoa).

in 1837 by Dumortier in *Limnæa stagnalis*, but was not thoroughly investigated until eleven years later, when Fritz Müller again brought it before the attention of scientific men. This phenomenon is now known as the extrusion of the polar bodies. It gives evidence that the ovum is approaching a state of maturity, not that it has already approached a state of ripeness, since Calberla has noticed extrusion of polar bodies previous to the egg attaining a matured state. The course of affairs is this. A

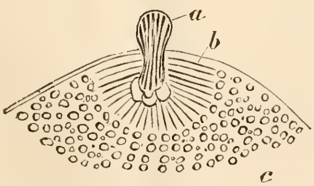


Fig. 124.—Extrusion of a polar body from the egg of *Succinea Pfeifferi*. *a*, polar body showing elongated filaments of nuclear matter; *b*, radiated appearance around the polar body; *c*, yolk.

spindle-shaped body is seen passing outwards from the germinal vesicle to the peripheral portion of the ovum; this body has been named the "amphiaster of rejection" by Fol, and the "direction spindle" by Bütschli. *Pari passu* with this the membrane limiting the germinal vesicle becomes dissolved away in the vitellus, and the yolk around it becomes disposed in a radiating manner; while a little later a small mass of protoplasm is extruded from the ovum at the peripheral end of the spindle to form the first polar body—a process which is repeated again. The question as to what this "direction-spindle" is made up has met with some discussion and has not yet been laid down to rest. The most probable explanation seems to be that of Hertwig—in which he is supported by Blockmann and Trinchese—who considers it to be fragments of the limiting membrane of the germinal vesicle and the germinal spot. Fol thought that it might be due to a swelling of some filaments which he has termed "filaments bipolairs," and which he conceives as passing from the germinal vesicle to each pole of the egg, while Bütschli considered it due to a coalescence of granules merely.

It is a question whether this phenomenon is one of indirect cell-division or karyokinesis, and this takes us back to discuss over the intricate subjects of the structures of the nucleus and the nucleolus of the cell and the various changes it undergoes during indirect cell-division. To this consideration we must give some little space.

In the seventy-seventh volume of Virchow's "Archives" is a paper by Professor Flemming, of Keil, and from the publication of this paper is to be dated the sober beginnings of our present knowledge of nuclear-structure. In a resting nucleus Flemming finds that there exists four determinable portions—a network of fine fibres to which he has given the name of "karyomiton," one or more nucleoli, an intermediate or nuclear fluid, and a limiting membrane enclosing them all. The fibres of the karyomiton are often nodular, and show a great affinity for colouring matters, and hence he has named the substance which composes them "chromatin." The nucleoli are to be regarded as a specific product of the reticulum of fibres and as devoted to a special function; there are differences between the nucleoli present in any given nucleus: some show the presence in them of minute vacuoles, and with some a slow kind of movement obtains. He distinguishes in the limiting membrane an achromatic and a chromatic portion, the former not being stained, the latter being stained by colouring reagents. The nuclear-fluid consists of a solution of albumen and salts. The chromatic portion of the limiting membrane is seen in some cases to be perforated, and through these perforations Klein and Frommann have conceived that a communication may probably take place between the reticulum of the fibres in the protoplasm of the cell (kytomiton) and that within the nucleus (karyomiton).

However, all observers do not agree with Flemming as to his description of the structure of the nucleus. The workers on this subject are divided into two schools—those who do, and those who do not, agree with Flemming. Van Beneden, Retzius, and Leydig belong to the former; to the latter belong Carnoy, Balbiani, and Strasburger. The latter hold not with the former, in that they consider the fibrous appearance of the nucleus to be due to a coiled-up filament, and in that the reticulum is due to a regular crossing of the coils. Carnoy also states that the chromatin of Flemming is identical with nuclein (a substance which Miescher discovered in 1871); that the filament is made up of a tube, a lumen, and of contents which may be organised; and that the nucleolus is due to a localisation of the filament. To the protoplasmic portion of the nucleus he applies the name of "karyoplasma." Strasburger regards the nucleus as made up of nucleoplasm (identical with Carnoy's karyoplasma), which consists of a filament crossing itself in coils in every direction, and in containing nucleomicrosomata which do stain, and nucleohyaloplasm which does not stain. Arnold Brass considers the chromatic filament to be made up of several substances, and to be the seat of metamorphoses. While Van Beneden, agreeing with the researches of Flemming, differs in the terminology he applies. In his paper on the fecundation of *Ascaris megalocephala* he gives the name of "nucleoplasm" to the substance forming both the membrane and the reticulum, and conceives that each fibre of the reticulum is made up of a great number of minute particles, or nucleomicrosomata, which are surrounded by the chromatin substance. The nucleoplasm he describes as made up of an achromatic substance disposed as fine moniliform filaments and of a chromatic substance which fills the meshes and is imbibed by the network and the membrane. The more elongated fibres he calls nuclear threads. I have referred to the fact that Miescher in 1871 discovered nuclein as a constituent of the nucleus. Since then Zacharias—in 1882 and 1883—has discovered another substance in the nucleus which he has termed "plastin," a substance nearly related to protoplasm. Nuclein has been isolated, and is a greyish-coloured mass soluble in weak Na HO, but insoluble in weak HCl. It is generally considered to be an organic body containing phosphorus, but

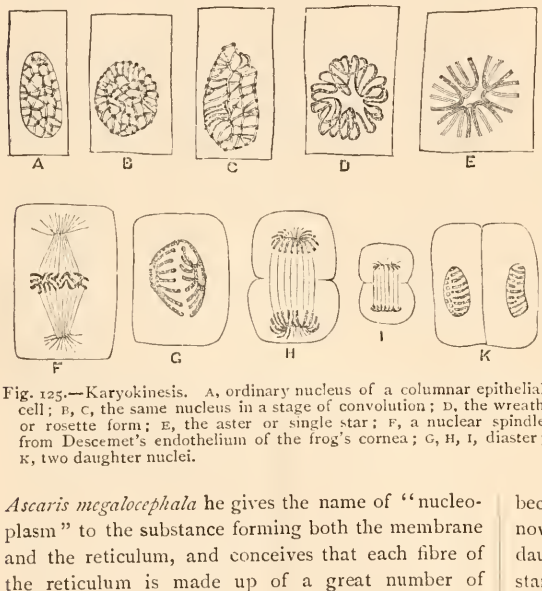


Fig. 125.—Karyokinesis. A, ordinary nucleus of a columnar epithelial cell; B, C, the same nucleus in a stage of convolution; D, the wreath or rosette form; E, the aster or single star; F, a nuclear spindle from Descemet's endothelium of the frog's cornea; G, H, I, diaster; K, two daughter nuclei.

Gamgee* considers the analytical results so unsatisfactory that he will not allow it to be considered as "a definite chemical individual possessed of constant composition."

Karyokinesis, to which we must now turn our attention, was first described by Bütschli in 1876, but the term was first used by Schleicher. Bütschli observed it taking place in the testicular cells of *Blatta germanica*, and in two cells of the blastoderm of *Musca vomitoria*. Perhaps the future will disclose to us that it is the only form of nuclear division, and that direct cell-division or karyostenosis † does not exist. Karyostenosis, however, has been described by Ranvier and Lavdowski as occurring in epithelial and adipose tissue cells and in leucocytes; perhaps, too, it is the manner of division in some thallophytes and in the cells of the parenchyma of the higher plants. The kinetic changes in nuclear division are well illustrated by Fig. 125, which I have taken from Klein's "Elements of Histology." The changes take place as follows—according to Flemming. The nucleoli disappear, and the chromatin of the nucleus becomes greater in quantity and disposed in a complexly coiled thread, which at length unravels to form the spirem or "wreath-form." The peripheral ends of the loops composing the wreath now become divided and form the aster or garland; then each filament becomes divided along its length, and all the filaments become localised near the equator of the nucleus forming an equatorial group. The equatorial group soon begins to be divided into two halves by the development of a transparent divisional plate—the cell-plate of Strasburger; and each half moves towards opposite poles of the nucleus to give rise to the pithode or barrel-form—which is identical with Eberth's and Maizel's creel-form or basket-form. The barrel-form develops further and becomes a double star or diaster. The process is now reversed. Each half of the diaster represents a daughter nucleus, which after passing through the star-form, then the wreath-form, and at last by shrinkage into the coil-form, becomes a resting nucleus. During the formation of the wreath-form of each daughter nucleus the cell-protoplasm begins to divide, so that by the end of the completion of the coil-form there results a divided cell, each division of which contains a nucleus. The whole process is rapid, and ends by the "constriction and severance of the cell-protoplasm."

For literature on this subject of karyokinesis I recommend the reader Carnoy's "La Biologie cellulaire," 1884; Ryder's "The Law of Nuclear Displacement, and its Significance in Embryology" ("Science," i. 1883); Kolliker's "Das Karyoplasma

* "Physiological Chemistry," vol. i. p. 243.
† A term proposed by Carnoy.

und die Vererbung, eine Kritik der Weismann-'schen Theorie von der Kontinuität des Keimplasma," in "Zeit. für wiss. Zool." xliv. 1886; Flemming in "Arch. f. mikrosk. Anat." vol. xvi.–xx.; Strasburger's "Ueber ein. z. Demonstration geeignetes Zelltheilungs-Object," in "Sitz. d. Jenaischen Gesell. f. Med. u. Naturwiss.," July 18, 1879, and "Zellbildung und Zelltheilung," 1880; Drasch, "Wiener Sitzungsber.," 1881; Klein in

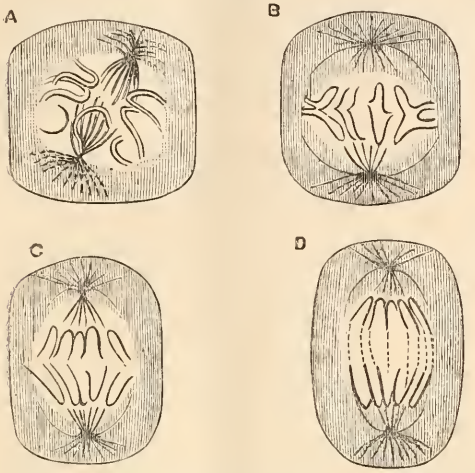


Fig. 126.—Diagram showing the mode of nuclear division. A shows strongly marked chromatin filaments with the spindle figure. At the ends or points of the figure observe the star-shaped or radiating arrangement of the protoplasm, and in the middle of the spindle the chromatin filaments. In the latter a longitudinal division of the filaments has already begun. B shows the number of chromatin filaments multiplied by division and beginning to be arranged with the loops in the same direction as the spindle; C shows the loops still more regularly arranged; D, both groups of the filaments or loops have retreated towards the poles of the spindle (after Rabl).

"Quart. Journ. Micr. Science," 1878 and 1879; Eberth in "Virch. Arch." vol. 67; and Arnold in "Virch. Arch." vols. 77 and 78.

Has the extrusion of the polar bodies anything to do with these karyokinetic changes? Flemming working in 1882 came to the opinion that the phenomena in both are identical, except that in the ovum the achromatin element is predominant, and that therefore it is in the achromatin figures which principally are fixed upon our attention. Van

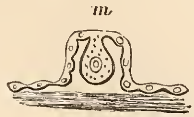


Fig. 127.—Young egg of *Holothuria Bohadschia*; *m*, the opening of the micropyle (after Semper).

Beneden in *Ascaris megalocephala* has observed the production of a Y-shaped figure which he has called the ypsiliform-figure, but as this has not been observed as yet in the Mollusca I accord to it here but a passing notice.

One spermatozoon is all that is necessary for the foundation of the ovum. The spermatozoon enters by an aperture termed the micropyle; its tail becomes absorbed, and the head remains to form the male pronucleus. According to Van Beneden and Blomfield,* the spermatozoon throws off a body (seminal granule) previous to fecundation and while it is within the ovum, probably with the second polar body; after the extrusion of the second polar body, the remaining portion of the germinal vesicle is termed the "female pronucleus." Fecundation consists in the fusion of the male and female pronuclei. For the discussion as to the consideration of regarding each living cell as a distinct hermaphrodite being, I must ask the reader to refer to the papers of Professor Sedgewick, Minot, since it is of too lengthy a character to discuss here, and a mention of the fact only suffices my purpose in this relation. He will find the papers in the fourth volume of "Science" for 1884, and in the "Proceedings of the Boston Society of Natural History" for 1887. After the union of the male and female pronuclei the ovum passes through the changes described on pp. 43 and 44 of my book "Land and Fresh-water Shells," in the "Young Collector Series," to which I must also ask the reader to refer. Every cell-division that the ovum undergoes, the reader will remember, is preceded by karyokinetic changes in the nucleus.

Thus I have massed here together in as small a space as possible the material on which I shall found the subject of Part IV.—The Probable Cause of Variation.

NOTE ON A TURBELLARIAN WORM.

EXAMINING some decaying leaves of ceratophyllum the other day, I disturbed a fine specimen of a turbellarian worm. He was favourably situated for drawing, being fixed in a clear space in the debris of the dead leaves, where he would not move freely, and where he seemed to realize the position, keeping as quiet as it is possible for one of these active, restless worms to remain. I have killed them with osmic acid, but the results have always been unsatisfactory, the animal contracting, &c. In this instance no osmic acid was used. The entire surface of the body was coated with cilia, and with careful illumination these could be seen in motion, not only on the edges, but also over the body (Fig. 128). The oral aperture, *o*, was ventral, and placed immediately above a strong muscular organ, *p*, the pharynx; the lips of the mouth were fringed with cilia, which seemed to extend into its interior. The stomach, *s*, was large, and of a yellowish colour; but I could not detect

* Van Beneden, "La Spermatogenèse chez l'Ascaride megalocéphale," "Bull. de l'Académie Royale de Belgique," 1884; Blomfield, "The Development of the Spermatozoa," Q. J. M. S. 1880.

any intestine. The eyes were black, and are represented by the two dots at the anterior end of the muscular pharynx. The integament was studded with trichocysts, and at the posterior end of the body a number of well-marked processes were observable, which perhaps serve purposes analogous to those served by the terminal toes of rotifers and various species of Chætonotus. As will be seen from my drawing, the animal did not possess a distinctly-marked head, and the body was variable in form; but, so far as I observed the worm, the anterior end was always broader, and perhaps flatter, than the posterior extremity. The same mass of decaying matter teemed with nematoid worms, which seemed to be passing an active and merry existence in working their way through the decaying cells of the ceratophyllum.

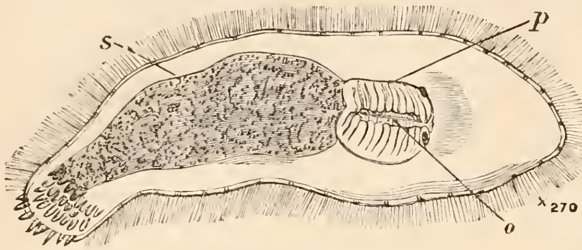


Fig. 128.—A Turbellarian Worm.

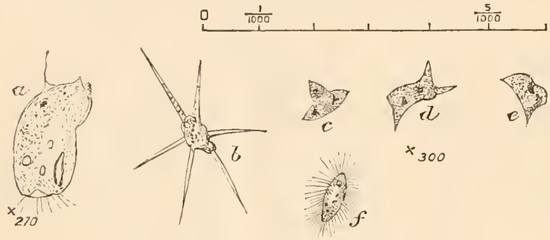


Fig. 129.—Animalcules obtained from scum. *a*, Vorticella; *b*, *Amœba radiosa*; *c*, *d*, *e*, Amœba at intervals of about ten minutes; *f*, *Paramœcium*.

W. J. Simmons.

Calcutta.

THE FERTILITY AND COLOURING OF BIRDS' EGGS.

From carefully observing the eggs of the common sparrow for four consecutive seasons, there can be no doubt that the percentage of fertility influences the colouring; or, in other words, the greater the fertility, the darker the colouring of the eggs.

In looking over a series of clutches of the eggs of the blackbird, it cannot fail to be observed that in every clutch there are two types of egg, one type being of a darker colour than the other.

Wishing to see if the fertility of these light-coloured eggs was under the same influence, I made the following notes on thirteen clutches which I was personally able to observe, and at the same time I endeavoured to test the theory, or statement, that "the light-coloured egg which is often seen in a clutch is the last laid, and light in colour from the colouring matter becoming exhausted." To do this I had to mark the eggs as they were laid, but unfortunately I could only carry this out in seven clutches.

The following notes do not give a very satisfactory result with regard to the fertility and the colouring, but I think they clearly demonstrate that the light-coloured egg in a clutch is not light in colour from the colouring matter having become exhausted.

There does not appear to be any rule as to the order in which the light-coloured eggs are laid, but very commonly there is a light-coloured egg amongst the first three laid, and these light-coloured eggs are generally a few grains heavier in weight than the darker ones.

The following gives the particulars of the thirteen clutches under observation:—

March 19.—Eggs, four; all light in colour; first and third the lightest; all infertile.

March 25.—Eggs, four; three dark eggs, one light. This brood died in the nest, probably from the cold. One infertile egg.

March 25.—Eggs, three; the first the lightest-coloured egg. All these were fertile.

April 15.—Eggs, five; four eggs of the normal colour, one very light.

April 15.—Eggs, five; three dark, two light. In this clutch the lightest-coloured eggs weighed 120 grains each, the dark ones 118 grains each.

April 20.—Eggs, three; one egg light in colour; all fertile.

April 20.—Eggs, five; three dark, two very light.

April 20.—Eggs, four; three dark, one light.

April 22.—Eggs, three; second egg laid the lightest.

April 24.—Eggs, four; first and fourth light eggs.

April 28.—Eggs, four; first and fourth light eggs.

May 6.—Eggs, four; the three first laid light in colour, the fourth darker and very much flecked; this egg infertile.

May 13.—Eggs, six. In this clutch the first four were typical eggs of the blackbird; the fifth egg very light in colour; the sixth egg dark, and very much coloured at the small end. These eggs were all fertile excepting the fourth, which showed no signs of fertility. This clutch was laid by the same bird, and in the same nest, as the clutch dated March 25.

These clutches may appear to some of your readers to be short, but in this locality a six clutch is quite the exception, the one I have remarked upon being the only instance I have ever met with. I have had two or three clutches of six sent to me from Shropshire, which all show the two types of egg.

One of the clutches of six eggs sent to me by Mr. Lawrence Copeland gave the following weights, which I consider rather unusual, i.e. $133\frac{1}{4}$, 133, $133\frac{1}{2}$, $130\frac{1}{4}$, 130, 127 grains.

I fear I have taken up this matter too late in the day; nevertheless, I most sincerely hope some young naturalist will carry on this investigation to see if the relation between colour and fertility can be firmly established.

It will, perhaps, be scarcely discreet for me to mention the number of clutches an investigation of this kind will require to be carefully examined, fearing another storm of invective may be hurled at me by your correspondent, Mr. E. W. H. Blagg.

JOSEPH P. NUNN.

Royston.

IN SUTHERLAND.

By DR. P. Q. KEEGAN.

A LAND, wild, rugged, cheerless, mountainous, varied occasionally with pleasant fertile vales and cheery, open, seaboard scenes. A land where bossy and hillocky tracts of the most extraordinary extent and monotony are relieved by mountain peaks and projections of the most striking and impressive picturesqueness. Sometimes there seems what is a rolling plain, bare and bleak, or an elevated plateau mottled with countless lochs; but anon these give way to a disrupted country with clustered ranges, abrupt or acclivitous, shooting up in sharp jagged peaks, or prolonged in broad-based, lumpish masses. But everywhere there seems to be a contention between land and water as to which shall have the sovereignty. The result is, that the prevalent uniformity of desolation is charmingly harmonized by the radiant faces of bright lakes, and the ever-winsome livery of flower-mantled tarns. On the coast the sea has deeply eroded and tunnelled into the land in long, winding kyles, bays, and estuaries, leaving on the outskirts or in the offing numerous stacks, islets, and spiry rocks—the vestiges of its sway. Everywhere, too, there are streams and lakes innumerable. A chain of large lakes, straight or sinuous, extends from the seaboard inwards from the north, and another from the west; most of the interior, indeed, is simply a vast network of lochs and lochans, the sum-total of which, in any one space or district, is sometimes extraordinary. In the parish of Assynt, for instance, an area of about 119,600 acres, three hundred is the traditional number, and two hundred and fifty have been actually reckoned and mapped. Their aspect, situation, and environment are as multifold as their number. How exquisite they are, embroidered with white-lily chalices, lying in their lonesome beds amid the rugged knolls and bosses of cold, grey gneiss! Who that has once threaded these lonesome, secluded defiles, where the roadway winds now sinuous and utterly sequestered, and anon suddenly ushering in a fairy scene of lily-mottled lochan, can ever forget the thrill of the impression? How still and peaceful is the scene! These rocks we skirt are the very foundation stones of the earth's crust, fixed fast and immovable. No brisk or cheery streamlet or sweet tinkling rill breaks the solemn silence becoming to a reverend antiquity. No sound, conscious or unconscious, of recondite molecular movement in the heart of rock or stone, or in the hollows of the ground, is perceptible. Here, if anywhere, the constituent particles of matter would seem to enjoy a condition of absolute repose. The powers of the heavens and of the earth are unmoved, immovable. The equilibrium of force has been seemingly attained, and a stern and rigid statical stability is the impressive result.

Standing on the crest of Cnoc Poll, about ten miles north-west of Lochinver, the peculiar features of the West Sutherland landscape can be fittingly discerned. Here is exhibited a panoramic view of a vast series of isolated and highly picturesque mountains, extending from Foinaven on the north to the Gairloch hills on the south, a line about sixty miles long. Again, on the south shore of Gruinard Bay, in Ross-shire, there is a capital station, looking northward, for viewing the alternative succession of lumpish hills, one projected beyond its neighbour, their long axes lying apparently due east and west—a series of mountains completely isolated, yet seemingly adjacent, and all, like Wordsworth's feeding cattle, with their faces turned in one and the same direction. This landscape includes Benmore, Coigach, Stack Polly, Coulbeg, Coulmore, Suilven, Quinag, and Foinaven, while on the right eastwards are the magnificent Teallach peaks of Ross. Here, round about this remote, retired spot, are scattered a few human habitations of a very primitive description. They are such as we find reared in the dreary bog-plateaux in all parts of the northern mainland of Scotland and of the Isles. Their wretched, swinish, begrimed character has often been depicted; but the utter sequestration of their situation renders them, perhaps, less ostentatious than what would otherwise be; and they shelter a race of men and women in whom, not seldom, we can detect the harmonies of nature unjarred by contact with the material and the mechanical, and prepared even yet to contend strenuously for the sovereignty of man's native ideas over artificial trappery and the so-called practical.

GEOLOGY.

To anybody accustomed to survey the more commonly occurrent geological formations, or the commoner species of strata in England or elsewhere, the physical aspect of West Sutherland seems truly extraordinary. Here is developed in extensive areas the Archæan Gneiss formation, the patriarch of British rocks, the uppermost layer of the under crust of the earth, "the very core, so to speak, the central part of the known stratified rocks of the earth." The type of scenery peculiar to this formation is very singular, and well worthy of portrayal. Perhaps the most remarkable feature consists of a vast, monotonous congregation of mounds, knolls, hummocks, and bosses of rock with hollows between; the whole rising to a pretty uniform level. Now there is seen a quasi-semicircular serrated slope, now a sharp pinnacle, or a steep precipice; a vertical acclivity, rocky and ridgy, studded and flecked with cold, grey, hoary rocks, verdureless everywhere, save only for an occasional upshot of stunted, olive-green, mossy blades of heather and grass, or a few trees straggling near the dreary lochs. Viewed from an elevation, there is seen sometimes the likeness of ridges rising up like storm-vexed billows, and then suddenly petrified and made to cease, rendered cold and lifeless for evermore; bright as may be occasionally, but then again, further away, deep purplish and dun.

Gneiss is a crystalline-granular compound of quartz, felspar, and mica, arranged with foliated texture, i.e. the original magma has been so chemically and physically altered, that these resulting minerals are now, to a certain extent, arranged in parallel layers, and not promiscuously. The quartz and felspar crystals exhibit a curved, wavy, or lobate outline (in granite it is mainly rectilinear). The general strike of the formation in Sutherland is N.W. and S.E., and there is great uniformity in lithological characters. The principal feature is a "coarse hornblende gneiss, with distinct zones of gray and pink granitoid gneiss wherein the mica is more abundant than the hornblende." This matrix or foundation rock is extensively intersected by veins of pink or white pegmatite (a very coarse sort of granite), and of hornblende-rock and hornblende-schist, and by dykes of pink granite (as at Cape Wrath, &c.), while small kernels of cleavable hornblende and of actinolite (a green variety of hornblende) occasionally occur. The principal minerals associated therewith are garnets, anthophyllite, chert, moss-agate, steatite, ripidolite, agalmatolite, titaniferous iron, &c. Numerous folds occur in these rocks; but, according to the best authorities, these rocks do not present any traces of a sedimentary or aqueous origin. They contain no fossils, are highly crystalline, and their planes of foliation are evidently not vestiges of planes of deposition, but are really planes of shearage and cleavage; for in many places the obvious effects of a shearing crush (such as "tailless" felspar, undulating mica, and uniform, lineally-arranged quartz) are abundantly manifest. On the other hand, that these rocks were not originally sedimentary and then subsequently metamorphosed, is just about as palpably evident. It is tolerably certain, indeed, that their origin consisted of the same sort of molten magma which produces true or igneous granite, the difference in the two cases being that in lieu of being formed quietly, and at great plutonic depths, the constituent materials of the gneiss have been violently erupted from the interior in a state of solution in water of an exceedingly high temperature, and have crystallised therefrom, under circumstances of vast contemporaneous disturbance and of horizontal and vertical movement. There is every indication that this part of Scotland and the outer Hebrides consisted in former times of a molten magma of rock, wavy and mobile, and bearing on its fiery billows colossal piles of grit and sand, which ultimately consolidated on the higher bosses and platforms of the denser and more highly compounded material below.

Reared for the most part on these high uplifted platforms or plateaux of archæan gneiss are seen colossal piles and domes of a bright red gritty or sandstone rock, representative of the metamorphic Cambrian formation. This is stratified in tiers and courses wonderfully distinct, uniform, and horizontal. This formation, as revealed in various localities in the county, consists of series of breccias, conglomerates, grits, and red sandstones, which are markedly unconformable to their basement rock, and are quite unfossiliferous. The grits, which are the predominant form, are uncommonly similar in appearance to a bit of well-burnt fireclay, and suggest at once the idea of an igneous origin. No, quoth the Scotch geologist, they certainly have been originally sedimentary (i.e., we suppose they have been mechanically deposited in "the cold," as chemists say), and have subsequently been subjected to the metamorphic agencies of heat, pressure, and water. And again, inasmuch as the eminently picturesque mountain of Suilven (the "Sugarloaf" of sailors) is formed of the same Cambrian rock as are the mountains Canisp, Quinag, Coulmore, &c., and as great gaps and hollows, some thousands of feet deep and wide, now subsist between these, it has been urged or concluded that vast piles of Cambrian grits and sandstones once covered the whole interspaces now breached and hollowed out by aërial denudation. But it so happens that the underlying gneiss is seen to run high up on the flanks of these hills; and as this rock has not evidently been very much denuded, it might be conceded that the Cambrian strata perched and exposed atop of these more protruding bosses of gneiss would be all the more likely to yield to abrading agencies there than elsewhere. If it be admitted that the grits and sandstones have been so very seriously attrited, then it would not be too much to expect that the gneiss, although considerably tougher, would be likewise more or less worn away—an anticipation hardly compatible with the facts gathered from an orographical and lithographical survey of the rock in question. On the shore forenent the village of Lochinver, there are to be found numerous beautifully-rounded pebbles of grit and conglomerate, but none of gneiss, and no fine sand whatsoever. Moreover, the comparative uniformity of the lay of the latter formation is conspicuously apparent to any one who has climbed the heights and so surveyed it from an elevation.

The Lower Silurian formation is well developed in Sutherland, consisting in its fullest range of a sandstone series at the base divisible into two zones, a partly calcareous and partly sandy series in the middle in three zones, and a markedly calcareous series in seven zones at the top. These strata almost invariably overlie the archæan gneiss and not the Cambrian rocks, the latter being now scattered either in isolated patches near the seaboard, or projected upwards to form picturesque mountains. Two areas on the north coast known as the Durness and Eriboll exhibit the most conspicuous development of the Silurian system. In the former or western area all the series as indicated above are represented; but the upper limestone series is specially predominant. Owing to excessive disturbance by faults, the position of the strata is very irregular and uneven, yet their thickness, according to estimation, is not less than 2,000 feet. Twelve zones in all have been detected from a basal breccia and quartzite, through "fucoid" calcareous rocks of various kinds, and "serpulite grit" of dolomite, with very marked mineral characters and fossils, up into the seven well-defined limestone groups at the top, well charged with fossil trilobites, annelids, sponges, &c.—the whole comprising a very decidedly conspicuous and well contrasted area extending in a sort of triangle.

Between this and the Eriboll or eastern basin there is a prominent ridge of archæan gneiss, which has doubtless been projected from below, shattering and faulting the overlying beds. Both the western and the eastern slopes of this ridge are covered by huge fragments and patches of the displayed Silurian quartzite. On the west shore of Loch Eriboll there is nothing exposed save some grits and "sago-pudding" quartzites; but on the east shore, at Ant Sron, there is a fine development of calcareous mudstones and bands of dolomite, with overlying dolomites, grits, quartzites, and cleaved shales. These pass underneath dark serpulite limestones; and these, again, rapidly give way to unfossiliferous flags and dolomites, and so end the series here (the higher fossiliferous limestones of the Durness area not being found). The strata just described exhibit some very remarkable phenomena, e.g. numerous flexures, and a peculiar aspect of their sharp anticlinal folds, the west limbs of which are sometimes vertical or inverted, or broken by what is called a reversed fault (i.e. a sloping fault where the under side of the strata of the rocks which have sunk down makes an obtuse angle with the plane of the fault). The effect of these disturbances is, that in traversing the ground the different layers or zones of the beds are seen to be repeated again and again, lower zones sometimes apparently overlying higher ones. Eventually, at various points, by the force of a great reversed fault or thrust-plane (i.e. a reversed fault at so very low an incline that the rocks on the up-throw side have been, as it were, pushed horizontally forward), the archæan gneiss has been violently thrust up from below and projected bodily over the fossiliferous Silurian strata. Further eastwards, again, another great thrust-plane is encountered ushering in a certain series of highly-metamorphosed schists and gneissoid rocks known as the "upper gneiss," or the "igneous rock," which bear unequivocal traces of tremendous mechanical energy. A similar schistose series with a similar order of succession in the beds having been discovered lying isolated near Durness, about ten miles westwards, the learned geologist has conjectured—or rather concluded—that the latter rocks have been pushed forwards for this distance along the surface of this upper and more energetic thrust-plane, i.e. the rocks along the upper thrust-plane override all the other rocks pushed forward by the lower thrust-planes in the Eriboll area, and rest directly on the limestones of the Durness basin. The savant, scratching some mathematical angularity on his elaborate map, and finding some lines or other to "coincide," hastens to the decision that geological or mineralogical phenomena obsequiously obey geometrical formulæ. Reviewing, however, the remarkable features here detailed, it may be useful to append, that there can be little doubt about the fact of prodigious terrestrial displacements having taken place; but that they differ little from what has occurred all over the world where the requisite conditions exist, more especially the presence of a highly tough and unyielding chemical compound in association with a material much simpler and more sensitive as to molecular and mechanical energy.

The Old Red Sandstone (lower division) is represented in Sutherland by numerous patches and outliers in various places, such as on the east shore and hill-ground of the Kyle of Tongue and thence towards Ben Stomino, also on Ben Armine, on Bens Griam More and Beg, etc., about Strathy Bay, and along a great belt, five miles broad, on the east seaboard. These beds consist mainly of a very coarse, dirty, red conglomerate, with red sandstones, red sandy clays, and calcareous flagstones and shales in minor proportions.

There is a belt about sixteen miles long of Secondary formations on the east coast of the county. Beds of Triassic age consisting of sandstone and dirty limestone occur on the shore near Dunrobin and Golspie. Following thereon are Lias strata, including sandstone and conglomerates at the base, followed by estuarine sandstones, shales, and very thin coal-seams, graduating into blue micaceous clays and fossiliferous limestones, which again are overlain by other micaceous clays containing pyrites and nodules of clayey limestone. Then, the Oolite is represented by estuarine sandstones, shales, and coals. The main seam of the latter is about three or four feet thick, and is found in some places decently workable and valuable, having been mined extensively for a century or more; but its worth is marred by the accompanying pyrites. It is considered the thickest stratum of pure vegetable matter hitherto detected in any secondary rock in the United Kingdom. Its composition is: carbon about thirty-five per cent. (good household coal has about fifty-seven per cent.), fifty oxygen and hydrogen, and about nine ash, and hence it burns with an offensive smell. It is found chiefly on the shore at Brora, in the valley of the river Brora. Overlying the lower oolite, there is a middle series of hard calcareous sandstone charged with fossils, and followed by fossiliferous clays and marine sands, and a considerable thickness of sandstones overlain by grey sandy limestone, clays, etc. The upper oolite is represented by shales, sandstones, grits, and limestones, with ferruginous sandstones at the top, in all about one thousand feet thick, much folded, abounding in fossils, and having in certain places huge and abundant blocks and boulders of local and foreign rocks embedded therein, known as the "brecciated beds." The remarkable peculiarity about the latter (which contain Primary fossils) is, that they should be found alternating with finely-laminated shales, thin sandstones with ammonites, and even thin layers of lignite, all of which, according to geological theory, indicate totally different conditions of deposition. So that we have here, at one and the same locality, samples of strata, one of which unequivocally suggests violent floods or disruptions (not to speak of glaciers or ice-rafts), while another neighbouring one just as unequivocally recalls placid seas or lakes, or retired, becalmed estuaries. Moreover, the different orders and varieties of fossils present in these heterogeneous beds argue that they belong, not merely to different geological systems or formations, but actually to different geological periods.

As regards the so-called glacial phenomena exhibited in these parts, little need be said. We are informed that the ice radiated from the high grounds in different directions, as toward north-west, and the Moray Firth, and that there is an enormous development of moraines, the situation, etc., of which is plainly indicative of very recent glaciation. It would seem, however, that the tremendous mechanical energies which erupted and metamorphosed the archæan gneiss, and shattered and displaced the Silurian strata by faults and thrust-planes, was quite sufficiently potent to superinduce the semblance of bedding on the bright red Cambrian grit mountains, as well as to inlay a certain area of hard rock with sundry scores, ruts, and streaks, the origin of which is frequently, if not invariably, assigned to the carving, grinding, and sculpturing manipulation of heavy-moving glaciers, or ice-sheets.

BOTANY.

It might naturally be considered, on first thoughts, that a territory of such uniformity of desolation, and having such a prevalence of wildness, sterility, and bleakness, would yield little of interest to the botanist. A little careful scrutiny, however, very soon dispels any anticipation of that sort. In the year 1883 there were recorded from West Sutherland 373 species, and from East Sutherland 184 species—total 557. The flora, although (save in some places) not particularly obtrusive or brilliant, is yet exceedingly interesting. The situations specially fertile or suited to certain species of wild flowers are rather numerous. The highest mountain, Ben More (3,273 feet), and many others from 1900 to over 3,000 feet, as regards position, configuration, and soil, are eminently fitted as nurseries for many an Alpine species. Thus, the Alpine sandwort (*Alsine rubella*), an extremely rare plant, grows on Ben Hope. Again, situations where an abundance of moisture is combined with a freedom from the ordinary forms ot vegetation, are not rare; so that plants that flourish only under such conditions find here ample scope for development. Thus, many of the bluffs of sea-rock that overhang the kyles or estuaries are lavishly decked and festooned with the cactus-like evolution of countless roseroots (*Sedum rhodiola*), while thrift and squill (*Scilla verna*) hang out their globes and bells among the clefts of stone, or on the crest of the sandy sea-cliff. The following plants were personally noted in Sutherland:—Globe-flower (*Trollius europæus*), marsh-marigold, spearwort (*Ranunculus lingua* and *flammula*), water-lily (*Nymphæa alba*), lady's smock (*Cardamine pratensis*), pepperwort (*Lepidium Smithii*), blue and yellow heartsease, milkwort, red campion, ragged robin, spurrey (*Spergularia arvense*), St. John's-wort (*Hypericum pulchrum*), flax (*Linum angustifolium*), cranesbill (*Geranium pusillum*), wood-sorrel (*Oxalis acetosella*), holly, furze, vetch (*Anythyllis vulneraria*), bush- and wood-vetch (*Vicia sepium* and *sylvatica*), tuberous vetch, meadowsweet, mountain-avens (*Dryas octopetala*), water-avens (*Geum rivale*), marsh cinquefoil (*Potentilla comarum*), lady's mantle (*Alchemilla alpina*, found near the coast at an elevation of only twenty feet), dog-rose, willow-herb (*Epilobium montanum*), water-purslane (*Peplis portula*), roseroot (*Sedum rhodiola*), stonecrop (*Sedum anglicum* and *acre*), saxifrage (*S. stellaris* and *aizoides*), golden saxifrage (*Chrysosplenium oppositifolium*), sundew (*Drosera rotundifolia* and *longifolia*), cow-parsnip, elder, bedstraw (*Galium Mollugo*, *boreale*, *verum*, and *saxatile*), valerian (*V. dioica*), immortelle (*Antennaria dioica*), water-lobelia (*L. Dortmanna*), bilberry, bearberry (*Arctostaphylos uva-ursi*), butterwort (*Pinguicula vulgaris*, *Scotica*, and *Lusitanica*), saltwort (*Salsola* *maritima*), winter-green (*Orientalis europæa*), bog-bean (*Menyanthes trifoliata*), figwort, foxglove, brooklime, red deadnettle, cow-wheat, yellow-rattle, wood-sage, woundwort, sea-pink (*Armeria maritima*), sea-plantain (*Plantago maritima*), bog-myrtle (*Myrica gale*), dwarf juniper (*Juniperus nana*), pondweed, lesser twayblade (*Listera cordata*), orchis (*O. Morio* and *maculata*), water-flag, crowberry (*Empetrum nigrum*), squill (*Scilla verna*), cotton-grass (*Eriophorum vaginatum*), bog asphodel (*Narthecium ossifragum*), hart's-tongue, royal fern, etc.

JULY NOTES, BY A FIELD NATURALIST.

IN this month I have seen, for the first time, a pair of red-backed shrikes (*Lanius collurio*, L.) with the young birds. Each year I had been aware that stray birds visited us in the West Midlands, but could never discover eggs or nest; this year, after the breeding season was finished, the young and old birds were to be seen daily fluttering about on the top of the same hedge. The harsh cry is distinctive, and the movement of the tail different from that of any other kind of bird. I have not been able to find impaled insects—the shrike's larder—in the vicinity, but I have noticed the strange power of fascination that shrikes possess over smaller birds, such as hedge-sparrows or linnets; although frightened, they follow the dreaded charmer. With a single blow from its powerful bill a shrike can cleave the skull of a small bird—it is almost a bird of prey—and yet the small fry hover round, as if lured to destruction.

Towards the middle of the month I found the brook swarming with tiny eels, barely an inch in length, the species being the silver eel. A few bigger ones must have found a way up the stream at the spawning season. For ten days I kept several transparent fellows with black and silver bodies in an improvised aquarium. Struck with the remarkable transparency of the body, I placed a living specimen under the microscope. The circulation in the pectoral fin was very beautiful; the oval corpuscles appeared almost too large for the small veins, but flowed ceaselessly in a never-ending stream. Every detail of structure was visible, from the spinal column to the heart and alimentary canal. In a few weeks all these young eels, attaining to the elver stage, will migrate to the weirs and rivers; hardly one will remain in the brook.

There is even now some obscurity regarding the embryology of the common eel, and the male has only been distinguished from the female within the last twenty-five years. Dr. Francis Day—whose recent death all naturalists deplore—contributed a valuable article to "The Field," dealing with the propagation of the species. He reviewed the ancient superstitions of various authorities. Aristotle thought eels were produced by spontaneous generation from slime. Pliny stated that a fragment of skin from the parent developed into young fish. Helmont gives a receipt for an artificial propagation as follows:—"Cut up two turfs laden with May-dew, laying one against the other, with the grassy sides inward;" after exposure to the sun numerous young eels appeared. Horsehair taken from the tail of a stallion was said to produce the fish, as well as parasitic intestinal worms. A common tradition stated that eels interbred with water snakes, and sea-coast fishermen still maintain that an eel changes into a conger.

Now, however, the eggs have been proved to be contained in frill-like bands of fat placed behind the liver almost as far as the vent. The ova, like small white dots, can be detached for the microscope. Not until 1873 was it clearly demonstrated that the eel was not hermaphrodite; for no males could be distinguished. In that year, Syeski, of Trieste, obtained an eel sixteen inches in length, minus the ovaries, but possessing a hitherto unrecognised generative organ. Since then many have been dissected, and the animate spermatozoa detected under the microscope in vigorous motion. The male eel is smaller than the female, and rarely found in rivers. The fully-developed ova do not appear to be known in the rivers; hence it is said eels breed in salt water.

The mature eggs when they are passed through the abdominal cavity—there is no special duct—must be deposited either in the bed of an estuary or in a river.* Adults are said to descend to the sea in the autumn for breeding purposes, and there is an up-stream migration of elvers in the spring. But in the brook that I mention, scores of minute eels certainly abound in July; they are too small to ascend from the sea. I feel convinced that they are hatched in the mud beneath, for it is hardly conceivable that a delicate and fragile body, as thin as a lucifer match and barely longer, could surmount all the obstacles between the sea and a small inland brook. I see them lie on the mud like transparent threads; and directly they are disturbed each tiny creature burrows in the mud with consummate ease, at home in its native element.

The loach (*Corbitis barbata*) also inhabits my brook. I have one before me now in a glass pickle bottle; it is about five inches long, and lies motionless at the bottom of the water. The dusky colour of the back, with transparent skin and numerous dark spots, renders it difficult to discover lying on the mud. There is one dorsal fin, two pectorals, two abdominal and one ventral fin. The tail is undivided, blunt-shaped and serrated. The course of the vertebral column is marked by a yellow line, and the gills have black markings. The eyes are black with a golden rim. Teeth are visible on the roof of the

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* Is it proved that the eel is not ovo-viviparous?

mouth. The mouth has four appendages on the upper lip, with one at each side; there are also two protuberances on the head. The general shape is graceful, and the head rather slender. The loach appears to feed on small crustacea among the weeds.

In a bit of swampy ground, hardly to be called a pond, a number of fresh-water shrimps have taken up their abode. The creature lies on the mud, but rises to the surface of the water every few minutes as if to breathe the air, or possibly for food particles. As it swims the segments of the body are visible, with the numerous pairs of legs in full movement.

During the last few days of July a weeping poplar had a dozen or more larvæ diligently feeding on the young leaves, as if the creatures were providing food enough for the pupa stage of existence. The fat green caterpillar, with faint yellow stripes and rough spots, was, I suppose, the larva of the lime hawk moth. Another, and on this tree the common species, must have been the poplar hawk. Smaller in size than the lime or privet hawk larvæ, a third species had two horn-like processes at the tail; from each of these, tubular pink filaments could be protruded at will; they were highly sensitive, and contracted with a touch. The caterpillar was green, with dark brown markings on the back in regular pattern, and a little pink round the face.* Notwithstanding the various sizes of this caterpillar, the morning after I had taken them every one had assumed the pupa form, or had at least spun a cocoon.

One night a bat flew into my bedroom, affording a dog and myself some violent exercise in the capture thereof. It proved to be the long-eared species (*Pleiotus communis*), a pretty little beast with the most knowing expression. I had never before admired the folds of the long ears; and the curious inner ear, or "tragus," was very prominent. I popped it into a bird-cage for the night, with a little milk and a morsel of raw meat for food, placing the whole concern in the dining-room. In the morning, when the cook drew up the blinds, a little black devil dropped down on to her head. It squeaked and she screamed, but no lives were lost. The bat had escaped through the cage wires; as it would not eat, we let the creature go free. For several days afterwards the dog sniffed at the cage each morning; he wanted that queer flying rat for his own purposes.

I have got two species of ants waging active warfare in a glass bottle. One colony is formed of the small red or yellow ant, so common in the fields. Having dug into the very heart of an ant-hill, I collected a trowel full of earth, together with a few winged specimens, large and small, a number of the working ants, and some of the pupæ. Having allowed these to settle in the bottle, I turned in a small regiment of the shiny black ant (*F. fuliginosa*), which dwells in a decayed stump; and many a fierce encounter took place. In a few days the battles apparently ceased, and a truce was agreed upon; each colony kept to its own side. The wings soon dropped off the red species.

In a bog where the round-leaved sundew, the bog pimpernel, the golden asphodel, the ivy-leaved campanula, marsh St. John's-wort, cross-leaved heath, lesser skull-cap, marsh veronica, and other plants flourished, I nearly trod on a jack snipe before it would rise. A young peewit pretended to be dead, but clung to the coarse herbage as I took it in my hand. The heart was throbbing with fear, so it was carefully replaced, while the parent bird flew overhead in circles, uttering the most plaintive cries.

In a tidal estuary I saw a cormorant swimming with a fish—likely enough a young salmon—in its mouth. It was in a tearing passion because the fish got crossways in the mandibles. It dived several times, and at last threw the fish up in the air, catching it lengthways as it fell; presently the whole morsel was swallowed. A number of small black-headed gulls were busily employed on the mud banks.

In a certain disused copper where rain-water had accumulated, I lately discovered the peculiar boat-shaped clusters of eggs belonging to a species of culex floating on the surface of the water; scores of larvæ were vigorously swimming to and fro, whilst several fully-developed gnats rose from the vessel. In a small dish the larvæ rapidly split the case, passing through another stage into the winged imago. The larva had several prolonged external tracheæ which disappeared in the transitional stage. The whole series formed a most beautiful slide, mounted in Canada balsam.

The scarlet acarus or harvest mite has been very troublesome this year, attacking both man and beast. I say this advisedly. My dandy-dinmont (before named) has had hundreds of these pests eating head-foremost into his skin, and they swarm on the kidney-beans, in the cornfields, and on dry banks. Microscopic in size, the insect burrows in the flesh, causing red swellings and an irritation usually attributed to "heat-spots." Washing with Jeyes' fluid effectually kills them on dogs. For myself I endure the discomfort; the acarus dies and the spots disappear. The dog is a better host; on him they multiply exceedingly.

C. P.

* From the contractile filaments, this may be the Cerura genus (puss moth).

SCIENCE-GOSSIP.

A new work by Mr. J. E. Gore, F.R.A.S., entitled "The Scenery of the Heavens; a popular Account of astronomical Wonders," is in the press, and will shortly be published by Messrs. Roper and Drowley of Ludgate Hill. It will be illustrated with photographs of star clusters and nebulæ from the original photographs taken at the Paris Observatory and by Mr. Roberts of Liverpool, and drawings from recent sketches by well-known astronomers.

We have received a "Note on a new Species of *Ampullaria* from the La Plata," by J. W. Williams, reprinted from the "Annals and Magazine of Natural History."

"Is Bad Sight on the Increase?" is the title of an interesting brochure by A. Fournet, in which the author recommends certain glasses for all those suffering from bad sight.

Mr. A. F. Guy sends us a copy of his "Electric Light for the Million." Mr. Guy has "endeavoured to set before the general public a sketch as to the cost, safety, and superiority of Electricity as a lighting medium."

"Our Common Garden Snails and their Variations," by E. D. Marquand, is reprinted from the "Transactions of the Penzance Natural History and Antiquarian Society." This is an extremely interesting article on the three snails *Helix aspersa*, *H. nemoralis*, and *H. hortensis*.

"The Journal of the City of London College Science Society" for June contains an exhaustive paper on "Recent Advances in Connection with Methods of Photographic Reproduction," by W. Boutell.

The following extract from Mr. Findlay's book, "The Working and Management of an English Railway," will doubtless prove interesting to many of our readers, as showing to what a state of perfection railway travelling has been brought in England. Mr. Findlay, it should be stated, is general manager of the London and North-Western Railway. "The engines of this one company run a mile and three-quarters every second, or 104 miles every minute, and in effect they put a girdle round the earth once in every four hours throughout the year; yet such is the perfection of mechanism attained in the present day, that engines were able to run a distance twice round the world for every single case which occurred of a hot axle, the loss of a split pin or cotter, or anything tending to throw an engine out of gear."

We are sorry to announce the death of Mr. C. Spence Bate, F.R.S., the well-known authority on the Crustacea, who died at Plymouth on Monday, July 29th.

We also have to announce the death of the veteran botanist, Rev. M. J. Berkeley, at Sibbertoft, near Market Harborough, in his eighty-seventh year. He was our greatest authority on Cryptogamic botany.

We have received a lengthy and elaborate syllabus of the Newcastle-upon-Tyne meeting of the British Association, which takes place from the 11th to the 19th of September. It contains, amongst other matter, portraits and brief biographical sketches of the presidents-elect of the various sections.

MICROSCOPY.

New Slides.—We have received from Mr. E. Hinton two beautifully prepared slides. One, a tube foot of a sea-urchin, is prepared to show the ambulacral foot and disc. The other, an arrow worm (*Sagitta bipunctata*), is prepared so as to show the remarkable structure of the mouth.

The Journal of the Quekett Microscopical Club for July contains the following papers:—"Notes on *Actinospermum*," by G. E. Mainland; "On the Abbe Diffraction Plate," by T. F. Smith; "On the Large Axial Cone, and its Bearing on the Diffraction Theory," by E. M. Nelson; "Further Notes on *Coccidæ* from British Guiana," by S. J. McIntire (illustrated); "On the Larvæ of some South African *Psychidæ*," by R. T. Lewis; "On the Male of *Icerya Purchasi*," by R. T. Lewis (illustrated); "On *Brachionus quadratus*," by C. Rousselet (illustrated); "On some New Species of Diatoms," by J. Rattray (illustrated).

The Journal of Microscopy and Natural Science for July contains: "Histology of the Teeth: Notes on Methods of Preparation," by V. A. Latham; "Curious Problems in the Struggle for Life," by Mrs. A. Bodington; "A Fly's Eye," by H. M. Underhill (illustrated); "To Stain Tubercle Bacilli"; "Some Fragments of Weed from a Pond, and their Tenants," by J. C. Webb; "On *Cuscuta Gronovii*," by H. E. Hooker (illustrated); "The Development of the Tadpole," by J. W. Gatehouse (illustrated).

ZOOLOGY.

Helix lapicidia.—Mr. Pannell, on p. 191 *ante*, asks me for an explanation of the fact that he found this species on sand eight miles distant from chalk, since I mentioned in my "Handbook" that the species was to be found on cretaceous soils. Clearly this is a case of migration. It is a well-known fact in distribution that any animal may be found between two or more sites of its loved abode. What I meant was that it is to be generally found more frequent on chalky soils.—*J. W. Williams.*

Variation in the Mollusca.—I have just been reading Mr. Williams' article (Part I.) on varietal nomenclature; and as he asks for the opinion of others, perhaps I may be permitted to say a few words from a different point of view. I welcome the appearance of this paper, because it is written in a reasonable manner, and fairly sets forth the views of one class of conchologists. It seems to me, however, that names fulfil much the same function everywhere, whether names of shells, of people, of chemical compounds, or what not—they facilitate the transfer of ideas. This is scarcely likely to be disputed. Our very ideas are rather to be compared with names than with descriptions. Let the reader for a moment conceive—a tree—and then stop to think what it was exactly that came before his mind. It was only the image of a tree, at best—something that was not a tree, but stood for a tree. The word "tree," if all its attributes were described in full, would take a book to define, and then there would be some things left undescribed—the whole mystery of life, for instance. So it is with all names, they mean more than we actually think of when we use them; they are, in fact, the index numbers to the great book of reality. Now this proposal to alter the names of certain varieties into English, means one of two things: it means the establishment of an English nomenclature for the whole lot (like the names of English butterflies and birds), and of necessity a like nomenclature in every language of civilisation (presuming that the scheme were fully carried out)—and I think no reasonable person will argue that that is an advantage; or else it means an attempt to name by description, that is to say, to leave it to each individual to characterise the peculiar form he may have met with. Now this latter plan sounds well enough; but consider the diversity of the human mind, consider the diversity of ways in which different people understand (or fail to understand) the same description, and, above all, the incapability of so many writers of penning a serviceable description—and it seems simplicity and light indeed to fall back on certain standard descriptions, with often good illustrations or the type specimens to guide us. One might suppose that the word "albino" was pretty definite and well understood, yet one constantly hears pied or pallid birds spoken of as albinoes, so that the records of so-called "albino" birds are often worthless from uncertainty as to what the author meant. In such a case, as I have urged elsewhere before, a code of names should be set up for use in all such cases, to be properly defined, and used only in their strictest meaning. The common language has grown to suit the common mind, and is too illogical and loose in its application for scientific names. So much for names; now a word about the rank of certain varieties. I am willing to concede that the word "variety" ought strictly to be limited to certain better defined forms, and should not, by rights, be applied to such as most of the colour and band varieties of *Helix nemoralis*. These latter are, technically speaking, "forms," a grade less distinct than varieties proper, as varieties are than sub-species, and sub-species than species. I have been wont to call both varieties proper and forms under the name "variety," because I have never been able to satisfy myself about the line to be drawn between them. The very varieties mentioned in the paper of Mr. Williams afford us excellent examples of this difficulty. I will take them in the order he mentions them, and offer a few remarks in reply to his. I have not seen the description of *Arion brunneus*, Lehm., but it certainly appears to be the same as *brunneus*, Roeb., and we should therefore amend matters by simply quoting *A. ater* var. *brunnea*, Lehm. The vars. *nigra* and *aterrima* of the same species are not quite the same thing. Var. *nigra*, which I have found near Warrington and elsewhere, about fields, is rather brown-black, and is, I think, the Linnean type, so it should be called *ater* var. *atra*, or *ater* type. Var. *aterrima*, on the other hand, is the pitchy black variety found in swamps, which is strikingly different to the eye from the dull blackish forms of drier grounds. Var. *pallescens*, so far as I know, is referable only to Moquin-Tandon, although Mr. Roebuck has split it into two sub-varieties—the pale-brown, *brunneo-pallescens*, and the pale yellow, *luteo-pallescens*. I have not seen a published description of the latter, although the name has been freely used for several years in MS.; the former is possibly what I had previously described as *fusco-lutescens*. I do not think that Moquin's v. *pumila* of *Limnæa stagnalis* is quite the same as Linné's *fragilis*, and, indeed, it does not certainly appear what "*fragilis*, L." is. Haldeman went so far as to refer it to *L. palustris*. Again, respecting Locard's varieties of *Bithynia tentaculata*, *cornea* is probably best referred to the type, but *fulva*, as I understand it, is a very pretty and distinct variety. I have seen it from Yorkshire. To come to the varieties Mr. Williams would cut out: his own var. *rava* of *Amalia gagates* would fall with the "unicolorous colour-change" forms, which would be a pity, as to my mind it is a really interesting form, well deserving of a name. In the east of England, and the south-east, it does not seem to be found; but it is characteristic of the west, and, I believe, will be found from Lancashire to Cornwall, wherever *gagates* occurs. *Limnæa peregra* var. *ovata*, on the other hand, seems only to be an old fellow, fat with rest and good living, and yet Mr. Williams would retain him. Show me a certain sort of a pond, and I can almost promise you *ovata* in it. Indeed, Hazay says typical *peregra* can be produced from *ovata* by transplanting the eggs of the latter to water which contains much carbonic acid.—On p. 164 Mr. Williams has an interesting little paper on shells from the North London districts. It is fortunate that he has not scrupled to use the "somewhat objectionable terms" to record his varieties of *Helix nemoralis* and *H. hortensis*, as these are very interesting indeed. Mr. Wallis Kew has been collecting and recording the slugs of North London, and I have been astonished to find how much they differed from those of the south and west. Now Mr.

Williams comes with further proof of difference in his Helices. *H. nemoralis* 00345 is interesting, but the array of band varieties of *H. hortensis* v. *pallida* is quite astonishing. I have never seen *pallida* other than bandless, and if these are the genuine *pallida* they are very curious indeed. One of them, (23)45, is a previously unrecorded band-formula. I collected *H. nemoralis* and *H. hortensis* in 1883 in the same locality that Mr. Williams found his, as nearly as can be judged, but I missed his *pallida* forms. This, however, is not strange, as I know how frequently remarkable varieties of *H. hortensis* are confined to limited spots—perhaps a single hedgerow. This is very notably the case about Chislehurst. I have note of eighty-six different band-varieties of *H. nemoralis*, and forty-nine of *H. hortensis*, as found in Britain. Some of them have not yet been published. It would be interesting if some one would collect a large number of the North London *Paludina fasciata* (*vivipara*, Auctt.). Some of the forms approach *contecta* closely in shape, such being apparently the var. *inflata* of Locard. I believe Mr. Wilcock has found the same variety in the Barnsley Canal at Agbrigg.—*T. D. A. Cockerell, West Cliff, Custer Co., Colorado.*

THE DARTS OF THE HELICIDÆ.—Some words of mine are needed in reference to Mr. Hart's note on p. 186 *ante*. If my note be referred to, it will be seen that I stated in my opinion the mention given by Mr. Standen of a crystalline stylet being found in the stomach of some snails (or, if you like, slugs, which also are Gastropods) in "Life-lore" was not quite correct. I thought that he had made a clerical error. And let it be understood that I do not undervalue Mr. Standen's accuracy in any way. But I may mention that I would rather have heard from Mr. Standen than have received a reply at second-hand. If I at any time am in error, I am always willing to correct that error and to acknowledge the fact. I, however, am not aware of any record, either English or continental, of a crystalline stylet being found in the stomach of a Gastropod. I asked for references: these have not been given. But these I should wish to be satisfied. And I may mention that in no morphological text-book—I have all of them on my shelves—does a mention occur of any crystalline stylet being found in the Mollusca, except in the Unionacea.—*J. W. Williams.*

NATURAL HISTORY AND SCIENTIFIC SOCIETIES.—"The Proceedings of the Bristol Naturalists' Society" contains the following papers: "The Geology of Tytherington and Grovesend," by Prof. C. Lloyd Morgan; "Notes Supplemental to the Flora of the Bristol Coalfield," by J. W. White; "The Fungi of the Bristol District," Part xi., by C. Bucknall; "A Few Notes on Heliothis Scutosa," by W. K. Mann; "Trigonocephalus Lanceolatus," Notes on the West Indian "Fer-de-Lance," by Dr. Wm. Duncan; "Talpa; or Remarks on the Habits of the Mole," by C. J. Trusted; "On Mr. Mellard Reade's Work on Mountain Building," by Rev. M. B. Saunders; "Do Snakes Fascinate their Victims?" by Dr. A. J. Harrison; "Mimicry amongst the Lepidoptera," by G. C. Griffiths; "On Putrefactive Organisms," by Rev. W. H. Dallinger; "Suggestions as to the Causes of the Difference in Colour between the Flowers and Foliage of Tropical and of Temperate Regions," by C. Jecks; "Voice, Language, Phonetic Spelling," by Dr. A. B. Prowse, &c.

THE Report and Transactions of the Penzance Natural History and Antiquarian Society contains the following: "Our Common Garden Snails and their Variations," by E. D. Marquand; "On the Occurrence of Foreign Plants in West Cornwall," by W. A. Glasson; "Birds' Nesting in Scilly," by Rev. R. W. J. Smart, &c.

BOTANY.

TROPÆOLUM MAJUS is a plant which may be seen by anybody, and deserves to be studied with more attention than has been given to it. I suspect that professional teachers of science shrink from saying much about it, lest any of their pupils might ask them how it was that a plant whose flowers are so obviously perigynous came to be associated by writers on systematic botany with such Thalamifloral Exogens as malva and geranium? That is a question which I wish that somebody would answer in the pages of SCIENCE-GOSSIP. I will now turn to another: the development of irregular forms in flowers. Botanists who lived before Darwin, looking on the irregularities of umbelliferous, papilionaceous, and labiate flowers in which the posterior organs are reduced in size or suppressed, thinking more of abortion than of development, ascribed the irregularities observed in such flowers to pressure or to want of space for their full growth. This consideration seemed to account for the want of a fifth stamen in didynamous flowers, for the suppression of all but the anterior carpel in Leguminosæ, as well as for the difference in size between the posterior and anterior portions of a flower, the anterior petals being commonly larger than the posterior. The keel of a papilionaceous or the lip of a labiate flower might indeed be a convenient landing-place for insects; but we need not invoke them to account for its existence. Tropæolum seems to laugh at such considerations. Instead of yielding to pressure which apparently forbids the formation of a free spur in pelargonium, whose clustered flowers are baffled in the attempt, Tropæolum seems to kick against the axis, which in return drives away the flower by increasing the length of its pedicel, so as to give room for the long distinct spur of the upper sepal. For this distinct spur in such a position, it is impossible to account without reference to insect visitors. As a matter of description, I call the flower-stalk a pedicel rather than a peduncle, because it never bears more than one flower, and because it has no bracteoles upon its sides, like those of convolvulus or viola. The presence of such bracteoles, however small, is of more importance in tracing natural affinity than any increase or diminution of size. *Convolvulus tricolor* (the minor convolvulus of suburban gardens) has solitary flowers each on a stalk with two small bracteoles, but these diminutive organs indicate affinity with Ipomœa, whose flower-stalk, a true peduncle, bears three or more flowers in an axillary cyme with centrifugal order of expansion.—*John Gibbs.*

Pollen of Caladium.—Is it generally known that the pollen of the cultivated varieties of Caladium contains free crystals scattered amongst the pollen-grains? The pollen is extruded in ropy masses from between the anthers which compose the spadix. I enclose enlarged drawings of (*a*) a mass of pollen showing crystals in situ; (*b*) crystals more highly magnified. I should be much obliged if any of your readers could tell me the probable components of these crystals. I have been unable to find any crystals in the pollen of the common Arum lily, and in several other plants of the same natural order. I may mention that the Caladium is very suitable for demonstrating the growth of the pollen-tubes, which are very readily thrown out if the pollen be left for a few hours on a damp slide.—*E. Ernest Green, Punduloya, Ceylon.*

NOTES AND QUERIES.

A Rook on Trial.—The Rev. Mr. Frizelle, of Bushmills, narrates that he witnessed a trial of a rook by his comrades for the act of stealing sticks from other nests. The other rooks assembled round the culprit and cawed for a considerable time, when the unfortunate bird was condemned to suffer the penalty, and he was then and there set upon and pecked to death. Two magpies were present, who appeared seemingly as witnesses.—*Rev. S. A. Brenan, Glendun Lodge, Cushenden.*

Ants and Aphides.—Watching, a few days since, the black aphides which covered the young shoots of the broad bean, I noticed the rapid movements of a garden ant. This insect was moving quickly from one aphis to another, gently touching their bodies with the tips of its antennæ. Sometimes there was no response to this tickling, and the ant passed to another; but when some of the aphides were touched in this manner, they exuded a drop of colourless liquid from the anal orifice. I noticed this repeatedly, and mention it because I do not remember to have read of it. Writers say the aphis milk is obtained by ants from the teat-like organs which project from the upper part of the abdomen. The insects observed had these projections apparently fully formed; but the honeydew certainly did not come from their teats, but from the end of the body. —*W. E. G., Bristol.*

The Mammoth not extinct.—The "Saturday Journal" of June 29th, 1889, says:—"Mr. C. F. Fowler, who has been living in Central Alaska for two years, reports a discovery which deserves to rank among the most interesting discoveries of modern times. The mammoth, otherwise the *Elephas primigenius*, which zoologists have hitherto supposed to be extinct, still exists in the neighbourhood of the upper waters of the Snake River. Mr. Fowler did not actually see the monsters, but he saw and interviewed a man who had killed two of them; and, what is more, he obtained the animals' tusks, to which some partly decomposed flesh was still adhering. The largest is 15 feet long, and weighs over 250 pounds. The animals are described as being about 20 feet high and 30 feet long, with smaller ears, bigger eyes, and longer trunk than an elephant, and with two large and four smaller tusks. Their bodies are covered with coarse reddish hair. Large herds of the beasts are said to survive on the unexplored highlands of the interior. The story is not by any means improbable. Much mammoth ivory has of late years been exported from Alaska, and, as recently as 1799, an entire mammoth, whose flesh was still so fresh that it could be eaten by dogs, was disentombed from the ice at the mouth of the river Lena. It is clear, therefore, that even if the mammoth be extinct, it has not, in the zoological and geological senses of the words, been extinct for long. Upon the whole, there seems to be a very good chance that we may yet see a living mammoth in the Zoological Gardens in Regent's Park, and that we may have the pleasure of feeding it with buns." If an entire mammoth was found in 1799, and disentombed in 1804, it is extremely probable that the ivory which has come from Alaska of late years has also been disentombed. The flesh of the 1804 mammoth was eaten by dogs, and because the flesh of the 1889 mammoth is partly decomposed, I fail to see in what manner it helps to prove that the animal is still extant. I am afraid some one has been playing with the credulity of Mr. C. F. Fowler. The skeleton and skin of the 1799 mammoth are preserved in the museum of the Academy in St. Petersburg. In Siberia, immense numbers of remains are still found; the tusks are collected and held in high estimation. They form the principal material on which the Russian ivory-turners work. The Tungusian chief who discovered the 1799 mammoth sold the tusks for fifty roubles (not quite £8 sterling), and according to his assertion, the animal was a male, so fat and well fed that its belly hung down below its knees. "We cannot doubt, after such testimony" (says Louis Figuier in "The World before the Deluge"), "of the existence in the frozen North of the almost entire remains of the mammoth. The animals seem to have perished suddenly; seized by the ice at the moment of their death, their bodies have been preserved from decomposition by the continual action of the cold. If we suppose that one of these animals had sunk into a marsh which froze soon afterwards, or had fallen accidentally into the crevices of some glacier, it would be easy for us to understand how its body, buried immediately under eternal ice, had remained there for thousands of years without undergoing decomposition."—*Geo. Ed. Seville, Cross Bank, Waterhead, Oldham.*

French Bird-Murder.—Any one who takes a walk abroad in the rural parts of France, when farming operations are going on, will often see small children following the plough armed with small pitchers, into which they put all the white, fat grubs of the cockchafer which are turned up. In England the rooks do this work, without young children being withdrawn from school or from play. But the French sportsman has nearly extirpated these useful birds. A recent iniquity, according to a contemporary of yours, is the systematic destruction of the swallows on their return from Africa. Emissaries of the Paris *modistes* fix up on the shore, about the points where the birds usually land, long wires connected with powerful electric machines. The wearied swallows perch on the wires, and are struck dead by scores. Their bodies are then sent off to Paris to ornament women who are a disgrace to humanity. The saddest feature is that our contingent of martins and swallows arrive by way of France, and will doubtless be cruelly decimated.—*J. W. Slater.*

THE YEW.—Letters have been appearing from time to time lately in SCIENCE-GOSSIP about the yew—about big yews, the measuring of the smallest diameter, and the means of approximately ascertaining their age. May I call attention to a notice in Gilpin's "Forest Scenery" in these words?—"At Hensor, in Buckinghamshire, there was lately, if there be not still, a yew in health and vigour, 27 feet in diameter, or about 81 feet in girth." What is remarkable about this notice is, that though this circumference is greater than that of any other mentioned by the writer, and greater than that of any other known yew, no special attention is called to it, and I cannot find any mention of the tree elsewhere. Will any of your readers kindly give any information about this tree?—*P. J.*

COLOUR OF EGGS.—Mr. Nunn, in a recent number of SCIENCE-GOSSIP, surmised that the colour of eggs bore some relation to their fertility. I ventured to doubt this, and gave reasons for my doubt, which Mr. Nunn entirely disdains to notice; but he asks the opinions of "those who have taken the trouble to investigate," and dismisses mine curtly "for what it is worth." In the meantime his theory, or surmise, or whatever it was (I have not that number of SCIENCE-GOSSIP by me as I write), has suddenly become an established fact. Mr. Nunn does not wish to enter into controversy on the subject, so perhaps it is too much to ask him to favour the readers of SCIENCE-GOSSIP with his reasons for putting forth a new fact in Natural History. But until he proves his position to be secure, he must not be surprised if others express doubts concerning his discovery. I have been an egg-collector myself for seventeen years (hence I might even claim to be one of "those who have taken the trouble to investigate"), and I must say that I have never observed more than an accidental coincidence between the degree of colour and the fertility of eggs. Lord Wenlock's gamekeeper kindly obliged me with a batch of addled pheasants' eggs some weeks ago. These should all have been exceedingly pale, according to Mr. Nunn's theory (or "fact"); nevertheless, out of sixteen eggs, eight were of the deep shade, which I consider to be the normal colour, the remainder being very pale. At the same time I saw numerous shells of both shades of colour that had produced healthy chicks. Birds of the crow-tribe are perhaps remarkable, at least they are in my experience, for leaving an addled egg after the hatching of the others. Sometimes this egg is abnormal, but very often indeed the reverse is the case. I feel rather curious to know if Mr. Nunn has collected other species on the same wholesale scale as those of the sparrow; certainly sparrow-clubs ought not to be required about Royston, and the farmers and gardeners of the district should be grateful to him for his endeavours to exterminate a bird which they, no doubt, regard as an enemy to their produce. —*J. A. Wheldon, York.*

VAR. OF H. ASPERSA.—I found, on July 30th, a *Helix aspersa*, with a spire almost as prominent as a *Limnæa stagnalis.* I have it alive still (August 13th). Are they comparatively common? I have not seen one alive before.—*S. Denys.*

NOTICES TO CORRESPONDENTS.

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

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

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

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

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

E. WHEELER.—The insect causing the gall on the leaf you send is *Cecidomegia bursaria.*

M. H. (Shrewsbury).—The specimens sent are the ordinary *Patella vulgata.* The others you mention are only varieties of the same.

J. H.—The nut and shell are certainly not those of the almond.

T. R. CAUX.—You should write to Mr. J. Sinel, Cleveland Road, Jersey, who will no doubt be able to supply you with all living marine objects you require.

C. C. WILSON.—If you will apply to the Secretary of the Belfast Natural History Society, you will doubtless get all you require to learn concerning the Dog's Bay foraminiferal sand. Mr. Joseph Wright (a member of that society) could give full particulars.

DR. B.—The best account we know of Pasteur's system of treatment for hydrophobia is by Dr. Suzor (London: Chatto & Windus), published at 6*s*.

H. M.—We have not the addresses of any makers of boxes for microscopic slides. We have been inquired of before. Usually they are made by local carpenters. If there is any specialist or dealer, perhaps our readers will let us know.

E. J. BATTY (Wisbech).—You can obtain sets of reagents and apparatus for a small laboratory of Messrs. Wiggin & Son, Ipswich.

R. W. (Wiesbaden).—See the list of reduced prices of object-glasses by Messrs. R. and J. Beck, offered in our advertising columns of last month.

M. E. POPE.—The cause of the curious development of the willow catkin was evidently due to gall insects.

H. W. (Durham).—Get the "Chemical and Physical Studies in the Metamorphism of Rocks," by Dr. A. Irving, just published by Longmans, price 5*s*.

R. T. SPURLING.—You will find the phenomena you mention gone into fully by Dr. Masters in his "Vegetable Teratology," published by the Ray Society.

J. MILES.—Get Professor Nicholson's "Manual of Zoology" (new edition), published by Blackwoods.

EXCHANGES.

UNUSED old red 1*d.* postage stamps in exchange for good foreign stamps, or offers requested.—Miss B. L. Purchase, Stockbridge Villas, Chichester.

TURTLEDOVES and zebra finches offered in exchange for foreign plants or named algæ and lichens.—J. A. Wheldon, York.

Gentiana pneumonanthe, *Drosera intermedia*, and other Strensall plants likely to be lost, in exchange for others.—J. A. Wheldon, York.

BRITISH and Exotic lepidoptera in fine condition, and well set in four cases, corked, glazed, and stained imitation mahogany (new). Would form very pretty show-cases, or excellent start for collection. What offers?—Joseph Anderson, jun., Alre Villa, Chichester.

Rare British lepidoptera in exchange for pupæ and good foreign postage stamps.—Joseph Anderson, jun., Alre Villa, Chichester.

COULD any reader supply me with one good specimen of any of the following?—*Turrilites catenatus*, *Hamites attenuatus*, *Cystidian*, *Megalodon*, *Unio Valdensis*, *Nautilus centralis*, *Oldhamia radiata*, *O. antiqua*. I will give four good specimens from Carboniferous, including *Lingulella equamiformis* (rare), for each of them.—P. J. Roberts, 4 Shepherd Street, Bacup, Lanc.

WANTED, a secondhand silver watch, to present to a youth, in exchange for rare British shells or rare microscopic objects. A good exchange guaranteed.—Thomas E. Sclater, Bank Street, Teignmouth.

OFFERED, clutches of chough, g. eagle, peregrine, kestrel, s. hawk, dipper, stonechat, grasshopper and rufous warblers, goldcrest, coal tit, rock pipit, cirt, corn and reed buntings, twite, bullfinch, kingfisher, nightjar, rock dove, capercaillie, g. plover, oyster-catcher, c. sandpiper, heron, water-rail, m. swan, cormorant, shag, kittiwake, hg. gull; eggs of chough, pine grosbeak, dotterel, ringed guillemot, razor-bill, gannet, sooty tern, m. shearwater, s. petrel; nests with several. Please describe clutches offered in exchange for the above.—R. J. Ussher, Cappagh, Lismore, Ireland.

FOREIGN land and freshwater and British marine shells wanted. Does not matter if they are not named, so long as the locality is accurately given. British land and freshwater shells given in exchange.—J. W. Williams, 35 Mitton, Stourport, Worcestershire.

WANTED, all or any of the following shells:—*Lyonsia Norvegica*, *Lima hians*, *Diodonta fragilis*, *Lucina locuma*, *Avicula hirundo*, *Isocardia cor*, *Scalaria Turtoni*, *S. Grœnlandica*, *Hippothyris psittacea*, *Terebratula cranium*, *Ianthina exigua*, *I. pallida*, *Triton cutaceus*, *T. nodiferus*, *T. Dalei*, *Fusus Turtoni*, *F. Norvegicus*, *F. Berniciensis*, *Spirula Peronii*, *Trochus granulatus*, *Pholadidea papyracea*, *Pecten niveus*, *Solecurtus coarctatus*, *Xylophaga dorsalis*, *Clio pyramidata*, *Pinna pectinata*, *Modiola barbata*, *Mactra helvacea* (Glauca), in exchange for other rare British shells. Mutual exchange.—A. J. R. Sclater, M.C.S., 23 Bank Street, Teignmouth, Devon.

FOR exchange, fine well-cleaned mountain limestone fossils, many species. Wanted, fossils from all formations.—Robert Allen, 66 Manchester Road, Mossley, near Manchester.

STAINED botanical preparations, mounted or unmounted, insect, and diatom mounts, offered for good water-colour drawings.—W. White, Litcham, Swaffham.

WANTED, naturalistic specimens of all kinds, in exchange for choice microscopic slides, anatomical, parasites, double-stained botanical, diatoms, &c.—R. Suter, 5 Highweek Road, Tottenham, London.

OFFERED, British plants for herbarium. Wanted other duplicates.—James Simpson, 51 Loch Street, Aberdeen, N.B.

EXCHANGE.—Good $\frac{1}{5}$-inch objective, &c., offered for $\frac{1}{8}$-inch or $\frac{1}{10}$-inch.—Chas. A. Whatmore, Much Marcle, Gloucester.

WANTED, odd numbers of "Annals of Botany," Bentham's "Flora," or any other good work on botany; also works on freshwater algæ.—Chas. A. Whatmore, Much Marcle, Gloucester.

FOR exchange, "Entomologist" for 1888, and SCIENCE-GOSSIP for 1887–8, all unbound, but clean. Wanted, vols. i. and iv. of "Boys' Own Paper," foreign stamps, or autographs. —R. H. Lawton, c/o Mrs. Goldstraw, 192 Ellod Street, Pendleton, near Manchester.

SCIENCE-GOSSIP, 1867–1874, eight vols. bound in four; also 1887–89, unbound; Klein's "Elements of Histology;" Blainville's "Organisation des Animaux;" Isaac Lea's "Observations on the Unioidæ" (coloured plates); Flower's "Osteology." Offers to—W. E. Collinge, 41 Springfield Place, Leeds.

FINE specimens of *Vertigo pusilla*, *Zonites fulvus*, and *Helix aculeata*, in exchange for *Vertigo angustior* and *V. minutissima*.—R. Standen, 40 Palmerston Street, Moss Side, Manchester.

WHAT offers for SCIENCE-GOSSIP for 1875–88, 1875 and 1878 bound in two volumes, half calf, all in first-class condition? Microscope preferred.—R. G., 8 Cambridge Avenue, Pilrig, Leith.

SCIENCE-GOSSIP for 1887–8, unbound, also a small microscope. Exchange requested in exotic shells.—W. J. Jones, jun., 27 Mayton Street, Holloway, London, N.

WANTED, common fossils from any formation; fine fossils from the eocene beds of Hampshire offered in exchange.—E. Walker, B.Sc., 37 Chichester Road, Portsmouth.

WHAT offers (apparatus, &c.) for three dozen well-mounted slides, physiological (some injected), botanical, &c.; also several sets of three slides from "Cat Embryo," showing development of bone, hair, &c.—Ferdinand Tomlins, High Street, Gosport.

WANTED, anemones, mollusca, and other marine animals, suitable for aquarium; will give micro-slides, nat. hist. books, &c., in exchange.—J. E. Lord, Rawtenstall.

"LORD BURY" telescope, with pancratic tube and leather case and strap, in good condition. What offers?—J. E. Lord, Rawtenstall.

BRITISH sand grouse, well preserved. What offers?—Geo. Sim, Gourdas, Fyvie, Aberdeenshire.

WELL-MOUNTED micro-slides offered for Figuier's "Insect" or "Ocean World," Wood's "Insects at Home" or "Insects Abroad."—W. Sim, Gourdas, Fyvie, Aberdeenshire.

Offers wanted for Stephen's "Catalogue of British Insects," and Kirby's "European Butterflies and Moths" (last edition, in parts, complete).—J. B. Mayor, The Beeches, Grange Avenue, Levenshulme, Manchester.

OFFERED, serpentines of various colours, columnar coal, cone in cone ironstone, pitchstone (ordinary, banded, and spherulitic), sapponite, yorbaneite, &c.; also carboniferous fossils in exchange for minerals and rocks, many common.

ETHNOGRAPHICAL and other curios wanted; will send return list.—Archibald Hy. McBean, S. Denys, Southampton.

WANTED, twenty mature living *H. pomatia*. Offered, six *V. pusilla*, or darts of *H. arbustorum* mounted in tube. The shells of *H. pomatia* will be returned if desired.—Chas. Oldham, Ashton-on-Mersey.

WANTED, dragonflies (*Odonata*) from all parts of the world. State desiderata in return.—Philip P. Calvert, Ent. Section, Acad. Nat. Sci., 19th and Race Sts., Philadelphia, Pa., U.S.A.

WANTED, microtome, injecting syringe, and microscopic accessories, secondhand. Good exchange given.—O. T. E., Belgrave, Leicester.

WANTED, exchange in good side-blown birds' eggs with collectors having side-blown eggs to offer.—A. James, Bingham, Notts.

WANTED, cuckoos' eggs from the following nests:—Red warbler, garden warbler, sedge warbler, wren, greenfinch, &c.; good eggs offered in exchange.—W. Wells Bladen, Stone, Staffordshire.

HERBARIUM.—Offered (all British), L. C., 3rd ed.:—3, 36*b*, 43, 182, 237, 256, 291*c*, 322, 342, 353, 415, 443, 495, 574, 576, 620, 621, 626, 783, 974, 978, 981, 1070, 1255, 1287*b*, 1302, 1331, 1355, 1365, 1367, 1424, 1412, 1413, 1510, 1588, 1577, 1658, 1669, 1606.—E. C. Robinson, 46 Fishergate, Preston, Lancashire.

BOOKS, ETC., RECEIVED.

"Picture-Making by Photography," by H. P. Robinson (London: Hazell, Watson & Viney).—"Metamorphism of Rocks," by A. Irving (London: Longmans, Green & Co.).—"Electric Light for the Million," by A. F. Guy (London: Simpkin, Marshall & Co.).—"Our Common Garden Snails and their Variations," by E. D. Marquand.—"Report and Transactions of the Penzance Natural History and Antiquarian Society."—"Observations made at the Blue Hill Meteorological Observatory, Mass., U. S. A."—"Photographic Determination of the Brightness of the Stars," and "The Henry Draper Memorial" (Cambridge, U.S.A.: John Wilson & Son).—"A 1."—"Health."—"The Lyceum."—"Canadian Entomologist."—"Insect Life."—"Journal and Proceedings of the Royal Society of New South Wales."—"Longman's Magazine."—"Journal and Annual Report of the City of London College Science Society."—"Proceedings of the Bristol Naturalist's Society."—"Research."—Knowledge."—"The Century Magazine."—"The Amateur Photographer."—"The Garner."—"The Naturalist."—"The Botanical Gazette."—"Belgravia."—"The Gentleman's Magazine."—"American Monthly Microscopical Journal."—"Wesley Naturalist."—"The Midland Naturalist."—"Feuille des Jeunes Naturalistes."—"The American Naturalist."—"The Microscope."—"The Entomologist."—"Book Chat."—"Journal of the Quekett Microscopical Club."—Cassell's "Technical Educator," &c. &c.

COMMUNICATIONS RECEIVED UP TO THE 13TH ULT. FROM: W. W. B.—C. O.—E. C. R.—O. T. E.—H. M.—P. P. C.—A. H. S.—E. J. B.—S. D.—E. V. P.—H. N. H.—C. H.—A. J.—J. W. S.—A. L.—H. U.—J. P. N.—H. J. S.—W. H. W.—W. J.—H. M. J. U.—J. W. W.—J. A. W.—R. S.—J. S.—B. L. P.—J. A.—J. H.—W. J. W.—T. E. S.—E. E. G.—P. J. N.—R. J. U.—T. D. A. C.—G. S.—W. S.—F. T.—C. A. W.—R. P.—E. W.—E. de C.—R. A.—R. H. L.—M. J.—J. B. M.—M. B. M.—Mrs. P.—R. S.—J. T. B.—R. G.—W. E. C.—W. W.—J. E. G.—T. G. B.—T. S. A.—S. A. S.—R. D.—Dr. A. G. H.—Mrs. W. W. T.—R. M.—S. A. C.—M. M.—J. T. B.—J. H.—W. J.—G. W. R.—Dr. E. C. de C.—C. C. W.—W. H. W.—H. M. J. U.—A. P., &c. &c.

CONCERNING CERTAIN FRUIT TREES.

By MARY B. MORRIS.

Part II.—The Quince Tree.

THIS tree, the *Cydonia vulgaris* of botanists, which from its beauty alone deserves more extensive cultivation than is accorded it in our gardens and orchards, and which also supplies us with a fruit which, if delicately manipulated, is a valuable addition to our culinary store, is by no means of modern introduction. Some say that it was not cultivated in England until Gerard's time, but this statement is refuted by a passage in the Chronicles of Matthew Paris dated 1257, wherein he describes a very bad season in England, when "Quinces, cherries, plums, and shell fruits were all destroyed." By "shell fruits" he probably meant walnuts, chestnuts, cob-nuts, &c.

The Quince tree was most likely one of the numerous fruit trees brought to England by the monks in the 11th century. Its native habitat has been much disputed, some writers assigning it to Austria, others to Northern Persia and Anatolia, where at least, as well as near the Caspian Sea and in the Caucasus, it is found in abundance growing wild. It no doubt became naturalised in Europe at a very early date, and, although cultivation has brought both the tree and its fruit to a larger size, it has been but little modified through centuries of culture, the fruit being almost as austere and acid as in the days of the ancient Greeks, who seem to have spared no pains for its improvement. They grafted on the wild Struthium, a superior kind, brought from Cydon, in Crete, and hence the Latin name *Cydonia*, by which botanists still designate it. The fruit was sacred to Venus and held to be an emblem of love, and as such entered into the marriage rites and ceremonies of the Greeks as prescribed by Solon. Some classical writers assert that a Quince was the golden apple which was thown by the goddess of discord amongst the goddesses as assembled at a marriage feast, and which was disputed by Juno, Venus, and Minerva. Plutarch records that the Greeks held many superstitious notions connected with it, amongst which one prevailed which caused it to be much cherished by them, namely, that it was efficacious in driving away, from its possessor, all evil influences. Hence they carefully placed it in their chambers, keeping it there both by day and by night. It seems probable that the tree was cultivated in Southern Europe before the time of the Trojan War. The Romans certainly knew it at an early period of their history, as we learn from Cato; and amongst the paintings found in the buried city of Pompeii, are at least two or three representations of the Quince tree. Pliny tells us that there were numerous varieties; his description of the fruit is as follows:—"The Chrysomelum (golden apple) is marked with many indentations down it, and has a colour inclining to gold; the one known as the 'Italian' quince is of a paler complexion, and has a most exquisite smell; the smaller varieties of the quince which are known as 'Struthia,' have a more pungent smell, but ripen later than the others; those called 'Musteum' (early ripeners), ripen soonest of all." After speaking of two other sorts, one of which was eaten raw, he goes on to say:—"At the present day all these varieties are kept shut up in the ante-chambers of great men, where they receive the visits of their courtiers; they are hung, too, upon the statues that pass the night with us in our chambers. There is a small wild quince also; the smell of it, next to the Struthium, is the most powerful; it grows in the hedges."

Appius, a member of the Claudian family, is said to have grafted the Quince on the "Scandian apple" (thought to be a winter pear), and the result was a fruit known as the Appian Quince, which is described as having the smell of a Quince, the size of the Scandian apple, and as being of a ruddy colour.

The uses to which the Quince has been put, whether as a medicine, an article of food, or a toilet requisite, are numerous and varied. As a medicine, its astringency would appear to constitute its principal virtue. Dioscorides recommends as an astringent the oil of Quinces (which he calls Melinum), obtained by boiling the fruit. For this use the fruit must be used, he says, which has not been grown on a moist soil; "hence it is that those which come from Italy are so highly esteemed for this purpose, while, on the other hand, the Struthium, though a kindred sort, is not so good." Up to quite recent times the Quince has been included amongst medicinal fruits, the "decoction of Cydonia" being a preparation found in a London Pharmacopœia as lately as 1830; the remark, however, is appended: "We believe it is much better known, and more frequently used, as an ingredient in pies."

An oil made from the blossom of the Quince was at one period in fashion as a perfume.

The fruit, too, was to be boiled in wine and applied with wax "to restore the hair when it has been lost by alopecy." An old author writes with such gravity that one can but think he believed in the efficacy of the prescription, that "a circle is to be traced round the root of the tree, and the root itself then pulled up with the left hand, care being taken by the person who does so, to state at the same moment the object for which it is so pulled up and for whom; this root, worn as an amulet, is a cure for scrofula." The same writer says, "Boiled quinces, preserved in honey, are beaten up with a decoction of rose-leaves, and are taken as food for the cure of affections of the stomach." "Quinces are more pleasant eating when cooked; still, however, eaten raw, provided they are ripe, they are very useful," says another.

Persian and Arabian physicians place the juice of the fruit when acid, amongst their stomachics, and they also use the apples when fried, for the like purpose. Some Mahometan practitioners prescribe a decoction of the seeds as a cure for certain forms of disease.

The Romans considered that Quinces ought to be stored in a place "kept perfectly closed, so as to exclude all draughts;" or else, that they should be boiled in honey or soaked in it; "persons are also sometimes known to give quinces a coating of Pontic wax, and then plunge them in honey."

Old John Gerarde gives us some pleasant recipes, albeit something quaint. "The marmalad or cotiniat made of quinces," says he, "and sugar is good and profitable to strengthen the stomach, that it may retain and keep the meal therein until it be perfectly digested. Which cotiniat is made in this manner: Take faire quinces, pare them, cut them in pieces, and cast away the core; then put into every pound of quinces a pound of sugar, and to every pound of sugar a pint of water; these must be boiled together over a still fire till they be very soft, then let it be strained, or rather rubbed, through an hairy sive, which is better, and then set over the fire to boil again until it be stiffe, and so box it up, and, as it cooleth, put thereto a little rose-water and a few graines of muske mingled together, which will give a goodly taste to the cotiniat. This is the way to make marmalad: Take whole quinces and boil them in water, till they be as soft as a scalded codling or apple; then pill off the skin, and cut off the flesh, and stamp it in a stone mortar, then strain it as you did the cotiniat; afterward put it in a pan to dry, but not to seeth at all, and unto every pound of the flesh of quinces put three quarters of a pound of sugar, and in the cooling you may put in rosewater and a little muske, as was said before. The seed of quinces, tempered with water, doth make a muscilage, or a thing like jelly, which, being held in the mouth, is marvellous good to take away the roughness of the tongue in hot burning fevers; the same is good to be laid upon burnings and scaldings, &c. Many other dainty and wholesome confections are to be made of quinces, as jelly of quinces, and suchlike conceits, which for brevity's sake I do now let pass."

The mucilage made of the Quince seed, unless mixed with some other ingredient to preserve it, very soon ferments and becomes useless; but, in combination with white wax, etc., was at one time much used in the composition of *bandoline fixateur*, a French article for the toilet. A hint worth taking with regard to the cooking of Quinces, be it in "cotiniat," "marmalad," or "pies," is to use a silver knife in cutting them, and a silver or wooden spoon for stirring, and the vessel in which they are cooked should be earthen, not metal; by this means the flavour, like onion, so commonly to be detected in the cooked fruit, is entirely avoided.

THE CUCKOO'S SONG.

We often read or hear of the "well-known" note of the cuckoo, the impression on the minds of most people being that his song is at all times one and the same. That is not so. Not only does the same bird sing differently at different times, but probably no two cuckoos sing exactly alike. The following memoranda, therefore, may be of some interest to the readers of Science-Gossip.

1. May 5, 1888.—Watched the bird near a coppice, and marked carefully the "interval" in the song. It was, without doubt, a major third, but rendered

more or less out of tune from the fact of the upper note being more of the nature of a call or shout than of a musical sound, i.e. that, short in duration as the note is, it has not the same "pitch" from beginning to end.

2. May 5, 1889.—Interval, a major third in the key of B (concert pitch). The bird was too distant to enable me to hear the peculiarity in the upper note mentioned above.

3. May 9, 1889.—Another locality; interval, a major third out of tune, the upper note being flat. The same bird varied the key from B to B flat, maintaining the same relative interval. Three-quarters of an hour later the song from the same direction was brighter and clearer, and a good major third in D flat. If it was the same bird, perhaps the weather had something to do with the change; at first it was dull, with thunder about, but later it had cleared up.

4. May 16, 1889.—Heard two calls only, consisting of an uncertain interval approaching most nearly to a minor third, key B.

5. Same day, another place; a fairly good minor third, key C. Weather hot and dull.

6. May 21, 1889.—Major third in D flat.

7. May 23, 1889.—Major third in B.

8. May 26, 1889.—Heard the song on two occasions at a considerable distance, minor third in D flat. On two other occasions, nearer, a major third in same key. The upper note was as described in the first instance above, or, in fact, a kind of "cluck."

9. May 30, 1889.—Good major third in D flat.

10. June 2, 1889.—One bird sang the interval of a fourth for several repetitions. The upper note was not hit upon at once, but preceded by a short one a semitone lower—an "appoggiatura." The same bird also sang sometimes a lesser interval. The song of another bird approached nearly to a fifth. Had no means of taking the key on this occasion.

11. June 16, 1889.—Forenoon; minor third, upper note a little sharp.

12. Same day, afternoon, another locality; major third.

From the foregoing it will be seen that the key ranged from B flat to D flat, and the interval from a minor third to a fifth, taking all the cases together. For convenience they may be tabulated thus:—

	Key (when taken).	Interval.
1.	—	Major third
2.	B	,,
3.	B, B flat, D flat	,,
4.	B	Minor third
5.	C	,,
6.	D flat	Major third
7.	B	,,
8.	D flat	Minor third
	D flat	Major third
9.	D flat	Major third
10.	—	Fourth and fifth
11.	—	Minor third
12.	—	Major third

Instances 2, 6, 8, 9, 10 and 12 are from one neighbourhood, and probably record the performances of one bird. In No. 8, the bird that seemed to be distant may in reality have been near, but cuckooing softly, and thus accounting for the lesser interval, just as a flute-player can produce a given note either very sharp or flat at will. It has been stated that the song consists of a major third at the commencement of the season, and a minor at the end; but that is certainly not the case. The reasonable conclusion is, that it depends entirely upon the humour of the cuckoo at the moment, and varies according to how he is affected by the weather or other circumstance. It is only uniform in its general character, and, it may be added, in the sentiment of the uncritical listener. Nevertheless, it is music in ears of a lover of the voices of Nature, compared with which the sound of the cuckoo clock is almost excruciating, and differs as much as would a stuffed, or even a make-up, bird from the beautiful creature itself, alive and gracefully perched on the branch of a tree.

W. P. HAMILTON.

Shrewsbury.

NOTES ON ECONOMIC BOTANY.

NUTMEGS: This spice is the produce of *Myristica officinalis*, Linn., also known under the names of *M. moschata* and *M. fragrans.* It is a native of the Molucca Islands, where it is largely cultivated, and especially at the Islands of Banda, also in Java, Sumatra, and other islands, as well as in some parts of India. In 1770 it was introduced into the Mauritius and Bourbon, where it produced very fine seeds.

It is a diœcious tree, from twenty to thirty feet in height, with a smooth bark abounding in a yellow juice; leaves, two to six inches long, nearly elliptical, smooth, entire, dark green and glossy above, paler beneath; flowers, axillary; male flowers, three to five on a peduncle, filaments incorporated into a thick cylinder; female flowers frequently solitary. Fruit, fleshy, spherical, about the size and form of a small pear, two-valved, dehiscing longitudinally; nut enveloped by a red aril, albumen ruminated. The properties of nutmegs are stimulant, narcotic, etc.; and if taken in considerable quantities are really poisonous, excite thirst, cause dyspepsia, intoxication, delirium, etc. At the Banda Isles, which is the principal seat of its cultivation, the fruits are gathered at three seasons, July, November, and March or April. The seeds are dried, and the hard outer shell removed, and imported; occasionally they are imported with the shells on, a procedure which greatly adds to the weight and waste, while on the other hand it prevents the attack of the nutmeg insect. The arils are taken from the seeds, dried in the sun, and constitute "mace" of commerce. The seeds and mace are both largely used as spices, and medicinally, as stimulants and carminatives. A fixed oil mixed with a volatile oil is obtained from the seeds by expression under heat, known as concrete oil of nutmegs, or "nutmeg butter" owing to its consistency and colour. The concrete oil is imported into this country, and from this the volatile oil is obtained by distillation.

At one time the cultivation of the nutmeg was entirely in the hands of the Dutch, who lost no means in order to monopolise the growth of the plant, and it is related that they used to burn the nutmegs when there was an abundant crop in order to command high prices.

Fig. 130.—Nutmeg (*Myristica moschata*).

Other species yield very inferior nutmegs, which sometimes find their way into English markets, notably those of *M. fatua*, known under the name of "long" or "wild" nutmegs; they are longer and more pointed, but of a very inferior quality. Sometimes the nutmegs are washed with lime to prevent the attack of insects, but this is also very often the means employed to give valueless seeds a saleable appearance.

Cassava or Mandiocca meal, and Tapioca :—These important articles of food, the latter well known in this country, the former known as a very necessary product in Tropical America and elsewhere, are the produce of at least two species of the *Manihot* genus (*M. utilissima*, Pohl., and *M. Aipi*, Pohl.); the former the bitter Cassava, the latter the sweet Cassava. These two plants are both largely cultivated in the W. Indies, Brazil, Peru, the Coast of Africa, etc., for the sake of their roots, from which the Cassava meal is prepared. Some botanists regard them as distinct species, and others regard *M. Aipi* as only a variety of *M. utilissima;* but let that rest with those interested; for our purpose we may regard them as distinct species.

M. utilissima, Pohl. (*Janipha Manihot*, Kunth.; *Jatropha Manihot*, Linn.). The bitter Cassava is a shrubby plant, growing from six to eight feet in height, with an erect, twisted, knotty stem. Leaves palmate, usually seven-partite; segments entire, lanceolate. Flowers axillary, monœcious, racemose; petals absent, stamens ten. Root large, tuberous, fleshy, and white, abounding with an acrid poisonous juice, externally of a yellowish colour. *M. Aipi*, Pohl., differs from the former species principally in having reddish-coloured roots, and five-parted leaves. One essential difference, however, in the nature of the roots is that, whereas the root of *M. utilissima* is extremely poisonous, the other is very agreeable and wholesome, and is cooked in various ways, serving as a most nutritious food. It is said that the acrid and poisonous nature of the bitter Cassava juice is due to the presence of hydrocyanic acid and probably an acrid principle.

The way in which the Cassava meal is obtained is by grating the roots. The graters are made of small fragments of granite fastened in a tough wooden frame by the viscid juice of one of the dogbanes (*Couma dulcis*, Aubl.), and washing or filtering the material in water, after which it is subjected to pressure ; it is then ready for use. It is made into cakes or cooked in various ways, and constitutes an important article of daily food to the natives of the parts in which it is cultivated.

Tapioca is prepared from the starch which settles in the water used for washing the meal. The water is strained off, and the starch is torrefied upon hot plates, the heat causing the starch grains to swell and become agglutinated, thus assuming the form of a shot, as known in commerce.

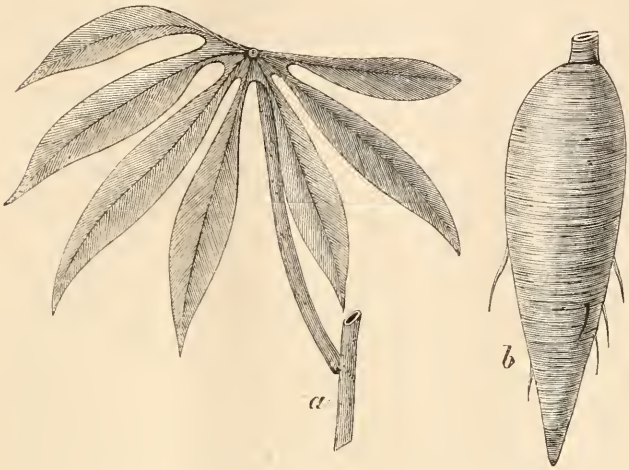

Fig. 131.—*Manihot utilissima.* *a*, leaf; *b*, root (reduced).

Although the root is so poisonous, the poison is entirely expelled by the processes carried on in the preparation of the meal.

A very repugnant practice is resorted to by the native women in the preparation of an intoxicating drink called "piwarrie ;" they chew the cakes, and eject the well-masticated material into a bowl, to which water is added ; it is allowed to stand until fermented, then boiled, and when cool is ready for use. It is said to be of a very agreeable flavour.

J. T. Riches.

"CLEVER SALLY" AT THE ZOO.

During a Saturday afternoon visit on Aug. 17 to the Zoological Gardens in Regent's Park, we took the opportunity of making a call upon our dear old friend "Sally." No doubt "Sally" is an old acquaintance of most of the London readers of Science-Gossip, but, for the benefit of many who have not been introduced to her, it will be as well by way of introduction to inform them that "Sally" is a young and intelligent-looking female of the genus *Anthropopithecus calvus*, known as the "bald chimpanzee," and according to the Society's guide books supposed to be referable to the variety "Nshiego-mbouvé" of Du Chaillu. "Sally" has been in the possession of the Society for nearly six years, having been purchased in October, 1883. She is now about eight years old ; and is at present located in the Sloth House.

Having heard from various sources that "Sally" was making rapid progress in her education, particularly in the abstruse science of simple addition, we were rather anxious to see an example of her cleverness and intelligence in this respect.

Upon interviewing the keeper in charge, we were informed that "Sally" was slightly unwell and rather inclined to be disagreeable (too bad to speak of a lady chimpanzee thus), and that in consequence she might be disinclined to exhibit her accomplishments. However, with a little coaxing from her keeper, aided by sundry tit-bits administered at intervals, we were enabled to see for ourselves how the intelligence of our "poor relations," the higher apes, is capable of being fostered and brought out by kind treatment and great perseverance.

"Sally's" first performance, in answer to her keeper's request, was to push a straw through the keyhole. This "Sally" managed to accomplish successfully, first wetting one end in her mouth, as a child might wet the end of a piece of cotton to get it through the eye of a needle. Being rewarded with a small piece of apple, she was asked to put a button-hole in master's coat, and picking up an ear of straw, and breaking its stalk to a convenient length, she proceeded to draw it through two button-holes of the keeper's coat, who then, cutting off two pieces of apple, placed them respectively on "Sally's" right and left hand, with the injunction that she was not to touch them until she was told. An invitation to take the piece on her right hand was promptly complied with, and the same with regard to the left-hand piece. "Sally's" keeper now told her he had still another piece of apple, which she should have for five straws ; this was accomplished by "Sally," leisurely picking up the requisite number of straws one by one from the bottom of her cage, breaking them short, and placing them in her mouth, making a bundle of equal lengths, and handing them to the master in exchange for the piece of apple. She was particular in remembering to pick up one that she had dropped in the commencement of the counting, and adding it to the others so as to make up the proper number.

Located in the next cage to "Sally," are a pair of quite young chimpanzees and a gibbon, and it was amusing to see "Sally" slyly peeping through the chinks of the wall of her apartment, and the evident discontent with which she watched them devouring some goodies in the form of figs which the keeper had just given them.

In conclusion, I think it speaks much for the care and kindness bestowed upon their charges by their keepers, that such a delicate animal as the chimpanzee is in captivity should have been kept in good health for six years.

A. J. Jenkins.

New Cross.

NOTES ON NEW BOOKS.

Chemical and Physical Studies in the Metamorphism of Rocks, by Dr. A. Irving (London: Longmans). Perhaps no department of modern geology has progressed more than petrology—that relating to the microscopical structures of rocks, and the changes they have undergone. This is largely due to Dr. Sorby, of Sheffield, whose remarkable paper on the construction of granites, published in the "Quarterly Journal of the Geological Society" in 1862, commenced a new era in the study of rocks. Since then, in England, France, Germany, and the United States, the study of petrology and micro-petrology has attained a highly specialised rank. In this country, men like Professor Bonney, Teall, Allport, Lapworth, and others (and the author of the present volume), have done good service for geological students. Teall's magnificently illustrated work is nearly completed. The volume before us is admirably adapted for the use of advanced students of geology. Its range is by no means confined to the microscopical study of rocks. It deals with their metamorphism upon their regional as well as their microscopic characters. It discusses the probable origin of the oldest metamorphic rocks, goes into considerable detail respecting the chemical changes which have occurred in all rock masses, but especially the most ancient; describes the alterations due to cleavage, crumbling, and foliation, as well as those frequent local metamorphisms of rocks directly due to heat and pressure; the circulation of super-heated waters, and even the results that follow upon cooling of these conditions. To the student, Dr. Irving's appendices in the present volume will not be the least valuable, and they occupy nearly one-third of its bulk. We cannot too cordially recommend the work (which is published at five shillings by Messrs. Longmans), to all students of the stony science.

The Flora of Switzerland, by A. Gremlix, translated from the fifth edition by L. W. Paitson (London: David Nutt, 1889). We are sorry not to have been able to notice this volume before the summer was over, for it is just the very work a tourist botanist in Switzerland should put in his knapsack. It is got up after the manner of Baedecker's guides, in red limp cloth, so as to suit the pockets. The present is a translation from the fifth edition of this well-established work. One of the remarkable peculiarities is that, whilst it is mainly intended for beginners in botany, it is of equal use to the most advanced student of the science. It includes descriptions of all the phanerogams growing in Switzerland. The letter-press descriptions of each species are so clear that a schoolboy familiarised with a knowledge of a few botanical terms could easily make it out. No illustrations are therefore required. The ability to refer a plant to its natural order will be quite sufficient, by the aid of this book, to identify it. The letter-press is unusually clear, and the arrangement agreeable to the eyes. A book which has passed into the fifth edition has placed itself beyond criticism, and we, therefore, notice the present work in the interests of our readers, many of whom have frequently asked us to recommend a good guide to the Swiss Flora.

Names and Synonyms of British Plants, by G. Egerton-Warburton, B.A. (London: George Bell & Sons). This handy little book is indispensable to an English botanical student. It furnishes him with a collation of the nomenclature of the "London Catalogue" of British plants, English Botany, Babington's Manual, Bentham's Flora, and Hooker's Students' Flora. Not less useful is the appendix of the synonyms of British plants, which enables the student to see at a glance the various names by which a plant has been described. The author has certainly succeeded in clearing away a good many of the perplexities and confusions of our botanical nomenclature. For the benefits of students who have not received a classical education, it may be stated that the botanical names are emphasised so as to enable them to pronounce names correctly. There is a long list of authorities for plant names. The arrangement of the work is in alphabetical order, which, of course, brings plants into juxtaposition through the initial letters of their names. Although this is not a scientific arrangement, it is a very useful one.

Health Troubles of City Life, by Geo. Herschell, M.D. (Bristol: John Wright & Co.). This well-written brochure, by one of the most eminent medical men of the day, should be read by everybody engaged in business life, as it deals with the health troubles which are only too commonly the result of commercial competition. As the author remarks, one of the most ordinary expressions used amongst business men, is that So-and-so "has broken down." Dr. Herschell's chief point in writing this little work has been to indicate the first beginnings of the nervous exhaustion which leads to such breakdowns. He gives a brief description of the various symptoms which usually mark its early stages, and a few rules of life for the benefit of those who are willing to be warned in time.

We cordially recommend Dr. Herschell's earnest book to the notice of our readers.

Messrs. Dean & Son, of Fleet Street, are bringing out a series of practical shilling zoological guide books. We have received two copies of the set. One, "The Amateur Zoo, or Pet Animals," is by Arthur Patterson, whose "Notes on Pet Monkeys" we had occasion to draw attention to a month or two ago. Mr. Patterson has taken advantage of the love of the study of natural history of animals to increase our number of pets, so that our knowledge of their life and habits can in this way be pleasurably increased. The next issue is on "Poultry," by Edward Brown, F.L.S., editor of the "Fancier's Gazette," in which lovers of poultry have plainly described the varieties, classification, exhibiting, treatment, breeding, rearing, housing, diseases, and general management. This is one of the cheapest and most useful handbooks of poultry we have yet come across.

The last *Annual Report of the Smithsonian Institution*, as usual, contains, in addition to the exhaustive report of the secretary, some papers by the leading scientists of the day. Amongst them are articles relating to Anthropology (copiously illustrated), by O. T. Mason, R. S. W. Schufeldt, Paul Beckwith (who discourses on the "Customs of the Dacotahs"); Lieut. H. T. Allen, "On the Natives of Copper River, Alaska;" C. Willoughby, on "The Indians of the Quinaielt Agency, Washington Territory" (very artistically illustrated); "The Stone Age of Oregon," by Rev. M. Eells; "Charm Stones," by Dr. E. Yates; "Studies on the Archæology of Michoacan, Mexico," by Dr. M. Leon; "Spurious Mexican Antiquities" (illustrated), by W. H. Holmes; "Time Reckoning for the Twentieth Century," by Dr. Landford Flemming, &c., &c.

The God of the Children, by Bedford Pollard (London: Elliot Stock). The author of this very pleasant and charmingly got-up book states that he has written it to supply thoughtful Christian mothers with the means of interesting and instructing their young people during the Sunday afternoons and evenings. He fears, he says, that children do not enjoy their Sundays. He might have gone further, and said he knew they did not. So Mr. Pollard herein preaches a series of short discourses on scientific and natural history subjects, which we hope Sundayish children will listen to better than to ordinary sermons.

NOTES ON LEPROSY.

THE article on the above subject in the September number of SCIENCE-GOSSIP has left one or two points open to further opinion; and, as this is a subject which has recently engaged public attention, some discussion of these points may not be altogether uninteresting. First, as regards the nomenclature of the disease. The true leprosy is now known as *Elephantiasis Græcorum.* It was described by old authors under the name of lepra, but this term is now used as synonymous with psoriasis, an entirely distinct disease, but one with which the disease now under consideration was confounded; it has also been confounded with *Elephantiasis Arabum*, syphilis, chronic eczema, lupus, and leucoderma, and hence there have been considerable differences in the descriptions of various authors. The name elephantiasis was given to it, not on account of the enlargement of the part affected, but from the magnitude of the disease; thus Ætius says, "Elephantiasis a magnitudine et diuturnitate nomen accipit" (it takes the name of elephantiasis from its magnitude and long duration). *Elephantiasis Arabum*, on the other hand, takes its name from the enormous size to which the affected parts attain, the scrotum sometimes weighing from fifty to one hundred pounds; except in name, these two diseases have nothing in common. Leprosy has also at various times been known as *Lepra vera*, *Lepra Arabum*, *Leontiasis*, *Satyriasis*, and *Morbus Herculeus.*

Then as regards causation. There is no doubt that the immediate cause of the symptoms is the growth in the affected regions of small round cells, like granulation tissue, derived probably from the connective tissue corpuscles; but what the cause of this new growth may be is still open to question. It is much too vague to put it down as a "parasitic lichen," "animalcula," "an exaggerated type of skin disease," etc., even though we may not be able to say what the determining cause is. Temperature can have no influence, since the disease occurs both in Norway and in India; soil and climate do not appear to affect it much, as it occurs both in low-lying marshy districts and in high altitudes, on the sea-coast and inland, in continents and on islands. Many of the places where it is endemic, are low-lying and marshy. Race does not make much difference, as it may occur in persons of any nationality; it is more common among the poor and filthy than among the better classes. It has been attributed to a diet of decomposing fish, especially as fish was so largely consumed in Europe in the Middle Ages, when leprosy was excessively common. But, unfortunately for this theory, leprosy may occur among those who live almost entirely on vegetables. A specific bacillus was discovered about fifteen years ago, pervading the tissues of the person affected, and more especially the nodules and ulcers which are so characteristic of the disease. This bacillus is about five micro-millimetres in length, and is very much like the *Bacillus tuberculosis*, only it stains more easily. However, inoculation with this bacillus has not, so far, produced the disease. This, however, is not surprising when we remember that the disease is not ordinarily contagious, but only appears in persons exposed to certain predisposing causes. Probably, if the *Bacillus lepræ* were inoculated into a person subject to these influences, it would produce the disease. Of these predisposing causes, heredity is certainly the most marked. Leprosy is not congenital, be it noted; that is to say, it does not occur in the new-born child (in fact, I believe it is unknown before puberty); but the presence of the disease in the parent has so modified the organisation of the offspring as to make it peculiarly susceptible to the disease. Living in the midst of filth and general unhygienic surroundings, appears to be another of these predisposing causes.

ARTHUR W. HARRISON.
Westminster Hospital.

THE MIDSUMMER NIGHT'S SUN.

By THE AUTHOR OF "INSECT VARIETY."

THE captain of the Henrik Wegeland, who had been pacing the deck, suddenly stopped short opposite where I was sitting upon the taffrail. "You are mistaken," he continued, "in supposing that the climate on our coasts is Arctic or perceptibly colder than that of the western seaboard of Scotland. True it is that snow covers the hills in November and April, and when the days grow bright and lengthen, then we find the cold to strengthen; but no surface ice blocks the channel south of Tromso, and our passage in winter, inside the islets, is mainly rendered perilous on account of the gloom and sudden extinguishing of the play of the northern lights. I have heard it said that the glares of the Hecla may be seen in passing—it lies behind us in the latitude of Trondjhem—but I much doubt it." He consulted his watch and added, "you see things look very different now it is midnight." I looked up in the direction of the north, and the sun remained above the horizon, glowing with a crimson blur in the sea fog, and enlivening the deck, and green and starry ripples with an orange lustre; and as it from time to time shot behind the passing skerries, their jagged peaks kindled into hues of rose and purple. We were beholding the midsummer night's sun, the crown of glory that wheels around the head of the old skald who bathes his feet in the Baltic.

Softly the steamer stole onwards, while time slumbered on the piston strokes, until, gently turning into a placid fishing cove, we paused opposite a Swiss hamlet perched upon a grassy bank—the village of Bodo. "You had better pay a couple of sovereigns and continue with us on to Tromso," resumed the captain, thumping the communicating rod. "Tromso is a pretty place." Verily, for matter of that, I had long since sent my heart on before me to Spitzbergen and Novaia Zemlia to be there enshrined in a casket of frost-work. but there reigned so much enchantment in the seclusion and impurpled haze of the radiant light, that I unwittingly entered the drowsily splashing ferry-boat and leaped upon the quay. The sun, as of yore, had driven his chariot behind a mountainous rock, and the golden flash that but lately had slept upon window, sign-board, and balcony, was replaced by a pale opal lustre, in which the fisher-lads and shop lassies moved about as glorified spirits and demigods. Must I say that it was but the flaunt and mirage of the desert, or feed on sun-stirred fancy that wanders in paths unknown?

The next morning I awoke in a highland village composed of wooden houses, not marble and gilded palaces, with here and there a peat roof mottled over with a savage snuff and peppermint of seeding-grass and feverfew; and, in going down the street, I encountered a stray Laplander wearing his mitre cap and Chinawoman's slippers, who, having left the reindeer on the wild, remained like Alice in Wonderland. I concluded that he must have come across the mountains laden with Arctic spoils for the approaching exhibition.

The midnight sun is seen at Bodo rather under difficulties: you have, in the first place, to await the advent of one of those anticyclonic days when the vault above at gelid sundown retains its crystalline clearness, and no misty wraps gather at the base or crests of the heights around; and you then have the option of mounting the church spire or making the ascent of the mountain that hems in the valley; what time the village thinks of rest, good folks in England are asleep and dreaming. Such an evening arrived the 5th of July of the present year, when a quiet stillness lured me forth, and a heavy fragrance-laden atmosphere enticed me to wander on. The sun-power that nerved my frame had been at work in the fairy world. As I went along the meadows, hastily drawn up by the revolving light, the dandelion stalks standing two feet, the grass definitely higher, and the cow-parsley clumps overtopping like guards in battalion, enunciated for my solution a problem of tapes cut to a length; although I must with fairness state that on the rich, tranquil banks of the Nidaros, where I left the little maidens scrambling to pick the carmine rosebuds, this individuality was more conspicuous. In these meadows where the nettle is unknown, geometrical moths were flitting everywhere in the bright sunlight, which revealed their occult wing-patterns to human eyes, and among them went the straw-coloured *Cidaria pyraliata*, that the English school-boy nets in our shrubberies at dew-fall, but which is here abroad, sipping the pride of the hay-field, throughout the blaze of noon.* Let the classifier, who is pondering over the problem of diurnal plumes and nocturnal feelers, consider how the witchery of the valley's twilight and the garish crown of northern light, has been perplexing his moth genera, and let him recognise this place of development with a saving clause: all of this group fly by night, save one that, like the *Gamma*, has learnt to love the sunlight.

* In company with *Scopula decrepitalis* and *Pachynobia carnea*: at seven in the evening *Larentia munitata* and *didymata*, *Melanippe montanata*, *Cidaria populata*, *Anaitis paludata*, *Euphisteria heparata* and *Emmelesia albulata*, are already enlivening the damp sunny grass.

A little farther on the road and I came upon a summer dry swamp mantled over with cloud-berry leaves, which here in the northland, carpet the low ground, but farther south retire higher up between the mountains. It occurred that the proprietors had not entertained the notion of demand and supply, or noticed the strife for existence depicted in many a yellow and white blotch at hand, or they would have cleared away the roots and weeds and transformed the brown peat into a garden of cloud-berries, and planted it about with an orchard of red rowans ; and here are wild monk's-hood and a feathery cistus to make the walks and alleys gay. Well, a Scotchman once said that to reclaim Scotland meant to spoil it, and in one sense he was right ; a woodcock that this moment fled from the brushwood held a similar view.

Places and scenes the world over have for the emigrant their family resemblances, and I had not gone farther on the narrowing path, before I had already mistaken it for the sheep's track that conducts up the mountain on the north of Charsaig Bay in Argyleshire, which the reader may have already trodden : contorted crags, a smaller Jura in prospect, everything had been hitherward transported ; and here also was the expected byre at the foot of a steep and stony gorge, where small whity-brown cows with antelope horns, over whose back you might have comfortably vaulted, were being milked. A half-penny to a dark-eyed woman who loved wild flowers, filled my brandy-flask, with an inexhaustible draught to spare, and then I tackled the pull up, past fish tank one and two—there were five at successive heights—until I drew breath on the brink of a darker tarn with a boulder in it, just opposite a silent orange mirage of birch-scrub, lint white as the locks of the northland maidens. Through these birchen bowers I got a glimpse of the rocky islets of Lofotodden and Vaero, and a purple line of water between, where of old lay the ship-engulfing malstrom. I recall having seen the waves of Corryvrechan break from the raised deck of the Iona steamship, but on the mälstrom I did not observe the ghost of a ruffle.

On resuming the ascent I found that the track before me had vanished, and then it was a hop, skip and jump, over bog, over stone, over berries and willows various, until I gained an elevation where the birches grew prostrate and contorted like the snakes that sprang from the enchanter's rods—mere roots and leaves.

When I emerged on the tabular plateaux on the mountain top it was ten P.M., and the sun stood over the long line of the Lofodens, whose wintry peaks, like the jagged saw of a shark's maw, bounded the seaward view. It fell perceptibly no lower, but appearing to pause, and casting a vermilion beam like a warning beacon, it ran as a billiard ball its midnight course. The orange-dyed water below spread calmly like a magic mirror, blurred with emerald in the tideway, and the shadows of the surrounding snow-streaked pinnacles dissolved in it deep and beautifully blue ; while a fishing-smack, apparently no larger than the full-stop that rounds this paragraph, floated out into the skimmer as though it slept in contemplation. The stonechats in the hushed ravines alone remained less restful and dreamy, for they were incessantly provoking their friends of a feather with a recitative, and then a sudden splash ! splash ! was borne on the ear from the bay on the right, where something black was circling in the water. Very suggestive of the Lofoden krake that appeared to Petter Smines and Son the

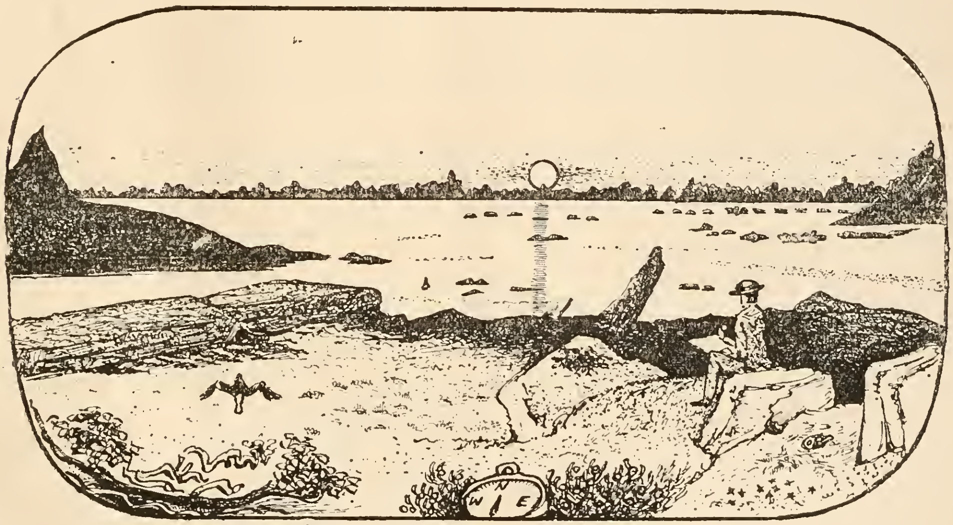

Fig. 132.—The Peaks of the Lofoden Isles. Passing the Sun at Midnight.

Monday before Easter this eventually took the shape of certain heavy shark or salmon that came leaping shoreward.

It was now upon the stroke of midnight, and marking the lofty peak on which the sun told the hour, I undid my papers, and between twelve and half-past busied myself with a sketch that I could have also coloured, since it remained as clear as lamplight, even on the hinder slopes of the mountains, where the ambient glow beneficently scared all dark and noisome shadows. Before I had completed my task, a wild duck whizzed past my head like a cannon-ball, and with a wilful quack plunged down on tarn number five, from which a steam-cloud was slowly wafting. My fingers had grown quite crude and numb in the land air that had commenced to breathe across from the snow-fields that lay like a white pall on Sulitelma beyond the Saltren Fjord, causing me to abandon melancholy communings, and then for the space of two hours I distractedly paced the mountain top. The sun was now quickly rising, and its coppery disk emerging from the belt of sea-fog, turned burnished and bright; a whiter light was shed around, and the birds chirped to business. Day came with an icy chillness, so I delayed no longer, but hastened down in leaps and jumps, and still, before I reached the mountain foot, the sun was looking at me curiously over the top. It was half-past five by the church spire, and the hoarse-voiced village cocks announced it with responsive crows, which, however stentorian, failed to reach the big grey gull standing in a drowse but a stone's throw from the shore; or the divers and mottley grebes who led certain fledglings in review in and around between the homeward whispering, viking skiffs, with the coolness of any well-behaved poultry. A nap being the order of the day, I put up my boots on the seat at the hotel door, and inhaled my share of impalpable sunbeams.

On the 11th of July, the weather being propitious, I got me up again into the mountains to see the midnight sun. As I passed through the birch scrub, certain cries of *u-tick*, *u-tick*, arrested me, which I fairly mistook for the perspiring come-and-catch-me of the Madonna del Pillone cicadæ; until a flash of white and sable betrayed a confabulation of moth-snapping whinchats (*Saxicola rubetra*). On reaching the bare spectacular summit, I undertook a nearer scrutiny of the sparse mossy tufts, which revealed plainly the operation of sun-power. Here, where the birch had reclined to wrestle against the winter's storm, and the mountain ash grew decrepitly like a Chinaman's potling, the summer seedlings, vetch, potentilla, and moss campion, delicately blossomed; and the bear-berries, blushed all over with their carmine drupes acrid as a raw potato. When I looked up, the sun had so considerably sunk down as to bring a flush of rosy ribbons over the opposing snow-fields of Sulitelma, which, however, before the dead of night had, chamelion-like, died away. It was the first whisper of love in the weary northland, a hue of the coming sunsets. Since the disk of the sun was partly hidden behind the Lofoden mountains its progress from peak to peak resembled the click of a catch moving around a cog-wheel, and the ocular impression was conveyed that the earth was turning like a penny-go-round about the mountain top on which I stood, so that, eventually, I fairly dreamt that I was enthroned at the North Pole. Its low course over about a ninth of the horizon being run, I advisedly prevented the morning air by hastening downwards; my right of way among the cow-berries, crow-berries and bear-berries red, being contested by a mother grouse, who depressed her frill and ran her circuits, while her chicks funnily bundled over an opposing mound. Arrived at the hotel door I discovered a belated damsel abroad, who, conscious of a back entry, went round and turned the latch, a matter that provoked a "what" from her fellow-maidens. Well, perhaps, when solar physics is better understood, the days may arrive when science will erect her observatories on these northern heights, and enlist the telegraph to flash us the news of the universe; while—

> "Pale suns unfelt in distance roll away,
> And on the impassive ice the lightnings play."

It was drawing towards midnight, and the footsteps of Christina, Johanna, and Emelia, mounting the staircase, had caused me to put up my window mat to exclude the sunlight and court repose, when suddenly I was startled by such a booming of guns and a cry of Keiser. I looked forth and saw a steamer flaunting German colours float by in the refulgence over to the northward. This was the tourist ship Capella, carrying a concourse of Americans, English, Germans, Austrians, Hungarians, Italians, French, Spaniards, Swedes, Danes, and Norwegians, to do the honours to the Emperor of Germany, whom they saluted in the Lyngenfjord the midnight of the 18–19th of July in the immediate proximity of the midnight sun, testifying their thanks and well-wishes to the captain and steward. From the programme furnished by these luxurious and well-appointed vessels, we gather that the sun remains above the horizon at Tromso from the 19th of May until the 23rd of July, and at the North Cape a little longer, from the 11th of May until the 30th of July. At Namsos, without the Arctic circle, it rises at the earliest at about half-past one, while at Trondjhem the midsummer nights remain so light that you can enjoyably read a newspaper, brevier type and all, at the witching hour. The sun disappears altogether at the North Cape on the 19th of November to reappear on the 24th of January, and meanwhile a dull light like a London fog replaces the daylight.

We had visited in the sweets of the morning the Svartisen glacier, greenly shimmering in its echo-fraught inlet, and wandered over its terminal high perched boulders pitched up by the winter ice block; and we were now at noon monotonously reeling up cargo in the water-way at Selsovig with a rock sculptured like a cathedral porch adown the vista, whose remoteness in the singularly deceptive Arctic air it would be hazardous to estimate. We lay just on the edge of that crown of light, the Arctic circle, and the sun shot a searching ray as from a burning glass, rendering it uncomfortable to bask with the bluebottles, so I went below and turned up a Norwegian paper on the saloon cushions, and perused an article composed by some Anchytas, who had discovered that this cap had once sat awry. After alluding to Professor Gylden's researches at Poltava it ran briefly as follows:—If we suppose the forces in operation to have acted unchanged, in 600 years the North Pole would have shifted the tenth of a minute, and after 360,000 years a degree; and in order that it should shift 10 and 20 degrees of latitude, we must look back 3,600,000 years and 7,200,000 years. This displacement would be required, before the Arctic land now buried in snow and ice could produce a tropical or sub-tropical vegetation like Spitsbergen in the miocene age; when it was so warm as to be clothed with woods of lime, magnolia, plane, oak, hazel, poplar, swamp cyprus, and sequoia. Formerly people supposed that the Arctic circle was immovable, but then no locality for tertiary fossil plants in Northern Asia was known, save Kamskatka. However, when Professor Heer came to describe those of Alaska collected by Bergmeister H. Furnhielm, which now compose a portion of the Royal Museum collection, he remarked that these must have grown in a climate less warm than the rest of the tertiary flora in the same degree of latitude, and in a still greater degree did this supposition become evident when he examined the fossil plants from the island of Sachlin, whence he drew a conclusion that the isotherms dipped then lower in the East of Asia than in Europe. The matter was further confirmed when Nordenskjald discovered at Mogi, in the south of Japan, plants that similarly bespoke a colder climate. All this is perfectly accounted for by conceiving the pole to be displaced the aforesaid 20 degrees, and thus to have lain in 70 degrees north latitude, and 120 degrees east of Greenwich, when the flora of Japan would be brought between the 53rd and 55th parallels, and Greenland to the 53rd. Oeningen, which boasts so many fossil palms, would then have been in the 36th degree of north latitude, and would have possessed the climate of Algeria. Allowing this, it is manifest that in the glacial age and time of the hairy mammoths, the pole must have left its position in Eastern Siberia, and shifted over to Northern Europe.

The moths fly to light, the wheeling swallows at the approach of the northern chill swoop after the sinking sun, and the shy fieldfare and plump missel thrushes, bewildered at the loss of their endless day, wander in search of it along our hedgerows; but in this country of *oe* and *ey*, I miss the sound of the children's voices in their play, that Norse-Asturian-Gothic warble of sunny notes that, even more than the Italian, seem framed to charm.

A SUCCESSFUL DAY'S GEOLOGISING.

THE latter end of last summer, a friend and myself resolved to spend a Saturday in examining some good examples of the upper chalk—or Senonian, as it is termed by Geikie—in the lower portion of the Medway valley, near Chatham.

By good fortune we met in a pit at a village close by called Luton, a gentleman who has had great experience with the geological features of this part of the county of Kent, and with his assistance we obtained a tremendous number of fossils, etc. He has also kindly furnished me with an account of the strata in the locality, notes from which, together with a short description of the "treasures" we obtained, may induce other amateur geologists to make an excursion to this interesting part of Kent.

The most prominent features of this district, the remains of an old plain of marine denudation, are the grand escarpments; the first overlooking the lower London Tertiaries around Upnor, reaching from the Chatham "Lines" to Bredhurst, a distance of about three miles in a south-easterly direction, and the other and steeper one at Blue Bell Hill, and north of Boxley, overlooking the Weald of Kent, from which the finest view in that county is obtained.

The upper chalk thus exposed, taken as a whole, is rather thick; at Snodland, lower down the Medway, 310 of the 600 feet of chalk belongs to the Senonian; at Wouldham, six miles above Chatham, it only occupies 12 of the 544 feet of cretaceous rocks; at Cuxton, further down, 120 feet; at the Great "Lines," 300 feet; at Blue Bell Hill, 380 feet; at Fort Borstal, 230 feet; and at Fort Clarence, 154 feet.

There are numerous fine sections of this formation along the two great escarpments, as well as very fair ones of the London Tertiaries. One at Luton shows that peculiar kind of excavation, or pothole, caused by the unequal wearing of the chalk, or by roots of trees, and known as a "pipe" (Fig. 135). Many other sections show these pipes, and all are filled with débris from the strata above the chalk, principally Thanet sands and gravel; while in one, Mr. Gamble, the gentleman we met at Luton, has found a very much worn tooth of *Elephas primigenius*, many remains of which have been obtained in the gravel in the valley, and in the river itself.

In many places the chalk has been greatly disturbed. Mr. Gamble states that Wouldham Common seems to have slipped over the underlying clay; this could only have occurred after the river had excavated its present valley. Further proofs of disturbance appear on the north side of the river opposite Borstal, where there are two faults showing a downthrow; whilst at Borstal itself a small fault, with five feet upthrow, can be seen half-way down the escarpment, the chalk there being false bedded, with very wide cracks or fissures filled with rubbly chalk and session is thus treated, the plane of the cut showing tiny dendritic markings of manganese dioxide (?)

At Blue Bell Hill the chalk is full of iron-stained fissures, the largest one being sixty feet deep, one foot wide at the top, and filled with clay and débris.

Between Borstal, Chatham, and Luton, there

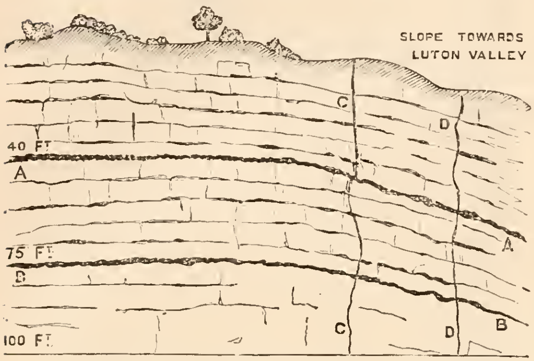

Fig. 133.—Pit at Luton, Kent. Upper chalk, 100 feet exposed; dip 6° N.W. A, B, two similar very hard iron-stained chalk layers of 2 feet thick. C, D, two fissures ½ to 1 inch wide.

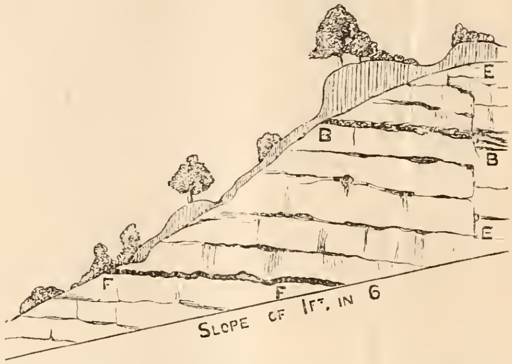

Fig. 134.—Upper chalk cutting on one side of London Road, Luton, commonly known as Chatham Hill, ¼ mile from locality shown in Fig. 133, and part of same escarpment. Dip N.W., 36 feet exposed. B, continuation of lower iron-stained layer shown in Fig. 133; E, faults; F, cheek of flint.

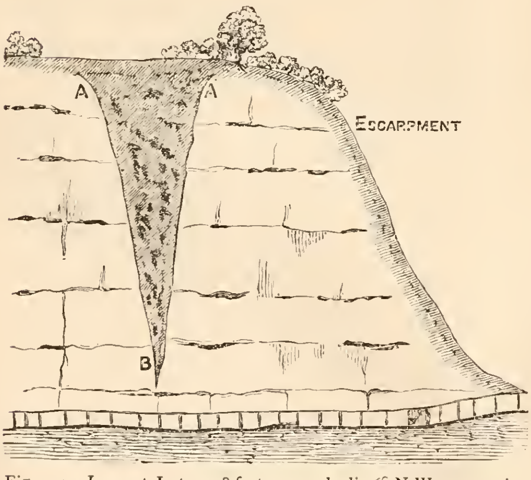

Fig. 135.—Lane at Luton, 48 feet exposed, dip 6° N.W. A, B, pipe, 36 feet in depth, containing Thanet sands, green-coated and ordinary flints. Fossils very rare here.

Fig. 136.—Ventriculite.

rain-wash. The whole aspect of the pit is very peculiar.

At the Luton Pit there are several cracks from top to bottom of the section, from ½-inch to one inch wide (Fig. 133). One remarkable feature about these fissures is that the flints and fossils (principally ananchytes) found on either side are split clean in two as if by a giant knife. A micraster in my possession is thus treated

occurs, on the top of the chalk, a triangular layer, six inches in depth, of chalk rubble re-cemented by carbonate of lime, and probably some silica and iron, while the chalk in the vicinity of New Brompton, near the river, is capped with Thanet sands, at the base of which occur those peculiar unrolled flints coated green with glauconite, about which Professor McKenny Hughes and Mr. Whittaker offer such a remarkable explanation ; viz., that rain-water charged with carbonic acid soaks through the sands, dissolves the chalk, and leaves behind only the flints and other insoluble residue forming or including glauconite. A thin bed of these glauconite-coated flints always forms the junction between the Thanet sands and chalk.

On entering the side of the pit at Luton, the first objects which attracted our attention were the regular horizontal layers of flints so characteristic of the upper chalk, pointing to the abundance of silica in the waters of the later cretaceous period. A short distance from this pit is a remarkable layer, three inches thick in one sheet, extending with scarcely a break for about fifty yards, with a dip northwards of about 10°. Mr. Gamble has traced this layer at two other points about five hundred yards distant.* It seems quite clear that this great tabular sheet must have been produced subsequently to the laying down of the upper chalk.

If a small quantity of the chalk from this pit be washed and examined with an inch objective, it will be found to consist of irregular granules of limestone, foraminifera in all stages of completeness, tiny irregular granules and minute oval nodules of flint, siliceous spicules of sponges in great profusion, minute polyzoa, tiny fragments and nodules of carbonate of iron, etc., etc.

It is therefore easy to imagine that water percolating through the chalk would take up a large quantity of this siliceous matter in its course, and re-deposit it in a large horizontal joint, and thus gradually form a great mass.

As the flints are excavated they are thrown up by the quarrymen into a huge heap. This we at once attacked. The flints, roughly speaking, seemed to be of three sizes—large irregular lumps, spongiform or nodular pieces, and small smooth lumps.

On breaking open some of them, most exquisite linings of quartz crystals and chalcedony were brought to light ; the crystals ranging from a most minute size to a little over one-eighth of an inch across the base of the pyramid. In many cases they were of beautiful colours, apparently caused by being overlaid with oxide of iron, etc. One such specimen possessed a most gorgeous, greenish iridescence ; another closely

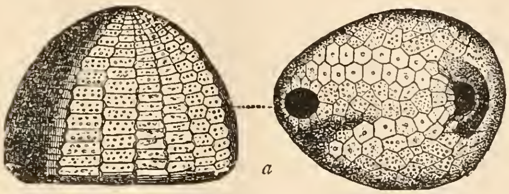

Fig. 137.—*Ananchytes ovata*, or "fairy loaf." *a*, base showing position of mouth and anus.

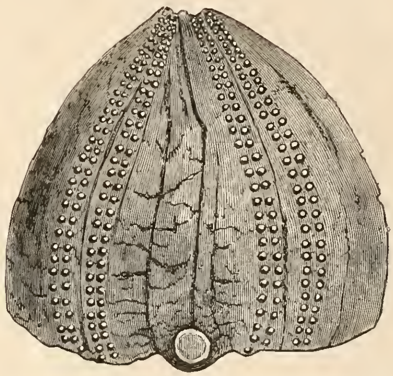

Fig. 138.—Natural flint cast of Ananchyte, showing perforations (in relief) for ambulacral or sucking-feet.

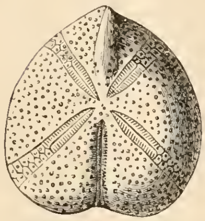

Fig. 139.—Micraster.

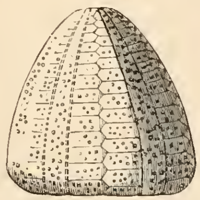

Fig. 140.—*Galerites albogalerus.*

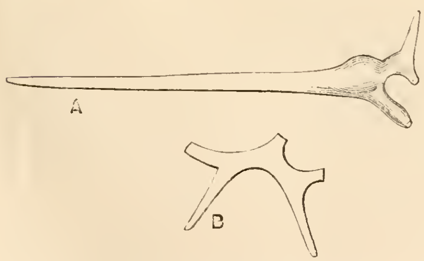

Fig. 141.—Tetractinellid spicules (upper chalk, Luton).

Fig. 142.—Nat. size. Siphonia showing internal radiated structure.

Fig. 143.—*Parasmilia centralis.* Primary theca.

* Vide also p. 22, "Report London Geol. Field Class," 1888.

resembled loaf-sugar (caused by a layer of quartz being underlaid with white opaque chalcedony), and, while in most cases the quartz merely occupied the outside edge of the space where a sponge had once been embedded, sometimes casts of the exhalant sponge pores were made in chalcedony overlaid with quartz. These specimens show most conclusively that the latter was introduced after the flint had been deposited around the sponge.

The different varieties of chalcedony were even more numerous than those of quartz. Many flints were coated internally with tiny mammillations, some with large ones which, when split open, showed layers of different degrees of opacity. The lovely milkiness of some of the specimens, and the delicately tinted translucency of others, make them the most beautiful objects I have ever seen; while a great many flints exhibit the gradation from black, through deep purple, to an almost transparent chalcedony in a very instructive manner. Among the different colours we obtained, one, a deep green, was most remarkable; purple, reddish, opaque white, and colourless being the most common.

We have been rather disappointed in the foraminifera. Either the chalk at Luton and thereabouts contains a comparatively small proportion of complete ones, or our mode of looking for them was defective—most probably the latter. I have, however, succeeded in getting complete specimens of globerigina, textularia, and one or two other allied genera, from washed chalk from Luton.

We obtained some capital specimens of sponges from Luton and adjacent places. Those interested in these fossils could get a fine collection in this district, as it is rather noted for them. Spicules of all kinds may be washed out in almost any quantity. One peculiar variety exhibits five rays in the direction shown in Fig. 141 *a*, another as in Fig. 141 *b* belonging apparently to the tetractinellidæ. Inside a flint I found, duplicated in a pale yellowish-brown chalcedony, a most exquisitely delicate cast, resembling in colour and appearance an ordinary Turkey toilet sponge.

We obtained several fine specimens of *Pharetrospongia Strahani*, perhaps the most common species of the calcispongiæ. In every case the sponge was embedded in flint, the upper part only being exposed on the surface, which presented to view, when cleaned, a beautiful, angular, though somewhat confused, network of calcareous threads.

Among the other finds which came to our bag were a good specimen of *coscinopora*, a hexactinellid cup-shaped sponge with a peculiar perforated exterior, the holes of which, filled with flint, project in knobs from the outside surface of the internal cast of the skeleton; verruculina; a very fine specimen of plinthosella; a large *Guettardia stellata*; a branched sponge, somewhat resembling, though in outward form only, the common *Doryderma ramosum*, of which we secured some very fair examples, and a great many ventriculites and siphonias, a cross section of one of which is shown in Fig. 142.

The curious hydrocoralline *Porosphæra globularis* can be here obtained in great numbers, and we found many specimens.

Among the Senonian corals, *Parasmilia centralis* is certainly the most common, and we secured several good examples. This coral has a very pretty little skeleton of variable length; our specimens are from ½ to ⅝ inches long. In the illustration (Fig. 143) a rough attempt has been made to show the edges of the "costæ," or ribs, on the upper part of the "theca," or external wall. These are very conspicuous in the better developed specimens.

Of the crinoidea we obtained, at Luton, part of the head and a few joints of the stem of *Bourgueticrinus ellipticus* and some scattered body plates of the star-fish *Oreaster obtusus*. The latter are very often found on the surface of the flints, which furnish a larger number of fossils than the chalk itself.

Sea-urchins abound in this neighbourhood, and if very great care be exercised, *Cidaris clavigera* and *C. sceptrifera* may be found with the spines *in situ*. We secured some perfect examples of spines and tests, but did not find them together. We obtained one of the five segments of the test of *C. perornata*, a very fine object, with its rows of pentagonal plates, each carrying a large primary tubercle situated on a smooth base to allow the edge of the socket of the spine to revolve freely, and forming a curious contrast to the rest of the plate, which is plentifully bestudded with tiny tubercles, decreasing in size as they near its edge. *C. perornata* has very long, thin, channelled spines with tiny thorn-like processes on the edges of the channels. We obtained many specimens of *Micraster coranguinum* of all sizes, and generally in a fine state of preservation. One small one shows, in a strong light, that strange lustre along the crystalline facets of the calcite composing it, which so puzzles the collector the first time he sees it.

We also bagged several specimens of *Echinocoris vulgaris* (*Ananchytes ovata*), a specimen of *Galerites albogalerus* (*Echinoconus conicus*), and another of *G. subrotundus*. Many of these echinoderms, that evidently lay at the bottom of the Senonian Sea some time before burial, are perfect museums to the palæontologist, furnishing him with serpulæ, polyzoa, under valves of craniæ, etc. We secured from Burham a specimen of that queer worm *Terebella Lewesiensis* (Davies) formerly described by Dr. Mantell as a fish, and named by Agassiz *Dercetis elongatus*; and several specimens of serpula and vermicularia, but they can only be referred to two species.

We obtained a goodly gathering of polyzoa, including escharina, *Reticulipora obliqua*, *Marginaria*, *Holostoma contingens*, lunulites, etc., from the outer surfaces of flints and echinoderms, and from the chalk débris; in short, as Mr. Micawber might say with one of his well-known "bursts of confidence," these fossils occur everywhere.

Space does not permit me to go into details about the remaining branch of the molluscoidea, viz., the brachiopoda, of which—together with the mollusca proper—we secured some fine examples. *Inoceramus* abounded everywhere in the flints and chalk; *Ostrea*, *Lima spinosa*, *Terebratulina striata*, *T. gracilis*, *Terebratula carnea*, *T. semiglobosa*, *Rhynconella Martini*, *R. plicatilis*, *R. Mantelliana*, and many others all fell to our bag.

If to these be added two fairly good specimens of *Beryx Lewesiensis* obtained by Mr. Gamble from the classic ground of Burham hard by, it will be seen that our day's geologising in this district was a most successful one. A great part of the specimens I have mentioned were obtained by that gentleman, who presented them to us; but in one day we ourselves got out such a large number of fossils, etc., as to warrant my assertion that for the collector there is no more prolific ground than the lower portion of the Medway valley, and, should any of my fellow brethren of the hammer pay a visit to it, I wish them good luck.

A. G. HAMMOND.

New Wandsworth, S.W.

FUNGUS FORAYS IN THE FOREST OF DEAN.

By Dr. A. J. H. CRESPI.

THE WOOLHOPE CLUB, under the fostering care of the late Dr. Bull of Hereford, was one of the most important field clubs in the kingdom. It has not been so prosperous since his death, and the attendance at its gatherings has fallen off. Last year, too, at its annual reunion, it had to face the pinch of severe cold. It met on October 1st at Hereford, and next day adjourned to the Speech House, in the Forest of Dean, for two days' work; later in the week meeting at Holme Lacey, and at Pontrilas. The season in Herefordshire was not good for fungi, and the mycologists, who came together from all parts of the country, were disappointed, especially as in Cumberland, in North Shropshire, and near London, more particularly in Epping Forest, the luxuriance and abundance of fungi had been remarkable. At the Fungus Foray in Epping Forest, September 8th, 1888, more than one hundred and forty species were found, of which twenty were new to the forest, and five had never before been recorded in Great Britain. The cold damp summer was unfavourable to the fungus crop, especially on the elevated and bleak hills of the Forest of Dean, always cool, and often much colder than the more genial and sheltered districts near. Few societies make a speciality of fungi, but the Woolhope does, and its meetings are generally enlivened by the presence of Dr. Cooke, one of our greatest living authorities, and of the Rev. John Vize, of Forden, whose knowledge of the microscopic species—a most difficult and extensive study—is almost inexhaustible. Mr. Vise has the rare honour of finding that his hearers are sometimes disappointed that his papers are not longer, and he is asked to go more fully into his subject next time.

Last year, though not then a member of the Woolhope, I received an invitation to attend, and, as I expected to meet several old friends and hoped to pick up some information that would be interesting, I set off, making the house of my esteemed friend, Dr. Theodor Linde, of Lydbrook, my headquarters. My friend met me in his usual cheerful fashion and made me feel thoroughly at home, for the fourth time, under his roof. The greatest charm in connection with the annual gatherings of learned societies is not the actual work done or the information acquired, but the meeting with friends whom the engrossing occupations of daily life and distance prevent from often seeing one another. Such reunions mark stages in life's journey; one likes to see the old faces and listen to the familiar voices, and to find out how friends are getting on. Some whom we thought fine fellows stop where they were, not making any headway; others seem weighed down with cares, and some few show, year by year, greater vigour and more than fulfil the promise of early youth. Sometimes, too, with advancing years we find how widely we are drifting apart, and we may be tempted to wonder how such warm friendships were ever formed between us and men who, were they to meet us now for the first time, would repel us.

I determined to walk through the forest, which is close to Lydbrook, and in which I had often passed many pleasant days, and to join the Woolhope Club at Blackpool Bridge. The roads are not very direct, and the landmarks are few; still, nothing venture nothing win. Through Lydbrook, which was very familiar ground, I got all right, and then began inquiring my way to the Danby Lodge Beeches, which the club intended to visit. Near the Coleford Road I met a pleasant-looking young mechanic, and, as his countenance spoke of intelligence and the Board School, I stopped him. Did he know the forest? Perfectly. Had he long resided in it? All his life. Where were the Danby Beeches? He reflected for some time, looked puzzled, and then frankly admitted that he had never heard of them; perhaps I had better ask some one else. Now, asking again in thinly-peopled country places is not always easy, for there is no one to inquire of—the hardy villager greatly preferring the shelter of his fire-side and not wandering farther from home than he can help; however, before long I reached a shut-up toll-gate left to take care of itself, and, after a time, a pleasant woman, evidently the keeper, came up. Did she know the forest? Of course. Then which was the way to Danby Lodge Beeches? The problem was too much for her, she was too old to have been to a Board School; there were, she knew, beeches near Coleford; perhaps I had better go to Coleford and ask there. As that would have been like going from London to Oxford to find the nearest way to Reading, I declined, and went across to the Speech House, asking the few people I met *en route*, all to no avail; no one had ever heard of the Beeches, still less seen them. After leaving the Speech House, to which I had often in other years paid visits, I walked six miles, meeting a few intelligent people, but, though they were most anxious to direct me, their capacity was limited. One worthy fellow, a farmer driving along in a cart, suggested that I should go back a mile and a half, and ask the road, if I found any one sufficiently well-informed, to a Mrs. Joynt's; that excellent woman would put me in the way to some one who could tell me. I declined to be sent back, and still walked on, meeting a few lads and lasses, who had never heard of the great beeches. At last I came to a big boy, clever and obliging; he had passed through the Board School and satisfied the inspectors. He knew it was half a mile, or a quarter, or less than a mile at any rate; you went down there, then over there, and you would come to them; perhaps the best thing would be to go to the Lodge. I took a fancy to that lad—he was so accurate and clear—and, as a mark of esteem, handed him the small change I had in my pocket, which he received with true John Bull composure. But, in spite of his luminous directions, I did not see my way clear to the Beeches, and to them I did not get, though an hour later I overtook the naturalists returning from the Big Trees. One might not get to the Beeches, but there were other things to see, and such men as Mr. Vize, the Rev. William Elliott, President of the Woolhope, Dr. Carlyle of Carlisle, a relative of the great Thomas, and Mr. William Phillips, of Shrewsbury, the laborious author of the volume on the "Discomycetes" in the International Scientific Series, are people whom one cannot help learning much from. Mr. Elliott is a particularly fine specimen of the best type of country clergyman, with all the instincts of the scholar and the gentleman, diffusing around him an atmosphere of refinement and culture; a more polished gentlemen one could not meet with. He has a great reputation as a geologist. Happy the land and the church that boasts of such sons.

The beauties of the Forest of Dean are too well known to call for any long description here. The forest is that extensive, wooded tract of hills stretching from Ross to Lydney in one direction, and to Llandogo and Monmouth in another; not remarkable for large timber, though in places the trees are splendid, there remain many thousand acres covered with wood of respectable size. The chief attraction, however, is the wildness and picturesqueness of the whole, and the exquisite bits of scenery which here and there delight the tourist. Among these natural marvels the rocks near Symonds' Yat are famous, and all the way on to Monmouth, along the valley of the Wye, the same charming landscape continues. The forest is essentially a hilly region, inhabited principally by miners and colliers, who still retain features and habits handed down to them from ruder and more primitive times. The district is not easy of access, and the few railways have an execrable service of trains, especially in winter, where on one line there are no afternoon trains at all.

My knowledge of the fungi lacks completeness and accuracy, but is sufficient to justify me in saying something on the subject. There are at least four thousand species in the United Kingdom, though the majority are microscopic. A definition of a fungus is not easy to frame, and what Dr. M. C. Cooke, of Kew, the author of some of the best and most splendidly illustrated works in the language on the subject, does not attempt, I cannot hope to succeed in accomplishing. Fungi grow almost everywhere—in houses, on wood, in the closed cavities of nuts, in animal tissues, and the *Quelelia mirabilis luxurialis* on tar; in short, fungi grow in and upon everything to which their spores can get access. A blacksmith at Salem threw on one side a piece of iron which he had just taken from the fire; next morning he found on this very piece of metal, lying over the water in his trough, a mass of fungi two feet in length; it had crept from the iron to some wood near, and not from the latter to the iron, and this immense mass had formed in twelve hours. The Rev. M. J. Berkeley saw a fungus on a lead cistern at Kew, and Sowerby found a species growing on some cinders on the outside of the dome of St. Paul's, in London. The great Puff Ball has been known to reach the size of a pumpkin in a night; and Lindley calculated that the cells of which it is made up multiply at the rate of 60,000,000 a minute. Dr. Greville records that a specimen of one of the largest British fungi, the *Polyporus squamosus*, reached a diameter of seven feet five inches and weighed thirty-four pounds; it only took four weeks to reach that size, and grew at the rate of nineteen ounces a day. An individual of this species has been known to reach a diameter of eleven inches in a week. The late Dr. B. W. Carpenter related an instance of the tremendous power which fungi exert in their growth. Basingstoke was, many years ago, paved, and some time later the pavement was found to be uneven; this unevenness increased until some of the heaviest stones were lifted completely out of their places by the growth of enormous fungi underneath. One of these paving-stones measured twenty-two inches by twenty-one, and weighed eighty-three pounds. Dr. M. C. Cooke had a similar incident brought under his notice—a large kitchen hearthstone being forced out of its bed by a fungus. Sir Joseph Banks relates a still more startling occurrence. A cask of wine leaked, and after a time a fungus grew from the leakage, which finally filled the cellar and lifted the cask to the ceiling.

Fungi give off carbonic acid like human beings, and not oxygen, as do other vegetables. This peculiarity is accounted for by the absence of green colouring matters.

The truffle is a subterraneous fungus, never appearing above the surface of the ground. It grows in light, dry soil, and is found in many parts of England—more especially on the Wilts, Hants, and Kent Downs. It is more plentiful in France than with us, and there grows to a larger size and has a choicer flavour. The species most valued, on account of their rich aroma, are those from the oak forests of Périgord. There are three varieties of truffles—the black, the white, and the red or violet. The last is rare, and of the two former the black is held in far higher repute; the white, indeed, is considered of comparatively little value. To be in perfection truffles should be eaten quite fresh, much of their aroma being lost by keeping. The black truffle is nodulated, and ranges in size from a filbert or plum to a closed fist. Inside it is marbled with white, filamentous streaks, which have been thought to be its mycelium. As truffles do not appear above ground, there is nothing to show the place of their growth, and animals trained for the purpose are used to scent them out. In England dogs are the favourites for this work; they scratch and bark over the spot where they grow, and then the truffles are dug out. In France pigs are used instead of dogs. The pig is very fond of them, and on smelling them turns up the ground with its snout in search of them. Truffles are considered, especially on the Continent, articles of the greatest delicacy; their firm, tough texture makes them indigestible, but they are valued for their peculiar aroma. They are seldom eaten alone, and are often used as stuffing, and they also form a frequent ingredient of made dishes, besides being employed to flavour gravies and sauces.

A popular error is to suppose that fungi are eatable, and toadstools poisonous; there is no such line of demarcation, nor, strictly speaking, has the word toadstool any precise meaning. Very many fungi are eatable, the number of poisonous varieties being exaggerated, and it is well known that the common Field Agaric, usually eaten in England, is not the most palatable and wholesome; indeed, in Italy it is condemned and not allowed to be sold in the fungus market, which is there quite an institution.

Mr. Howse, a member of the Woolhope, paid, a few years ago, a visit to the French Botanical Society, and on his return wrote a capital little paper on the fungi, which, while in France, he had closely studied. He mentions that the French fungus forays were originally arranged to promote the use of these vegetables as food. But they do not seem to be gaining ground generally, and the consumption remains small. The main difficulty is cooking them properly, although our neighbours are ahead of us in this respect. At the banquets of the French Society many kinds were eaten. Mr. Howse thought the *Helvella crispa* the best; but in England it is too rare to be of account for the table. At one of the evening meetings an interesting discussion took place on poisonous fungi, and it was generally agreed that the deleterious property of the common fly agaric—the *Agaricus muscarius*—had been much exaggerated, and that most of the poisoning cases recorded in the newspapers were from the *Amanita pantherinus*, which closely resembles the *Amanita rubescens*, the last a species much eaten by the French peasantry. *Amanita mappa* also has an unenviable reputation for destroying human life.

Few foods are more savoury or greater favourites than well-cooked fungi; the *Amanita Caesarea* is said to be the best of all the edible fungi, though as it is an Italian species, and does not develop its flavour in a cold climate, it does not concern us much. Fungi are popularly supposed to be very nutritious, but physiologists now assert that this is an error, and that a given weight will not be found to be as sustaining as would be inferred from their chemical composition. This does not prove that they are not useful adjuncts to food, and as flavouring ingredients they have few superiors. Far greater resort to them ought to be encouraged, and I cannot see why the supply of fungi should not be increased twenty-fold, and in this way a most valuable industry might be developed, or, more correctly, built up. When cultivated in pits and cellars they can be obtained all the year through; few crops are more prolific and so seldom disappoint the grower, while the demand for them is always very great.

A physician whom I met with at the Woolhope Fungus Dinner, at Hereford, last October, told me that, twenty years earlier, he had freely experimented on fungi, and had then eaten many species with impunity. If the smell was pleasant he tasted the raw fungus, and then fried half of it. He rarely suffered temporarily, never permanently, and he believed that most fungi could be eaten with safety; and, as he was a man of great intelligence, and evidently well-informed, his deliberate opinion carried great weight with me.

Dr. Cooke's charming little work on British Fungi contains the following lively passage, which I venture to transcribe: "From amongst the most common of continental modes of cooking them, I have selected several. Having picked a number of freshly-gathered mushrooms, cut them in pieces, wash them in cold water, and dry them in a cloth, then put them in a pan, with butter, parsley, salt and pepper, and place them over a quick fire. When ready, add cream and yolk of egg, to bind them together. Some tastes are in favour of having them dressed *à la Provençale*, in that case they must be cut in two, washed and dried as before, and then soaked in oil for one or two hours with salt, pepper, and a clove of garlic; at the end of this time they should be put into a stew-pan with oil, and cooked over a brisk fire; when done, a little chopped parsley and some lemon-juice should be added. There is a delicacy under the form of stuffed mushrooms, which, although unknown to me by personal knowledge, is so strongly recommended by those who count them amongst their experiences, that I am induced to quote M. Roque's instructions for its preparation. 'Take mushrooms of medium size, and prepare for them at the same time the following stuffing—a piece of butter, grated bacon, some bread-crumbs, sweet herbs, garlic, salt, coarse pepper, and the least morsel of spice; when these are well mixed together, turn the mushrooms over with the concave side upwards, take away the stems and fill the concavity with this stuffing; then wrap each one in paper, and cook it in a pan, adding a spoonful of oil as occasion may require. If thought well a few slices of fowl, partridge, or pheasant may be added.' There is also an economical method, and one which may serve alternately with, or as a substitute for, the slovenly old English plan, which seems to reduce all cooking to three types—roast beef, boiled mutton, and grilled chops and steaks; even mushrooms must be cooked on one of these plans, unless we can induce a change for the better. Having peeled your mushrooms, and removed the stems, place them in a stewpan with fresh butter, and let them stew over a brisk fire; when the butter is melted, squeeze in the juice of a lemon; after a little while add salt, pepper, spice, and a spoonful of water in which a clove of garlic has soaked for half an hour; let them stew together for about an hour, and then add yolk of egg to bind them; pour your stew upon some small crusts of bread which you have previously fried in butter. A charming variety may be found on 'cold mutton days' in hashing the mutton with mushrooms, making what our transmarine neighbours would call 'hachis aux champignons.' For this, two dozen mushrooms should be selected, washed, and well dried, then put in a stewpan with a piece of butter. When the butter is melted, stir in a tablespoonful of flour, two wine-glasses of beef gravy, salt, pepper, and a bay-leaf. These should be cooked until reduced one-half, and then poured over the hashed leg of mutton. The whole should be well mixed together, and served with small crusts of bread fried in butter."

The active chemical principle, which in very rare instances causes inconvenience or even death from eating fungi, is called *muscarine;* it is the same which, I believe, occurs in putrid, poisonous meat, but how it is formed in the latter I do not know. Foul-smelling and repulsive-looking species are rich in it, but most fungi are harmless, and a few country walks in the early autumn, in the company of a well-informed mycologist, would furnish invaluable hints to any person of average intelligence, and teach more than a year in a study or library would do.

We eat and cultivate the *Agaricus campestris*, or common field mushroom; but Dr. Cooke tells me that probably many other species could be as readily cultivated, and that much still has to be made out, and that a wide field lies before the enterprising fungiculturist. I can assure the reader that the *Lactarius deliciosus* and some of the *Agarici proceri* are excellent and abundant, and equal to the sorts held in the highest favour by the general public.

The best method of getting information on this most difficult subject, which cannot be learnt from books, would be to attend lectures on fungi from some practical man. I can imagine the excellent and popular address which such a lecturer as the Rev. John Vize would give; and in such a way, and in it alone, could reliable information be conveyed that would be of service to learners. Scientific mycologists rather pride themselves, it seems to me, on ignoring the utility of fungi as food, and think it a degradation of their subject; but, after all, usefulness ought to play an important part in all scientific pursuits, and the public would be led to see the beauty and value of the study of fungi did some obvious advantage attend it. This year the Woolhope will meet at Hereford on the last day of September, and will then go on to Ludlow to pass a couple of days there in the midst of delightful country. I am sure that the conscientious and able honorary secretary, Mr. H. C. Moore, formerly of the Bombay Engineers, and now of 26, Broad Street, Hereford, would gladly take the names of candidates for the membership of this venerable and excellent Field Club. Membership is, I believe, a matter of half-a-guinea subscription, which entitles to a copy of the annual transactions, so that, should no meeting be attended, the money is well laid out. May this year's reunion be larger, and favoured with warmer weather than the last one, which, however, had exceptional cold to face, and was in marked contrast to the sultry rambles which we enjoyed in 1886.

Wimborne.

ASTRONOMY.

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

Dr. Zelbe has published the result of a new calculation of the orbit of Brook's comet, from which it appears that the orbit is elliptical, and has a period of about $12\frac{1}{3}$ years. Dadvidson's comet is now scarcely one-tenth as brilliant as it was at the time of its discovery.

Mr. Stanley Williams has published an account of the changes he has observed in the markings on the

Rising, Southing, and Setting of the Principal Planets in October.

	D.	Rises. h. m.	Souths. h. m.	Sets. h. m.
Mercury ☿	1	8 27M	1 10A	5 53A
	8	7 52M	0 39A	5 26A
	15	6 39M	11 48M	4 57A
	22	5 26M	10 59M	4 32A
	29	5 0M	10 37M	4 14A
Venus ♀	1	2 50M	9 48M	4 46A
	8	3 11M	9 53M	4 35A
	15	3 30M	9 57M	4 24A
	22	3 51M	10 1M	4 11A
	29	4 10M	10 5M	4 0A
Mars ♂	1	2 49M	9 48M	4 47A
	8	2 46M	9 37M	4 28A
	15	2 44M	9 26M	4 8A
	22	2 40M	9 14M	3 48A
	29	2 36M	9 2M	3 28A
Jupiter ♃	1	1 28A	5 20A	9 12A
	8	1 4A	4 56A	8 48A
	15	0 41A	4 33A	8 25A
	22	0 18A	4 10A	8 2A
	29	11 54M	3 47A	7 40A
Saturn ♄	1	2 16M	9 27M	4 38A
	8	1 52M	9 2M	4 12A
	15	1 28M	8 37M	3 46A
	22	1 5M	8 12M	3 19A
	29	0 41M	7 47M	2 53A

planet Jupiter. Mr. Williams has noted systematically the changes in the appearance of all the spots and markings, which were sufficiently distinct for him to observe them with the needful amount of accuracy. The well-known red spot which was very conspicuous in 1887, has become much paler, but a red or pink tinge is always visible. The period of rotation of this spot is 9 hrs. 55 min. 40 secs., which corresponds with Mr. Denning's determination. Mr. Williams considers that, in the neighbourhood of the equator, the dark markings are generally at a higher level than the light ones, but that this may not always be the case.

The death is announced of the distinguished American astronomer, Professor Elias Loomis, at the age of 78. He was a great worker in many directions. His first noted work was making observations of shooting stars; next, he noted daily, for upwards of a year, the change of the declination in the magnetic needle, and, later on, the dip of the magnetic needle at many places in the United States from the Atlantic to the Mississippi. During the time he held the chair of Natural Philosophy in the University of New York—from 1844 to 1860—he produced a set of text books on mathematical subjects, and afterwards added to these, Astronomy, Meteorology, and Natural Philosophy. More than half a million of these books were called for. His "Practical Astronomy" and "Elements of Astronomy" are well known and highly valued in England.

On Oct. 15th there will be an occultation of η Geminorum; magnitude $3\frac{1}{2}$. The disappearance takes place at 3 hrs. 4 min. morn., and the reappearance at 4 hrs. 21 min. morn.

Oct. 16th, Venus will be nearest to the sun at 1 hr. aft.

In October Mercury will be a morning star in the latter half of the month.

Venus will be a morning star throughout the month.

Mars will be a morning star throughout the month.

Jupiter will be an evening star.

Saturn will be a morning star.

OUR SCIENTIFIC DIRECTORY.

[The Editor will be obliged, if, for the benefit of his numerous readers, secretaries of scientific societies will send notices like the following, also place and time of meeting.]

Hey Stamford Society: President, Rev. S. S. Adkins, M.A.; Secretary, Mr. J. Gartside, Princess Street, Lees, W. Oldham. Meetings held every Tuesday evening at 7·30, in St. John's School, Hey, Lees. First meeting of season 1889–90, last Tuesday in October. Further information from the secretary.

Great Yarmouth Young Naturalists' Society: Hon. Secretary, J. B. Beckett, Trinity Place, Friar's Lane; Treasurer, J. E. Knights.

SCIENCE-GOSSIP.

An Introduction to Botany entitled "Flowerland," by Robert Fisher, M.A., with one hundred and-fifty illustrations, will be issued in a few days by Messrs. Bemrose and Sons.

The three hundredth anniversary of the invention of the microscope will be celebrated by the Executive Committee of the International Exhibition of Geographical, Commercial, and Industrial Botany at Antwerp in 1890. A retrospective exhibition will be got together from all available quarters, illustrating the history of the microscope, as well as an exhibition of the modern instruments of existing workers. A variety of conferences relating to technical and scientific questions connected with the microscope will be arranged.

M. Schloesling (who has long been engaged in researches of a most important nature, relating to the nitrogeneration of the soil) has fairly demonstrated, from experiments made in various soils and under divers circumstances, that there is no soil destitute of germs which can fix the nitrogen of the atmosphere. Mr. Warington long ago showed that the germs in the soil were nitrificating microbes. Is this the real scientific reason why farmers stick to farm-yard manures in preference to "artificials"? They may do it without knowledge, but with experience. Farm-yard manures will certainly develop and prosper the nitrifying micro-organisms in the soil more than artificials would. If so, then the superior nitrification of natural soils by natural manures is explained.

MR. FRED. MATHER, the well-known fish culturist, has been estimating the number of eggs in a six-pound eel in November (in what is known to fishermen as "eel fat," but which are really the ovaries), and credits that eel with fully 9,000,000. Under the microscope he found that they measured eighty to the linear inch, and taking one ovary and dividing it by means of the most delicate scales known to science, he halved, quartered, and further divided the mass seventeen times, until he had a section small enough to count the eggs in it. This section represented 1,131,072 of the total number, and three sections were laboriously counted under the microscope. One of the sections contained sixty-eight eggs, making the total 8,912,896 eggs. The second held seventy-seven eggs, or 10,992,544 in the whole. The third section consisted of seventy-one, from which it would appear that there were 9,306,112 eggs in the eel. Taking the last as the medium number, Mr. Mather figures, in round numbers, that a six-pound eel contained 9,000,000 eggs.

"THE NATURALIST" is publishing every month an important series of papers on the Bibliography of Birds, 1887.

UNDER the title of "The Naturalist's Record," we have to welcome a new competitor. The first number promises well.

PROFESSOR T. RUPERT JONES and Dr. H. Woodward announce, in "The Geological Magazine" for September, the discovery of some new Devonian entomostraca to which they have given the following names:—*Echinocoris Whidbornei*, and *Beyrichia Devonica*.

PROFESSOR LOBLEY'S new illustrated work on Mount Vesuvius—dedicated by special permission to the King of Italy—will be published immediately by Messrs. Roper and Drowley. All geologists will be glad to hear the news.

WE have received Nos. 15, 16 and 17 of Mr. Howard Saunders' "Illustrated Manual of British Birds." They are as full of interesting matter, and as highly artistic figures, as usual.

MR. S. B. J. SKERTCHLY has an interesting paper in "The Annals and Magazine of Natural History" for September, "On the Habits of certain Bornean Butterflies." The most interesting portion is that relating to sexual selection. Mr. Skertchly shows that it is not always the males who are the wooers, and the females the choosers, but that they often change places like bashful bachelors and eager spinsters in Leap year. The wooer is as a rule handsomer than the chooser, as well as more common, but this is not always the case.

THE "Annals and Magazine of Natural History" for September contains an illustrated article by A. Smith Woodward, "On Atherstonia, A New Genus of Palæoniscid Fishes from the Karoo Formation of South Africa." Till this fossil (*Atherstonia scutata*) (now in the possession of the British Museum) was found, the only remains of Palæoniscid fishes from the Early Mesozoic Karoo Series of South Africa consisted of a few detached scales.

WE have received the "Report on the Progress and Condition of the Botanic Garden (South Australia), for 1888," by Dr. R. Schomburgh. The gardens are in a very flourishing condition; and the report gives coloured illustrations of several of the newest and most interesting trees and shrubs planted there.

DR. A. GÜNTHER writes to "The Annals and Magazine of Natural History" with regard to some dredgings made by the Rev. W. S. Green, last July, off the South-Western coast of Ireland. The collections, which were made for the British Museum, are extremely interesting, and add several new species to the British Fauna.

THE Pharmaceutical Conference (which always assembles in the same town as the British Association) appears to have been unusually interesting this year, under the presidency of Mr. C. Umney, F.C.S., F.I.C. The papers read were both highly practical and interesting. As might be expected, from a recent trial for murder, arsenic came in for its full share of discussion.

AN important volume, freely illustrated, entitled "Service Chemistry," will be issued immediately by Messrs. W. B. Whittingham & Co. It is a work upon which Professor Vivian B. Lewes, Professor of Chemistry at the Royal Naval College, has been laboriously engaged for the past year, with a view to bringing the entire subject up to the latest date. Chemistry, as affecting not only the navy and the army, but also the merchant service, is treated with technical detail.

MR. MOND, the President of the Society of Chemical Industry, in his address, gave the result of considerable and varied research, demonstrating that nitrogen in the form of sulphate of ammonia can be recovered from coal on a profitable commercial basis. He says that the loss in gasifying coal in order to recover ammonia from it amounts to about twenty per cent. of the fuel used. From 125 tons of fuel four tons of sulphate of ammonia can be obtained, and beyond that the same result would be obtained from the 125 tons as from 100 tons which had not been treated for the purpose of recovering the nitrogen. That means that twenty-five tons of fuel are consumed to obtain four tons of sulphate, or six and a quarter tons of coal for one ton of sulphate. In coal districts the six and a quarter tons of fuel would cost about thirty-five shillings, and the total cost of producing the sulphate of ammonia would be about £4 10*s*. to £5. As the sulphate is worth about £12 a ton, there is an ample margin for profit and contingent expenses. Mr. Mond points out that the process is one which would prove particularly profitable for large consumers of fuel in districts where coal is cheap; and if only one-tenth of the coal used in this country were treated by it a sufficient supply of nitrogenous compound would be provided to meet the requirements of the whole of the Old World.

A NEW method of preserving butter consists in adding to it a very small portion of salicylic acid dissolved in two parts of lactic acid and ninety-eight parts of water. Little salicylic acid is required to keep butter fresh for an indefinite length of time, not more than one grain being employed for every 100 kegs of butter.

DISCOVERIES of gold quartz are said to have been made in the Voel Vamman range of the mountains in Flintshire. On the north side of the mountain, at Glyn Arthur, a lode has been struck, which, on analysis, yielded three ounces six pennyweights fifteen grains of pure gold to the ton. A Crown licence has been obtained at a royalty of one-fifteenth. On the north-east side of the mountain a lode has been struck eight yards in width, and the analysis is said to show it to be the richest goldfield yet found in Wales. A level has been driven fifteen yards along the course of the lode, and then intersected for a distance of eight yards, and at the end a sump has been sunk a depth of four yards. Quartz taken from the sump shows a yield of seven ounces three pennyweights one grain of fine gold. Thousands of tons of this quartz have been proved in the sett. The gold-mining industry is attracting a large number of men to the locality.

A CONTINUOUS lode of the rare metal Uranium has been discovered at Grampound Road, Cornwall. The ore contains an average of twelve per cent. of the pure metal. It is stated that the market price of the pure metal is £2,400 per ton.

MEASURING WAVES.—The Honourable Ralph Abercromby, while on board the steamer Tongariro, succeeded in measuring the height of ocean waves by floating a sensitive aneroid barometer upon the water. The width and velocity of the waves were also obtained by timing their passage with a chronograph. The biggest wave he encountered was in 55° S. latitude, and 105° W. longitude. It was forty-six feet high, 765 ft. from crest to crest, and had a velocity of forty-seven miles an hour. As the weather was not exceptional for the latitude, Mr. Abercromby concludes that waves must occasionally reach a height of sixty feet, as has been stated by Admiral Fitzroy.

AT the recent meeting of the Royal Archæological Institute in Norwich, Mr. Harmer, the deputy mayor, a well-known geologist, exhibited a "section" of the strata on which the enormous castle stands, and proved to demonstration—that which never has been proved till now, but which in future will not be disputed—that the mound is certainly an artificial structure, and composed almost entirely of "made earth." The inference is very suggestive, compelling us to postulate a very long interval of time between the date of the first erection of such a stupendous earthwork, and its settling down to a condition of solidity firm enough to bear the weight of so vast and ponderous a structure as the immense castle, with its massive masonry, that has never shown the smallest sign of settlement at any point.

THERE are signs and tokens that the crusty stupidity and niggardliness of our English Stationery Office are giving way before public criticism. Here, for instance, is the "Geology of London and Part of the Thames Valley," by W. Whitaker, in two vols. Vol. i., "Descriptive Geology," contains xii. + 55 pages and a folding table. Vol. ii., "Appendices" (Wells, Borings, etc.), contains iv. + 352 pages. It is a first-class and most useful work by a first-class author, and one of which the whole Geological Survey will be proud. Had Mr. Whitaker been an American geologist, and had this volume been published by the U. S. Government, copies of it would have been sent out gratis to every scientific journal and society of note in the world. Our Government never sends out a single copy even for review, so that when our most scientific men have published their best work, the world knows nothing of what they have done. Still, there is hope for the future; for this is the cheapest work (5*s*. and 6*s*.) the office has yet issued.

ZOOLOGY.

MR. BOWMAN'S ANTS.—I have read with interest Mr. Bowman's paper on the Wood-ant in SCIENCE-GOSSIP, for last month. I am not, however, convinced by the experiment which he mentions as proving that ants can hear. As I understand, the bell-glass which he struck was standing on the table, and, in that case, the vibrations would be communicated to the ants through their feet. I would ask him to try again, holding the glass bell in his hands.—*John Lubbock.*

OUR NATURAL HISTORY MUSEUMS.—The British Association Meeting at Newcastle, which commenced on September 10th, has shown no falling off as far as numbers are concerned, or abundance of papers dealing mostly with original work and observation. The President, Professor W. H. Flower, delivered the inaugural address, which related chiefly to museums.

His principal point was when he held that the primary principle which ought to underlie the arrangement of all museums, especially for objects of natural history, was the distinct separation of the two purposes for which collections were made : the first a publicly exhibited collection such as the ordinary visitor could understand and profit by, and the second, for students, so arranged as to afford every facility for examination and research. Professor Flower gave a little advice as to what he considered the beau ideal way of forming a museum. The first consideration is that it should have some definite object or purpose to fulfil ; and the next is that means should be forthcoming not only to establish, but also to maintain the museum in a suitable manner to fulfil that purpose. What a museum really depends upon for its success and usefulness is not its building, not its cases, not even its specimens, but its curator. He and his staff are the life and soul of the institution, upon whom its whole value depends. A museum, like a living organism, requires continual and tender care. It must grow, or it will perish ; and the cost and labour required to maintain it in a state of vitality is not yet by any means fully realised or provided for, either in our great national establishments or in our smaller local institutions. The real objects of forming collections are two, which are quite distinct, and sometimes even conflicting. The first is to advance or increase the knowledge of some given subject. "I believe that the main cause of what may be fairly termed the failure of the majority of museums—especially museums of natural history—to perform the functions that might be legitimately expected of them is, that they nearly always confound together the two distinct objects which they may fulfil, and by attempting to combine both in the same exhibition, practically accomplish neither. In the arrangement of collections designed for research, which, of course, will contain all those precious specimens called 'types,' the principal points to be aimed at are : the preservation of the objects from all influences deleterious to them ; their absolutely correct identification, and record of every circumstance that need be known of their history ; their classification and storage in such a manner that each one can be found without difficulty or loss of time. On the other hand, in a collection arranged for the instruction of the general visitor, the conditions under which the specimens are kept should be totally different. In the first place, their numbers must be limited, according to the nature of the subject to be illustrated and the space available. None must be placed too high or too low for ready examination. There must be no crowding of specimens one behind the other, every one being perfectly and distinctly seen, and with a clear space around it. Every specimen exhibited should be good of its kind, and all available skill and care should be spent upon its preservation and rendering it capable of teaching the lesson it is intended to convey. Every specimen exhibited should have its definite purpose, and no absolute duplicate should on any account be permitted. Above all, the purpose for which each specimen is exhibited, and the main lesson to be derived from it, must be distinctly indicated by the labels affixed, both as heading of the various divisions of the series and to the individual specimens."

BOTANY.

Mounting Plants.—In "Nature" for Sept. 5th, Dr. John Wilson proposes a new method of mounting dried plants. Short strips of lead, such as is used in packing tea, are passed through slits in the paper on each side of the part of the plant to be fastened, and the ends then bent over on the back of the sheet.

The London Catalogue.—I am perplexed as to the exact meaning of the letters a, b, c, etc., placed before varietal names in the "London Catalogue." For example:—(1) *Thalictrum minus.*—a. *maritimum;* b. *montanum;* c. *flexuosum.* (2) *Viola odorata.*—b. *alba;* c. *permixta;* d. *sepincola.* Will you kindly oblige me by saying if I am correct in thinking that all our plants of *T. minus* can be referred to one of these three forms, whilst, in the second case, there is a true *V. odorata*, and in addition, three forms, b, c, and d.—*T. N. Woodhead.*

NOTES AND QUERIES.

Clutches of Eggs.—Your charming publication should most certainly not be the place for a display of vindictiveness, but as I have been so pointedly attacked by two of your correspondents, I hope I may be allowed to say a word or two. To satisfy Mr. Wheldon's curiosity, I beg to inform him that I have not collected the eggs of other birds on the same scale that I have those of the sparrow, but, if I wanted a long series of clutches of any particular bird, I should not hesitate to obtain them. When any one attempts to be sarcastic, it is as well to be in possession of facts ; I therefore think it would have been quite as well if Mr. Wheldon had put himself in possession of the fact that the eggs in question were not collected in the immediate vicinity of Royston, thereby making sparrow clubs unnecessary ; but were collected over an area of more than twenty thousand acres of purely corn-growing land. I also wish to ask Mr. Wheldon if he has, during the seventeen years' collecting in which he prides himself, given to the public in statements and figures any of the oological peculiarities and phenomena he must have met with. I should also like to know if the one specimen egg-collecting, which Mr. Blugg so strongly advocates, has ever been instrumental in elucidating any peculiarities or previously unrecorded facts ; if not, I fear such collecting must be of a rather schoolboy character. I always look to your field and other notes with considerable interest for any scraps of fresh or novel information, and I most sincerely hope when any fresh subject is broached in your journal it may be met in a friendly spirit, not with ridicule and contempt, by those who should try to promote investigation instead of checking it. I beg to state that I feel in no way subdued by the odium heaped upon me for collecting eggs in clutch, and also for stating that there is most probably some relation between the colour and fertility in the eggs of wild birds, and I hope shortly to have more to say on these subjects, backed up by facts or very strong evidence.—*Joseph P. Nunn.*

QUERY CONCERNING CATERPILLARS. — The writer is desirous of having the opinion of readers of SCIENCE-GOSSIP as to whether the caterpillars, which for first few weeks in the spring of the last two or three years, have destroyed the leaves and, in some cases, the blossoms of the apple, plum, rose, hawthorn, oak, &c., can be connected with the wholesale way in which our small birds are killed and their eggs taken.—*W. J. Weston, Beckley, Sussex.*

EGGS OF THE COMMON SNAKE.—A man brought me a few days ago a batch of eggs which he had found in a manure-heap. I counted over one hundred and fifty in the batch, which he said was compact and all in one place. I was surprised at the number. Do several snakes ever lay in one spot? Country people say they do not; but this large number could never have come from one female. There is considerable uncertainty and error in Natural History books about the number. In Tate's British Reptiles it states that it is from sixteen to twenty: and the Rev. J. G. Wood gives fifteen to twenty, further stating that they are laid "in strings," which is not the case. But one I had in captivity last year laid thirty-one all at one time. I should be glad if any of your readers could throw any further light on the subject.—*Henry Ullyett.*

RED SPIDER.—On preparing some specimens of *Rubus corylifolius* a few days days ago for pressure, I had occasion to unroll several leaflets which contained spiders and their nests. The creatures were not very small; colour, red with a line of white chevrons down the centre; the bag, in which the eggs were enclosed, was of a dull green colour. As I have never met with it before, I should be glad to know if the species is a rare one.—*E. de C.*

HELIX ACULEATA.—Whilst staying at Truro I found five *H. aculeata* in a lane under some dead leaves. The locality was about half-way between Truro and Rosedale, and was distant about a mile from either place. This is, I believe, the first recorded find in Cornwall.—*Frederic H. Harvey,* 41 *Hugh Street, S.W.*

NOW, MY LITTLE BOY, CAN YOU TELL ME WHERE THE MÅLSTRÖM IS?—Avast, my teacher, can you in person answer this question? It used to lie betwixt the islets of Vaerö and Lofotodden, and now we hear of its being off the shore at Svolvaer, and aboune the Salten Fjord; and the latter are reputed to be the greater and more terrible whirlpools. Some there are who plainly tell us that the målström is all a myth, and certainly the capsizing and boat-sucking occurs during winter storms, when waves run rough. It has been suggested that some of our steamboat proprietors should ship a scientific man with a stomach for the matter and visit these eddies, at the full of the moon, to test their strength and gyration, and tell us truly, for what the skipper doubts the cabin-boy will still believe. If not all a myth, the målström they say may yet prove phenomenal on the pages of history, or it may continue as a rich repast for the fancy.—*A. H. Swinton.*

"ANIMALCULÆ."—In his short but interesting article on Leprosy, why does "Medica" use the above barbarism? There is, or ought to be, no such word. It implies a plural to *animalcula*, which itself is the plural of *animalculum*, English *animalcule*, plural *animalcules*.—*W. P. H.*

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.

H. M.—In reply to query *re* manufacturer of rack boxes, I beg to give the name of Mr. T. Middleton, 19 Shepherdess Walk, City Road, N. He has always made boxes for me, and always given satisfaction. The father is dead, and the son (seventeen years) supports his mother and five brothers and sisters.—F. E.

J. W. KING.—All exchanges are inserted gratis if they do not exceed three or four lines. Some exchangers prefer *twenty;* but this is obviously unfair to those who loyally keep to the rule, and might even be considered selfish. *Verb. sap.*

G. E. S. (Oldham).—We are under the impression that the "Naturalist's Note-Book" is not now being published, as we have not seen a copy for some time back.

R. W.—We could not insert your exchange, as it would have run to thirty lines, and only three, or at most four, lines are allowed, unless paid for as an advertisement.

EXCHANGES.

WANTED, "Knowledge," No. 4 of vol. i., and index; also index to vol. iii., first series.—C. Carus-Wilson, Althome, West Bournemouth, Hants.

WANTED, a good microtome in exchange for foreign microscopic specimens, mounted.—M., Ferndale, Brondesbury Road, London, N.W.

WANTED, books on lichens in exchange for Wood's "Insects at Home," "Zoologie," by Milne-Edwards, "L'Anthropologie," by Paul Topinard, "Text-Book of Botany," Prantl and Vine's "Northern Microscopist" (4 vols.), Cassell's "Natural History" (6 vols.).—Thos. Hebden, Cullingworth, Bradford, Yorks.

OFFERED, 300 or 400 specimens of fossil shells from the Paris basin, in exchange for British tertiary fossils, land, freshwater and marine shells, or prehistoric implements.—Monsieur Louis Giraux, 22 rue Saint Blaise, Paris.

OFFERED, *Sph. lacustre, Unio margaritifer, P. contecta, P. glaber, P. dilatatus, P. contortus, L. palustris, Succ. Pfeifferi, Z. glaber, Z. purus, H. pygmæa, H. sericea,* &c. Wanted, *Pecten septemradiatus, Venus lincta, Donax politus, Mya arenaria, Pholas dactylus,* and many others.—F. C. Long, 8 Cog Lane, Burnley, Lancs.

WANTED, some portions of freshwater sponge, with gemmules, from the Exe, or from rivers or streams in Suffolk or Norfolk, in spirits, put up fresh from water, in bottles 3 inches by 1 inch. Writer will gladly pay postage for above, if any reader of SCIENCE-GOSSIP will oblige by sending him during October.—Joseph Clark, F.R.M.S., Hind Hayes Street, Somerset.

WANTED, a microscope by Swift, or other leading maker, in exchange for scientific works of authority, copiously illustrated with coloured plates and engravings, viz.: Houghton's "Freshwater Fishes," Couch's "British Fishes," Pritchard's "Natural History of Man," Harvey's "British Marine Algæ," Schubert's "Natural History of the Vegetable Kingdom;" also Balfour's "Botany" (Treasury of Natural History), Rymer Jones' "Animal Creation," and other works.—J. Asher, 8 East Grove, New Basford, Nottingham.

OFFERED, L. C., 8th ed.:—99, 189, 620, 923, 939, 1060, 1081, 1669. Desiderata, 26, 86, 106, 371, 374, 466, 652, 980, 1136, 1556, 1591, 1597, 1603, 1635, 1704, 1776; also lepidoptera (local), and hymenoptera (bees).—E. D. Bostock, Stone, Staffordshire.

WANTED, works on natural history by the following authors: J. G. and T. Wood, Hartwig, R. Jefferies, Grant Allen. Jefferies' "Story of my Heart" wanted; good exchange.—A. W. Nott, 75 Waterloo Road, S.E.

WANTED, *Cardium aculeatum, echinatum; Pinna rudis, Pectenculus glycerimus, Mactra glauca, Psammobia vespertina, Tellina squalida, Scaphander lignarius, Mya truncata, Venus verrucosa, casina, chione; Tapes aureus, virginea.* Good exchange given in British and foreign shells, hooks, and foreign stamps.—Mrs. Heitland, The Priory, Shrewsbury.

Hydrobia similis and *Helix cartusiana* offered for other land or freshwater shells. Rare varieties of *H. nemoralis* or *hortensis* acceptable, but only rare ones, as I have a very large number.—Rev. J. W. Horsley, Holy Trinity Vicarage, Woolwich.

WANTED, any English fossils, insects or shells. Offered, Cape shells, insects, or dried plants. Correspondence invited. —Joseph W. King, Fairford Farm, Cathcart, Cape Colony.

SCIENCE-GOSSIP, Nos. 163, 181–6, 189, 192, 240, 247, 251, 270–2, 277, for exchange. Wanted, Davis's "Microscopy," or Adams' "Collector's Manual of British Land and Freshwater Shells," or offers.—J. B. Beckett, Trinity Place, Friar's Lane, Great Yarmouth.

DUPLICATES.—*A. fluviatilis, A. cygnea, B. tentaculata, C. rugosa, C. lubrica, H. arbustorum, H. aspersa, H. caperata, H. ericetorum, H. hispida, H. hortensis, H. nemoralis, H. rotundata, H. virgata, L. peregra, Physa fontinalis, P. umbilicata, S. corneum, S. putris, V. piscinalis, V. pellucida, Z. celarius, C. Europa, S. siliqua, P. opercularis, D. entale, Tapes palustra, T. tenuis, N. catena, M. stultorum, M. solida, F. antiqua.* Desiderata: land, freshwater, and marine shells (British or foreign), or lepidoptera. Lists to—W. Turnbull, 1 Horne Terrace, Edinburgh.

OFFERED, sections of *Clausilia rugosa* and *laminata*, showing the clausium in situ, and sections of other shells; also fine specimens of *A. cygnea*, var. *intermedia*. Wanted, foreign or British shells not in collection. Foreign correspondence desired.—F. Rhodes, M.C.S., 26 East View, Eccleshill, Bradford, Yorkshire.

OFFERED, six polished mahogany glass cases, sixteen inches square, containing about 327 specimens of butterflies, moths, dragon-flies, and one or two beetles, mounted on covered cork; flanged lid, fitting inside, and being same depth as tray. Photo on application. Wanted, ¼-plate camera and accessories, or what offers?—J. G. Dufty, New Church College, Devonshire Street, Islington, N.

WANTED, good specimens of *Helix pomatia, cantiana, cartusiana, rufescens, fusca, caperata, rupestris, pulchella*, and *obvoluta*, in exchange for Cape stamps (used), post-cards, newspaper bands, registered envelopes (new), duplicate specimens lepidoptera, pupæ, larvæ, and ova.—Mrs. Smith, Monmouth House, Monmouth Street, Topsham, S. Devon.

OFFERED, 100 good fossils (all named) from cretaceous, oolitic, liassic, carboniferous, and silurian. Wanted, silver watch, good timekeeper.—Charles Wardingley, Blackwood Crescent, Edinburgh.

STARK'S "British Mosses," Plue's "British Grasses" (both new), Newman's "British Ferns," and Moore's "British Ferns," in exchange for De Bary's "Comparative Anatomy of the Phanerogams and Ferns," or Goebel's "Classification and Special Morphology of Plants" (Clarendon Press).—T. J. Porter, Perranarworthal, Cornwall.

WANTED, good foreign stamps; will give books, micro-slides and material, or British land and freshwater shells in exchange.—A. Alletsee, 1 South Villa, Kensington Road, Redland, Bristol.

OFFERED, British shells, birds' skins, &c., in exchange for butterflies and moths.—T. A. Lofthouse, 67 Grange Road, Middlesbro'.

WANTED, *Sphærium rivicola, Dreissena polymorpha, Cochlicopa tridens, Helix pisana*, and *Physa hypnorum*, in exchange for *H. ericetorum, caperata, virgata; Neritina fluviatilis, Planorbis nautileus, Paludina contecta*, and *Succinea elegans*.—Alfred A. Moore, 1 Grove Place, St. Giles' Road, Norwich.

Helix damarensis, from South Africa, in exchange for any of the following: *L. peregra*, var. *Burnetti, H. obvoluta*, or *H. pomatia*.—Arthur G. Baker, 97 Upper Kent Street, Leicester.

EXCHANGE.—Smith and Beck's Universal Microscope, with three eye-pieces, 1-inch and ⅙-inch objectives, camera lucida, mechanical stage; all fitted in a mahogany cabinet.—J. W. Horton, Brayford Wharf, Lincoln.

WANTED, two Jubilee sixpences, first issue. Will give in exchange SCIENCE-GOSSIP for 1887 and 1888, unbound, also lot of miscellaneous music, vocal and instrumental. A great bargain.—W. Mathie, 127 Buchanan Street, Glasgow.

WANTED, foreign reptiles and small rodents, alive.—W. Hannan Watson, 219 St. Vincent Street, Glasgow.

WANTED, a secondhand silver watch, to present to a youth, in exchange for rare microscopic objects and rare British shells, or state requirements to—Thomas Edward Sclater, jun., Bank Street, Teignmouth, Devon.

OFFERED, *Rissoa fulgida, R. membranacea, R. punctura, R. cingillus, R. costata, R. parva, V. interrupta, R. inconspicua, R. cancellata, R. striata, Lacuna pallidula* (yellow type), *L. puteolus, Scalaria clathratula, Lachesis minima, Eulima polita, E. distorta, Cerithium perversum, Odostomia nivosa, Cerithiopsis Clarkii*, in exchange for slides of rock. Wanted, a *Mactra helvacea*. Will give recent objects for the micro in return, or shells.—A. J. R. Sclater, M.C.S., 23 Bank Street, Teignmouth.

DREDGINGS, soundings and siftings, containing foraminifera, for other similar material containing mollusca.—J. T. Marshall, Sevenoaks, Torquay.

WANTED, mounted micro-photos and foreign shells, in exchange for choice microscopic slides, anatomical, parasites, diatoms, double-stained botanical, &c.—Suter, 5 Highweek Road, Tottenham, London.

JAPANNED tin entomological collecting box, 11½ inches by 8 inches, corked both sides, hardly used. What offers? Books or insects preferred.—Rev. W. W. Flemyng, Clonegam Rectory, Portlaw, co. Waterford.

DESIDERATA.—*P. nitidum, roseum; B. Leachii, V. cristata, L. glutinosa, S. oblonga, Z. excavatus, H. cartusiana, revelata, obvoluta, lamellata, pygmæa; P. ringens, C. biblicata, A. lineata*, and any of the vertigos. Duplicates, other land and freshwater shells.—T. A. Lofthouse, 67 Grange Road, Middlesbro'.

EGGS.—Duplicates of eider duck, oyster-catcher, herring gulls, Arctic and common terns, razorbill, curlew, night-golden plover, ringed plover, jar, puffin, tits, pipits, green woodpecker, pied flycatcher, wood and willow wrens, and many others. Desiderata.—Wheatear, stonechat, warblers, twite, redwing, starling, rock and stock doves, black grouse, Kentish plover, tree sparrow, swift, whimbrel, heron, bunting, wild duck, grebes, cormorant, ruff. Send lists to—Arthur Hollis, Manthorpe Road, Grantham.

I HAVE a few spare English specimens of *Physa acuta* (Drp.) which I shall be pleased to exchange for any of the following: *S. oblonga, H. lamellata, H. revelata, H. obvoluta, V. substriata, V. angustior, Acme lineata, L. involuta*, or *Bulimus Goodallii*.—J. W. Williams, 35 Mitton, Stourport, Worcestershire.

FOREIGN land and freshwater shells wanted. Will give in exchange English land and freshwater.—J. W. Williams, 35 Mitton, Stourport, Worcestershire.

OFFERED, cone in cone and slaty band ironstone, porphyritic, banded, spherulitic and ordinary pitchstone, prehnite, torbaneite, Osmonde stone, various serpentines, also a number of carboniferous plants, &c., in exchange for graphite, elaterite, stinkstone, emery, chryolite, wavellite, chrysolite, natrolite, labradorite, landscape marble, &c.—Robt. Pettigrew, jun., Gartlee, Airdrie.

ENGLISH and foreign coins, ancient and modern, desired in exchange for other coins, rare stamps, philatelic publications, birds' eggs, useful articles, curiosities, &c. Complete lists from collectors, with all particulars, requested and forwarded. —A. J. Palethorpe, Bingham, Notts.

WANTED, *Cyclostoma elegans, Paludina vivipara*, with *opercula*. Offered, *Nucula nucleus, Tellina balthica, Tro. ziziphinus, Natica catena, P. lapillus.* Good foreign shells also wanted, in exchange for nat. hist. books, &c.—W. J. Jones, jun., 27 Mayton Street, Holloway, London, N.

BOOKS, ETC., RECEIVED.

"Annual Report of the Board of Regents of the Smithsonian Institution."—"The Amateur's Zoo," by A. Patterson, and "Poultry; their Varieties, &c.," by E. Brown (London: Dean & Son).—"The God of the Children: or, How the Voices of Nature Speak to Us," by Bedford Pollard (London: Elliott Stock).—"Illustrated Manual of British Birds," Nos. XV., XVI., XVII.—"The Microscope."—"The Naturalists' Record."—"Essex Naturalist."—"The Sanitarian."—"Insect Life."—"The Entomologist."—"Annals and Magazine of Natural History."—"The Century Magazine."—"The Amateur Photographer."—"The Garner."—"The Naturalist."—"The Botanical Gazette."—"Belgravia."—"The Gentleman's Magazine."—"The Midland Naturalist."—"Feuille des Jeunes Naturalistes."

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

CONCERNING CERTAIN FRUIT TREES.

By MARY B. MORRIS.

No. III.—Apple and Pear Trees.

AS these two fruits are botanically very closely allied, both being included in the genus Pyrus, they may well be classed together in our "jottings" upon their origin and history.

The apple has, indeed, a very early history, and though so many varieties have been introduced in the course of the thousands of years during which they have been favourite and familiar fruits, that before our American cousins brought their new and beautiful varieties to swell the numbers, we could count about fifteen hundred kinds, yet it is asserted that the earliest kinds differed so little from some of the fruits we now cultivate that they may even be said to be identical.

Careful researches made in the pile huts of the Swiss lake dwellers of the stone age have resulted in the discovery there of many apples, indicating plainly that the fruit was used in very large quantities, and that these pre-historic men dried their apples for winter use. Many specimens have been met with dried, and also many carbonized by the action of fire; and when in this latter state, the internal structure of the fruit is better preserved and more easily recognised. A German author who enters into the minutest details of the discoveries made, distinguishes and describes the distinct kinds of apples differing in size, the one being twice the size of the other kind, and corresponding with an apple which still grows both in Germany and Switzerland. "The other, the smaller kind," he says, "is found in such abundance amongst these relics of a past age, as to suggest the probability of its having been a wild apple. Investigations made in the lake dwellings of Italy have led to similar discoveries. The conclusion to be drawn from these facts seems to be that the apple is indigenous in these two countries, at any rate."

Philologists assert that every one of the ancient languages has its own word for apple; which we may accept as a strong reason for assuming that in every country, whose language named the fruit, it was a native tree, and this being so, it must have been indigenous throughout a very widely-extended area.

On the other hand, pears have been found but rarely in these lake dwellings, and when they have been discovered, were usually cut lengthwise, in which state they had evidently been dried. Accompanying circumstances, however, seem to indicate that these pears do not belong to a period earlier than the foundation of Rome, or, perhaps, to that of the Trojan war. The mural paintings of Pompeii abound with examples of the pear tree with its fruit, and ancient writers give interesting and minute descriptions of many varieties with which they were acquainted. The fruit is mentioned under three different Greek names by Theophrastes and Dioscorides. Pliny, who calls it by its Latin name, "Pyrus," says there were forty-one varieties cultivated in his time. "All the world," he says, "are extremely fond of the Crustumian pear, and next to it comes the Falernian, so called from the drink which it affords, so abundant is its juice. This juice is known by the name of milk, in the variety, which, of a black colour, is by some called the pear of Syria."

Various methods of keeping the fruit seem to have been adopted, which have probably fallen into disuse. Thus: they were placed, we are told, in earthen jars which were pitched inside, the jars, when filled, were reversed and buried in pits. Of the Amician pear we are told, "it keeps well in raisin wine." It seems certain that both the Greeks and Romans made cider, or rather perry, using for this purpose the *Pyrus sylvestris*, whose acid fruit is well suited to the purpose.

Of this, or a similar kind, is the French, "Poirier à cidre," which has become wild in many of the forests in France. The *Pyrus nivalis*, or snow pear, though not found in England, is largely cultivated in Austria, some parts of Germany, Italy, and France; its specific name, as well as its German name, "Schneebirne," being given it from the fact of its being made into a conserve by the Austrian peasants when the mountains are covered with snow. But I must not enter into further descriptions of the varieties, which being "so many," says Gerarde, "to describe them apart, were to send an owl to Athens, or to number those things that are without number."

We do not know whether the apple is really a native of Britain, though our Anglo-Saxon forefathers knew it, and from their name "æppel" is derived our English "apple."

There is extant the roll of the household expenses of the Countess of Leicester, a daughter of King John, in which the only fruits mentioned are apples and pears, and from this period at least considerable attention appears to have been paid to the planting and cultivation of both fruits, whenever, that is to say, the warlike spirit of the age did not interfere with the pursuit of so peaceful an art as that of gardening.

Still we find Gerarde, four centuries later, writes with great earnestness, endeavouring to persuade his readers to more energy in this direction. "I have seen," says he, speaking of apple trees, "in the pastures and hedge-rows, about the grounds of a worshipful gentleman, dwelling two miles from Hereford, called Mr. Roger Bodnome, so many trees of all sorts, that the servants drank for the most part no other drink but that which is made of apples. The quantity is such that by the report of the gentleman himself, the parson hath for tithe, many hogsheads of cyder; the hogs are fed with the fallings of them, which are so many that they make choice of those apples they do eat and will not taste of any but the best. An example doubtless to be followed of gentlemen that have land and living. But envy saith, the poor will break down our hedges and we shall have the least part of the fruit. But forward in the name of God, graff, set, plant and nourish up trees in every corner of your land. The labour is small, the cost is nothing, the commodity is great. Yourselves shall have plenty, the poor shall have somewhat in the time of want to relieve their necessity, and God shall reward your good minds and diligence."

Other somewhat less important reasons he no doubt recognised, which should lead to the cultivation of the fruit in the numerous remedies for which he prescribed its use.

Amongst these are some which might even now find favour with the fair sex, if they will but give them a trial. Here are one or two of his suggestions: "There is likewise made an ointment with the pulp of apples and swine's grease and rosewater; which is used to beautifie the face and to take away the roughness of the skin, which is called in shops, pomatum, of the apples whereof it is made. Apples cut in pieces and distilled with a quantitie of camphere and buttermilk, take away the scarres and marks gotten by the small pockes, being washed therewith when they grow into their state and ripeness; provided that you give unto the patient a little milke and saffron, or milke and mithridate to drink, to expell to the extreme parts the venome which may lie hid, and as yet not seene." Were the old "Master in Chirurgerie" to know the perfection to which apples have now been brought, and could he see the vast cargoes which each year are brought us from America, he would surely rejoice in the fact of the extended cultivation of the tree!

Pears, too, have received abundant attention of late years, and though our climate is scarcely warm enough for the maturing of the more luscious sorts, we have still a very considerable number of varieties under cultivation, and for the rest may be well content to derive our supply from more favoured climes.

My "jottings" on apples and pears must conclude by commending to all concerned the words of Evelyn in his "Sylva." "I do only wish—upon the prospect and meditation of the universal benefit—that every person whatever, worth ten pounds per annum, within Her Majesty's dominions, were by some indispensable statute, obliged to plant his hedge-rows with the best and most useful kinds of fruit trees . . . . Undoubtedly, if this course were taken effectually, a very considerable part both of the meat and drink, which is spent to our prejudice, might be saved by the country people, even out of the hedges and mounds, which would afford them not only the pleasure and profit of their delicious fruit, but such abundance of cyder and perry, as should suffice them to drink of one of the most wholesome and excellent beverages in the world."

INSECTS AND THE COLOURS OF FLOWERS.

I AM sure all your readers must have been interested in the discussion in your pages on the development of the colours of flowers through insect selection, and possibly those who have been accustomed to look upon the brilliant colouring of flowers only as related to insects, may have been astonished to see how much still needs to be proved before the insect-selection theory can be accepted in its entirety. Without joining in this discussion otherwise than to relate a few observations made here in the West, I would yet call attention to the papers read by Mr. P. Geddes at the Linnean Society, on April 21st and November 17th, 1887. In these papers Mr. Geddes points out that certain characteristics of the inflorescence cannot be due to natural selection, and urges that flowers are due to a katabolic change in vegetation, the reproductive function subordinating the vegetative one—"the reds and yellows of flowers (as of spring and autumn foliage) being simply the imperfect vegetation of immaturity, reproduction, and decline." He does not deny that insect-selection may have had its influence, but regards it as at best of secondary importance.

This summer, while wandering in the mountains of Western Custer County, Colorado, I have made the following observations, which, although scanty, may have some slight bearing upon the matter.

1. The more showy and numerous flowers are yellow, and these attract large numbers of insects.

2. I incline to the opinion that insects cannot distinguish between red and yellow. This is fully discussed in connection with a spider of the genus *Misumena* in "Canad. Entom.," Sept. 1888, p. 176.

3. *Vanessa cardui* is very abundant, and seems decidedly to prefer yellow flowers, especially those of *Hymenopappus filifolius.*

4. 12,000 feet altitude. *Brenthis* species at flowers of *Achillea millefolium.*

5. Over 12,000 feet altitude on the bare ground above timber line, the extraordinary nodding *Cnicus eriocephalus* is conspicuous. Its bright chrome-yellow flowers are frequented by *Bombus.*

6. 10,000 feet altitude. *Bombus* visiting the pale yellowish flowers of *Cnicus Parryi* and the pink flowers of *Epilobium angustifolium.*

7. *Colias Alexandra* seems fond of yellow flowers, and also visits *Epilobium angustifolium.*

8. *Bombus* visits the flowers of *Calochortus Gunnisoni* and *Sidalcea candida*, both white and regular.

9. *Chrysophanus* visits flowers of *Galium boreale.*

10. *Gnophæla vermiculata* is frequent on the yellow flowers of *Gymnolomia multiflora* and *Senecio.*

11. *Argynnis* and *Bombus* visit pink *Cnicus* flowers.

12. The brilliant yellow flowers of *Rudbeckia laciniata* attract many insects; *Vanessa atalanta*, *Satyrus Charon*, *Argynnis*, *Grapta*, *Bombus*, and many other lepidoptera, hymenoptera, &c.

13. *Limenitis Weidemeyerii* visits the flowers of *Achillea millefolium* and *Epilobium angustifolium.*

14. *Neophasia menapia* visits *Senecio* flowers.

15. *Bombus* visits the blue and specialised flowers of *Aconitum Columbianum* and *Delphinium.*

16. A bee was observed visiting the whitish flowers of *Geranium Richardsoni*, and passing by the blue flowers of *Aconitum Columbianum.*

These notes are collected impartially, without any idea of favouring one or the other view. Most of them do not bear upon the immediate question of bees and blue flowers, but they seem to show that here insects have no preference for blue, and even bees are quite content with white.

T. D. A. COCKERELL.

West Cliff, Colorado.

THE RUDIMENTARY INTELLIGENCE OF THE INFUSORIA.

By A. C. DEANE.

ALTHOUGH the ever-interesting "inhabitants of a drop of water" have been of late years the subject of prolonged and careful study, great uncertainty still exists, not only with regard to the manner in which their various vital functions are performed, but even as to their true relative place in the scale of creation. There are many forms which are still bandied about between the animal and vegetable kingdoms; there are others which have been permanently transferred from the one to the other. Theories are often started as to whether some forms, which have hitherto been classified as different species or even genera, are not in reality immature forms of other well-known individuals.

So much with reference to their bodily structure; with reference to their comparative intelligence there has been but little difference of opinion. It seems to have been universally agreed by physiologists that these minute species of protoplasm, as they have the lowest bodily structure, have also the lowest mental development. The complete decentralisation of the organs of sense must, they urge, result in a corresponding smallness of intelligence; the intelligence must be minute since the physical structure of the creature is what it is.

Now, as a theory, this is all-sufficient; but if by long observation we have convinced ourselves of the fact that these forms possess a far higher degree of intelligence than that attributed to them by this theory, what are we to do? Are we to endeavour to fit our facts to our theory, as is so often done, by supposing that these movements and actions, which we have ascribed to intelligence, are in reality due to rudimentary instinct, and to unconscious instinct alone? Or are we to fall back on a second hypothesis, to deny the hitherto received rule, and maintain boldly that the lowest mental development does not necessarily co-exist with the lowest physical structure?

Let us take each of these points separately.

In the first place, I do not think that any one who has studied the Infusoria with any care will deny them the possession of this intelligence; it is unnecessary to multiply instances, they will appear to any who take the trouble to look for them. But if we merely examine under our microscope a drop of water containing Infusoria, we shall at once be struck by the seeming bustle and activity of life within it. If we watch, for instance, a Paramœcium in search of food, as he hunts amid a fragment of flocculent vegetable matter, we shall note how he systematically and carefully begins at one end and progresses regularly to the other, how he rejects some of his find as unpalatable, how he uses his cilia at one moment for locomotion, and at another for making currents which bring food to his mouth, and how, in his rapid motion, he makes straight from one point to another, yet deviating of his own accord if any obstacle presents itself in his path, and how, if he is hemmed in, he will poke about in all directions for an exit, and, finding none, will resolutely force his way through the barrier. Now all these actions may not seem to show any great intelligence, yet what do they imply? One and all show a distinct power of reasoning. When the Paramœcium selects particular spots for obtaining food, he reasons that these places will be most productive of what he requires. When he uses his cilia at one time as organs of locomotion, and at another to procure food, in each case he, unconsciously probably, reasons what the effect in each case will be. When he avoids an obstacle in his path, it is from a direct process of reasoning, which tells him that the result will be unpleasant if he does not do so.

But, perhaps, it will be urged that these actions are due to so-called "instinct." Now, if this be so, one of two hypotheses is true, the instinct must be either (1) innate, or (2) inherited; but if it be innate, it was in the first place obtained by reasoning, although by long habit the result only is retained, while the inductive steps which led to it are discarded. It is like a child, wishing to find out what 12 times 12 are, who has to go through the entire series, beginning 12 times one are 12, 12 times two are 24, and so on; yet afterwards he will know instinctively that 12 times 12 are 144, without repeating the steps which led up to it. Nevertheless, the reasoning must have been performed once, and is instinctively, though not consciously, employed every time afterwards.

In the same way the actions of the Paramœcium may have become instinctive, but if that instinct be innate, as distinguished from hereditary, the chain of reasoning must, none the less, have been performed by that individual at some former time.

The question of heredity instinct is, of course, in such a case, an impossible one; as it must imply that there was once an exceptionally wise Paramœcium, who did all the reasoning for himself and his descendants, and who transmitted his instinct to all succeeding generations. The existence of such an infusorial Solomon is at least improbable.

So much for the intelligence of the Infusoria; it is not great, but it is something. Now let us go a whole family higher up, and we find sea-anemones. Let us go two families higher, and we find the Rotifera, some of which, so to speak, grow on stalks and there remain all their life, for the existence of Melicerta is but little removed from this. Do sea-anemones and Melicerta show intelligence in the way the humble Paramœcium does? We think not. We ought then surely to conclude that mental development does not necessarily vary directly with physical structure. These creatures are Protozoic, are they necessarily Protopsychic? Too little is known of them to speak with any certainty; it is as impossible as it is undesirable to dogmatise on such a subject. We would merely offer as a suggestion, that we must not be too hasty in laying down the law that the mental development in every animal must necessarily be on a strict equality with the physical.

BOXES FOR SLIDES.

In reply to H. M. Cases for the purpose can be obtained from several of the dealers in microscopical appliances, but as they come rather expensive where the number of mounts is large, the following is a good plan.

Get a carpenter to make a deal box, of which the inside measurements are $7\frac{1}{2}$ by 8, and say 3 in. deep (if deeper the box becomes too large to grasp comfortably in the hand). The lid should hinge on

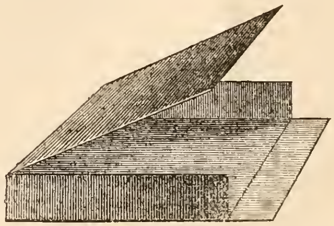

Fig. 144.—Box.

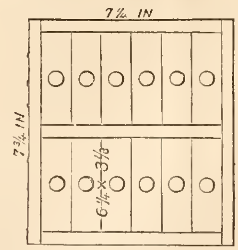

Fig. 145.—Tray.

one of the $7\frac{1}{2}$ in. sides, and the opposite side of the box should let down flat by means of a pair of hinges at the bottom. Cut a number of squares of cardboard for trays, $7\frac{1}{4}$ by $7\frac{3}{4}$. Then for each tray cut two half-inch strips of stoutest millboard, $7\frac{3}{4}$ in. long; three strips the same width, $6\frac{1}{4}$ in. long. With glue or thick gum affix the two long and two of the short strips to the cardboard close to the edge, and use the remaining short piece to divide the central space equally into two. The size of the spaces will be $6\frac{1}{4}$ by $3\frac{1}{3}$, and each tray will hold 1 doz. slides. My own box, 3 in. deep, holds 24 of these trays, capable of accommodating 288 slides, and the cost of the whole is between 4*s.* and 5*s.*, or less than one-fifth for the same amount of accommodation in boxes sold for the purpose.

The cardboard and millboard must be cut with a knife, not with scissors; if gum is used it must be well dissolved, strained and very thick, and each tray as it is made must be placed under a weight, one on the top of another. If the thickness of the millboard is not enough to furnish depth for slides containing objects mounted in raised cells, it can be increased by adding a thickness of cardboard, or even another of millboard.

W. P. Hamilton.

Shrewsbury.

VARIATION IN THE MOLLUSCA, AND ITS PROBABLE CAUSE.

By Joseph W. Williams.

Part IV.—The Probable Cause of Variation.

"O mother and queen, beneath the olden spell
Of silence, gazing from thy hills and skies!
Dumb mother, struggling with the years to tell
The secret at thy heart through helpless eyes!"
Theodore Watts in "*Natura Benigna.*"

I WISH the reader to take especial notice that I undogmatically and advisably head this chapter as dealing with the probable, not *the*, cause of variation. Had I done otherwise, I, indeed, had taken a false step, since it is certainly not without the bounds of probability that the whole subject of heredity may take, in the course of further work, a different aspect and a different interpretation. I say it may take that course, but I will not say that it will; at present it is but a theory which, although presenting a large amount of plausibility, yet, as a theory, dogmatism in connection with it is out of place. The reader, therefore, must not consider me as dogmatic on any one point I introduce.

I divide variation up into two distinct groups, and I think rightly. On one of these my attention will be mostly occupied, which I call congenital variation, that is to say, variation present in the animal pre-natally or natally, either actually or latently; as opposed to the other, acquired variation, due to variation acquired after birth, as by force of circumstances, which I shall touch but lightly upon. That an albino parent shell can have an albino offspring, as has been recorded by Colbeau* (though this does not always obtain) must be rendered under my division, congenital variation; that in a normally unicolorous shell a pale-coloured band is sometimes present which has been stated by Hazay† to be due to a wound of the mantle-edge destroying the unicellular glands in that region, must be regarded as a case of acquired or accidental variation, and so on; but these two cases are enough to render my divisions clear to the mind of the reader.

* "Bull. Soc. Mal. Belg.," vii. p. lxxxix.
† "Mal. Blätt." (2), iv. pp. 103–105.

I consider heredity as the principal and master-factor in producing cases of variation which may be legitimately considered as of congenital origin. In them the principle of adaptation has had an opposing force, I must admit; but its opposing force has been of a minor character. Gasquet has compared the law of heredity to Newton's first law of motion, which may be tersely expressed that "matter has inertia," or, in Newton's own words, "Every body tends to persevere in its state of rest or of uniform motion in a straight line, unless in so far as it is acted on by impressed force." Wiedersheim, in his "Grundriss der Vergleichenden Anatomie der Wirbelthiere," states that "the capacity of adaptation varies inversely with the persistence of inherited qualities. These two opposing factors, adaptation and heredity, constitute the formative principle of the animal body."

What, then, is the state of our knowledge with regard to the principle or law of heredity in all its intricacies and complications? Can we bring all that has been written upon it down to a substantial and tentative whole? That the whole subject can be reduced to one thing—the plastic nature of protoplasm—does not admit of a doubt; but such a simple statement does not satisfy our inquisitive longing for a thorough knowledge of what, a few years back, was one of Nature's greatest arcana, and we must therefore go deeper into the subject. I have already, in part III., sketched, as fully as my space would admit, the various phases of the cell theory, and in this paper I shall use the terms there explained without stint. It is hoped that the reader interested in this question has already made himself familiar with them in their entirety.

It is not a question of psychology, and I shall therefore pass by the theories of Stahl and others, which are "explanations without an explanation." It is a question of hard fact upon which to build our theories, and hard fact we want. Charles Darwin * tried to give an explanation by his theory of pangenesis, and Ernst Häckel† has tried with his theory of perigenesis; but these theories are rather too conjectural for our practical needs. The latter theory fails because it brings in to our acceptance an assumption of which we know as yet practically nothing. We know practically nothing of molecular movements. In his thesis on this subject, Häckel argues that some kind of molecular movement is transmitted which the tissues have acquired by constant repetition; that heredity is dependent upon a true and accurate transmission of distinct species of movements of molecules, and that

* "Variation of Plants and Animals under Domestication," 1867, Chaps. 37 and 38; also Herbert Spencer's "Principles of Biology," Vol. 1, Chaps. 4 and 8.
† "Die Perigenesis der Plastidule, oder die Wellenzeugung der Lebenstheilchen," 1876.

variability (adaptation) is due to the action of environmental chance forces upon the movement thus transmitted, altering its character in a greater or a less degree. But, supposing our knowledge of molecular movement was *au fait*, how many distinct kinds of movements of molecules would the modern physicist be prepared to admit? More than one?

Naegeli, on the other hand, considers protoplasm to be compounded of a fluid hygroplasm and a solid stereoplasm. The seat of active change is resident in a portion of the latter which he terms idioplasm, and which depends upon a more (higher animals) or less (lower animals) complex grouping of minute particles or micellæ. Each cell of the body contains its own portion and its own kind of idioplasm, the difference between the various kinds being of a dynamical character; reproductive idioplasm is idioplasm in its most primitive character, that of the germ from whence the organism sprang. It is somatic, or body-idioplasm which has become rendered into its primitive condition. Then, if from two organisms engaged in coitus, an equal transmission of idioplasm obtains, then the future organism has characters in equal degree of father and mother; if the greater amount of transmitted idioplasm belongs to the father, then the future organism has characters more like its father, and so on. And, since somatic idioplasm of an organism is acted upon by environmental conditions, the rendering of this kind of idioplasm to its primitive state of germ idioplasm in that organism is not always exact, and thus it may be conceded that an organism to which it gives birth may resemble its parents in not all degrees, and hence arises variability. Of course, if we may regard this theory of Naegeli's as not too conjectural, and there is plenty of evidence to substantiate the theory of the existence of idioplasm (pathological, zoological, and botanical evidence), then Simroth's laws of the colouration of Styrian Limaces* may be explained as different environmental conditions acting upon the somatic idioplasms of the various slugs localised in the regions he enumerates; and primarily of their parents. These laws are summed up as follows:—

"1. The further north, the simpler the markings, so far as black is concerned.

2. Mountains are more favourable to brilliant colouring than the plains.

3. In the north the red of youth is extinguished in the winter, in the south it is retained and further developed in the summer.

4. In mountains and in the south the colour of youth is retained longer than in the plains and in the north.

5. The full development of a red and black colouring takes place only in the Southern Alps."

To the same cause must be accorded Cockerell's observation † that on the plains *Limax arborum* is spotted with black, while on the hills it is normally coloured; the variation in *Limnæa*, attributed by Dodd * to alternating conditions of dryness and wetness; the albinism which Hartmann † refers to cold, wetness of weather, and want of sunshine, etc. It may be worth mentioning here that Gredler considers albino varieties as due to heredity ‡; that Eimer § is of opinion that species originate from varieties produced by constitutional causes; and that Hyatt, in a paper entitled "Transformations of Planorbis at Steinheim, with Remarks on the effects of gravity upon the forms of Shells and Animals," which was read before the twenty-ninth meeting of the American Association at Boston in 1880, attributes the unsymmetrical spirality of gastropod shells to heredity combined with the influence of gravity.

Strasburger || has identified the idioplasm of Naegeli with the chromatin filament of the cell-nucleus, and he calls it nucleoplasm or nucleohyaloplasm. This nucleoplasm directs all the metabolic processes in the cells of the animal body, and he considers that the filament is composed of segmented portions which belong to preceding generations, and that any one special segment may influence the cell protoplasm (kytoplasm) of the ovum so as to give rise to hereditary qualities of the special generation from which it is derived. But here—as hinted by Dr. McKendrick, in the recent edition of his "Text-book of Physiology"—Strasburger "passes entirely into the region of theory," and it is here that the researches of Van Beneden come directly to our aid. For, "if it be the case that the chromatin filaments from the male and those from the female remain distinct, and are communicated in equal amounts to the nuclei formed by the division of the fecundation nucleus, and if this process be multiplied indefinitely in the formation of the cells of the body, we see that each cell is representative of both father and mother to a greater or less extent, according to the amount of maternal and paternal idioplasm present." It is also assumed that this idioplasm can increase itself in quantity by nutrition, and that it can be acted upon by environmental conditions in an amount as to individualise the organism in which such changes take place. The time comes, however, in the life of the organism when the cells of the body no longer proliferate and the character of the organism becomes fixed. Strasburger (*loc. cit.*) remarks that the generative power of a cell is dependent upon it being in the embryonic state, and it is also said that the extrusion of the polar bodies and of the seminal globule marks the return of the ovum and of the spermatozoon respectively

* "Steierische Nacktschnecken." Nachr. Mal. Ges. xviii. pp. 65–80.

† "*Limax arborum* and the Influence of Altitude on Colour." Zool. (3), x. p. 341.

* "Journal of Conchology," iv. p. 304.

† "Gastropoden d. Schweiz," 1840–44, p. xvii. In these environmental conditions as producing albinism, given by Hartmann, P. Hesse coincides, from observation of albino cases found by him on Mt. Wittekind, Westphalia.

‡ "Nachr. Mal. Ges.," 1878, pp. 33–37."

§ "Tag. Deut. Nat. Vers.," lviii. p. 408.

|| "Neue Untersuchungen über den Befruchtungsvorgang bei den Phanerogamen als Grundlage für eine Theorie der Zeugung." Jena, 1884.

to their embryonic states. Professor Balfour * considered that "the function of forming polar cells has been acquired by the ovum for the express purpose of preventing parthenogenesis;" but the fact that Weismann † has observed the extrusion of polar bodies in parthenogenetic crustaceans, while no extrusion of polar bodies has been found to obtain in the rotifera and arthropoda, somewhat negatives this explanation. Carnoy ‡ is strongly opposed to this view. He will not admit that the extrusion of the polar bodies equals the extrusion of the male idioplasm from the ovum, so that what is left is entirely female, and that the extrusion of the seminal globule equals the extrusion of the female idioplasm, so that what is left in the spermatozoon is entirely male. But other authors are not so entirely opposed to this view as is Carnoy. Dr. McKendrick § says that, even if the observation of Weismann be correct, it does not seem to him "to destroy the validity of Balfour's theory, but only to show that it is less extensive in its application. The extrusion of polar bodies by parthenogenetic ova may be the survival of an ancestral habit, and possibly after removal of the polar body there may still be enough of the male matter left to allow of development going on without the entrance of a fresh spermatozoid."

That, however, Balfour's theory must be modified to some extent admits of no doubt, since the male idioplasm cannot be regarded as entirely male, nor the female idioplasm as entirely female, since—as has been pointed out by Kölliker and Strasburger—the male parent may send onward traits of the paternal grandmother and great-grandmother, and the female parent may send on traits of the maternal grandfather and great-grandfather, besides peculiarities which belong strictly to themselves alone. Hence, we may concede, may arise atavism. The greater the difference between the idioplasms of the two individuals engaged in coitus, the greater will be the stimulus setting into action the division of the oosperm and the development of a new individual. Self-impregnation has been observed in *Limnæa auricularia* by von Baer and in some species of Planorbis; but it is hard to consider for one moment that the ova would be fertile, since the spermatozoa fecundating them came from exactly the same kind of germinal elements in one and the very same organ, and hence the male and the female idioplasms were theoretically equal one to the other, and no stimulus consequently would be set up by their union to give rise to continuous segmentation of the oosperm. The difficulty about these two theories—those of Strasburger and Naegeli—is to account for the manner in which the somatic idioplasm becomes converted into germ idioplasm, and hence Weismann* has brought forward a theory which he calls "the continuity of the germ-plasma." He believes that what is transmitted is neither idioplasm nor nucleohyaloplasm, but that it is a substance of peculiar molecular structure resident in the nucleus, to which he has given the name of keimplasma; that this keimplasma is not produced from somatic-plasma, but is independent of it; that it does not alter in its characters from one generation to another. He considers also that this keimplasma derived from the parents is not entirely used up in the development of the embryo, and that the residuum is applied to the production of the keimplasma of the succeeding generation. He explains away the transmission of hereditary qualities by considering that it is due to an exceedingly strong influence of the germ-plasma upon the development of somatic-plasma in the embryo. These are the main features of Weismann's theory. But, as pointed out by McKendrick (*loc. cit.*), while on the one hand it may remove some of the difficulties, yet, on the other hand, the acts of hereditary transmission remain unexplained. For, "if the portion of germ-plasma not laid aside influences the development of the body, conferring on each tissue and organ at least some of the peculiarities of the parent, how does it so? The molecular mechanism by which this is accomplished is inexplicable. On the other hand, if this germ-plasma does not so influence development, how are the facts of hereditary transmission to be explained?" In a recent pamphlet † Prof. Nussbaum, with much forceful argument, ascribes variation to the action of extrinsic and intrinsic forces upon one another. "Selection is a consequence of this interaction, since it always rests with the numerical strength of the forces, whether the individuals and their germinal material persist, change, or perish." Thus much for the most principal theories of heredity. I have by no means exhausted the subject, but I hope that I have shown the conchologist ‡ that the cause of variation will be no sooner brought to light by the getting together of varietal collections from different localities, and by the wholesale naming of varieties as a help thereto. I hope I have shown him that, if the cause of variation is to be sought anywhere, it is to be sought in the plastic nature of the protoplasm of the ovum and of the spermatozoon. In his untiring zeal to seek the cause of variation by handling and pondering over the shells in his cabinet, he has forgotten a dictum of one of the oldest conchologists, Adanson, who, in his "Voyage to Senegal," which was published in the year 1757, stated that, to get a true knowledge of the mollusca, it was necessary to know the anatomy

* "Comparative Embryology," vol. i. p. 72.

† "Richtungskörper bei parthenogenetischen Eiern," *Zool. Anz.*, Sept. 27, 1886.

‡ "La Cytodiérèse de l'œuf." La Cellule, tom. iii. fasc. 1, p. 60.

§ "Text-book of Physiology," footnote, p. 238.

* "Die Continuität des Keimplasma's als Grundlage einer Theorie der Vererbung," Jena, 1885. See also Professor Moseley in "Nature," vol. xxxiii. p. 154.

† "Ueber Vererbung," 1888.

‡ This word, though sanctioned by usage, I may point out, is not quite correct. It should be *conchyliologist*; conchology should be *conchyliology*. Conchology is derived from the two Greek words *konche*, a shell-fish with two valves, and *logos*, a discourse; conchyliology from *konchulion*, which means all sorts of shell-fish, and *logos*, a discourse.

of the animal as well as of the shell. Whether the colouring of the shell has been acquired in a manner similar to that of birds' eggs I am not prepared to give any opinion, but in a paper on the colouring of birds' eggs, published by Lucas, on pp. 52–60 of the twenty-fourth volume of the "Transactions of the Royal Society of Victoria," last year, there are one or two suggestions which are legitimately applicable to the mollusca. Mr. Lucas considers that the effect of environmental conditions upon the nervous constitution of the bird while the shell is in formation is a very important factor in producing colour-variations in the egg. But that the bird is restricted by tribal habits of preceding generations, so that, no matter what colour-variation there is, a good ornithologist knows the particular species of bird to which any particular egg belongs. By a suitable changing of words, I am of the opinion that his theory equally applies to the colour-variations of molluscan shells. It would be interesting to know whether food has any influence on the production of colour-variation in shells. Miss Hele, I know, has recorded the darkening of the shell of *H. aspersa* by feeding the animal upon lettuce, a circumstance which I attribute to the absorption of an alkaloid, or alkaloids, from the lettuce by the animal. This is a matter upon which all conchologists can work and record. There have recently been two papers published in the "Naturalist," by Gain and Kew, on snail and slug food, but they are both mere statements of the names of plants upon which this snail or that slug has been seen to feed—very interesting and worthy in their way, but without any mention of the effect of food upon variation, and without any suggestions or explanations as to why this slug or that snail chooses this or that particular plant as its food. Consequently, they serve but little purpose in this relation. But, if I may be allowed and not be considered as too greatly deviating from my present subject, I would like to refer them and those persons interested in the subject upon which they have written, to an exceedingly suggestive paper which has been recently published by Stahl, in the twenty-second volume of "Jenaische Zeitschr. f. Naturw.,"* on the protection afforded by plants against snails. Stahl divides his subject up into two divisions. In his first division—substances contained in the cell-sap of plants as protection against snails—he includes raphides, bitter principles, tannin, calcium bioxalate, and volatile oils, with the oil receptacles of liverworts. His second class—external morphological protection of plants against snails—includes the formation of mucilage by water-plants, the impregnation of the epidermis by siliceous matters, and stiff hairs.

Reverting again to variation and the recent published literature on the subject, whether the theory which the Rev. J. T. Gulich has recently promulgated, in the "Journal of the Linnean Society," of "Direct Evolution through Cumulative Segregation," and which he has been led to formulate on account of some divergence of type in some land-shells of the Sandwich Islands which he could not explain by the theory of natural selection, will give us any good and true light into the cause of variation, other than what has been already advanced by Darwin, Wallace, Wagner, and Romanes, is open to some doubt. The whole theory enunciated by him is almost inextricably entangled by a mesh of terminology, that I could not do any justice to the reader by giving a résumé of it here, and must refer him to its published source.

On the other hand, it seems exceedingly probable that Prof. Eimer's now publishing book, "*Die Entstehung der Arten auf Grund von Vererben erworbene Eigenschaften nach den Gesetzen organischen Wachsens. Ein Beitrag zur einheitlichen Auffassung der Lebewelt*," of which the first portion only has been seen by me, will help us to a more thorough understanding of variation. Of course, with this book I am as equally unable as with Mr. Gulich's paper to give in this place a resumé, owing to the large amount of matter and argument contained in Prof. Eimer's pages; but I may give one or two statements which especially struck me as valuable, and with that finish my communication on the subject of variation. These are, that variations due to the conditions of the surroundings may give rise to distinct species without calling in the aid of natural selection at all; that "variations occur throughout in perfectly definite and only in a few directions, and are due to physico-chemical conditions in the interaction between the material composition of the body and external influences;" that "varieties and species are essentially nothing but groups of forms which have remained at various stages of a progressive development"—to the remaining of forms at various stages he gives the term *genepistasis;* that all variations express themselves simply as growth in definite directions, since "just because the organic modification depends upon physico-chemical processes, the result, as in the inorganic crystal, is definite."

(*Concluded.*)

* See also "Bot. Centralbl.," xxxvi. (1888) p. 164.

NOTES ON WORCESTERSHIRE BIRDS.

An inquiry was recently made in Science-Gossip, asking information relative to the birds of Worcestershire. I beg to forward a few notes made by me during the summer of 1887 in the immediate neighbourhood of Worcester and the Valley of the Teme, the result, be it understood, of personal, though incomplete, observation. The nomenclature adopted is from Dresser's "Birds of Europe," and I should like to state that my attention has been drawn to the study of bird-life by that pleasant book, "A Year with the Birds," by "an Oxford tutor."

The song thrush (*Turdus musicus*, L.), haunts certain grass fields at Powick in great numbers, feeding greedily where sewage is carried to the surface of the land; missel thrush, redwing and fieldfare, in due season.

Turdus torquatus, L., the ring ouzel, has been seen in a hazel copse near the same village. It is a shy bird, but on several occasions, towards evening, we have caught a glimpse of a pair noiselessly flitting into the thickets. The white ring was distinctly noted in marked contrast to the dark head and body. At North Malvern the same species has bred; therefore, I am tolerably certain of the identity of this bird.

The common dipper (*Cinclus aquaticus*, Bechst.), frequents the Teme. Last winter, abroad, I saw the dipper, or water ousel, actually run along the bed of a mountain stream, under water.

The whin-chat (*Pratincola rubetra*, L.), was very plentiful in the new-mown hay, to be identified at once by the cry "Utick, utick," which, after the breeding season, is contracted into "Tick, tick."

The stone-chat (*Pratincola rubicola*, L.), is not uncommon on the Malvern Hills.

Ruticilla phœnicurus, L., the redstart, was also seen to advantage in the hayfields. The male bird is brilliant, with white and black head and black throat; the hen more like a robin, with the red tail and speckled fawn breast.

Erithacus rubecula, L., the redbreast, of course abounds.

The nightingale (*Daulias luscinia*, L.), was heard by Powick Brook early in June. It is there, however, some time before giving forth song.

The white-throat (*Sylvia rufa*, Bodd.), is here very plentiful, but has not this year nested so freely as usual. Other species of warblers I cannot speak to with certainty, but probably several others are near at hand.

The chiff-chaff (*Phylloscopus collybita*, Vieill.), was at Powick, May 16th. I got quite close to a pair creeping about in a thick hedge; they exhibited no signs of fear.

The willow wren (*Phylloscopus sibilatrix*, Bechst.), was by the side of Powick Brook.

The reed warbler (*Acrocephalus streperus*, Vieill.), has built several years among the reeds of the Worcester Canal.

The grasshopper warbler (*Locustella nævia*, Bodd.), I heard several times among the uncut grass by the Teme side.

The common wren and hedge-sparrow are in most hedges.

The long-tailed tit (*Acredula rosea*, Blyth): I saw a fine nest taken from a yew tree.

Blue tit (*Parus cæruleus*, L.): about a dozen came one day in June to the pear trees in the garden—the only time I have noticed them this year.

Sitta cæsia, Wolf nuthatch: was active on the moss-grown trunks of elm trees at Norton, near Worcester, in the month of July.

The creeper (*Certhia familiaris*, L.), was at Powick. I saw the one bird only, common.

Motacilla lugubris, Temm., the pied wagtail, built at the gas-works, Powick Asylum. I was pleased to note the bird closely to compare with the rarer *M. alba*, L., which I knew well in Switzerland. The latter has a blue or slate-coloured back, the black of the head ends suddenly on the neck, and the white patches at the side of the head are very striking. The two species seen together show marked distinctions.

M. Raii, Bp., the yellow wagtail, was feeding freely in the hayfields. The back is olive brown, the breast yellow. Here, again, I was glad to compare the species with *M. melanope*, Pall., the grey wagtail, which I knew well in Switzerland. It has, perhaps, as much bright sulphur yellow as Ray's species, but the back is bluish-grey, and the tail much longer. It is a more elegantly shaped bird.

Anthus trivialis, L., tree pipit: saw one bird in June, in an apple tree. Its breast was spotted like a lark.

The red-backed shrike (*Lanius collurio*, L.): male and female seen at different times in July and August. First I had ever seen. Male bird, unfortunately, was shot.

Spotted fly-catcher (*Muscicapa grisola*, L.): seen 25th April. Great numbers in August, at Powick, hovering over sewage fields in search of insects.

Cotile riparia, L., sand martin. By the Teme a colony was destroyed two years ago in the great floods. They have returned to same holes in sand bank.

Greenfinches very common in hay-fields.

Haw-finch (*Coccothraustes vulgaris*, Pall.): not rare, but rarely seen. One pair this year at bird-stuffer's shop. One seen July last.

Linota cannabina, L., brown linnet: common, but I have not been able to see it in full summer plumage.

Linota linaria, L., mealy redpole: found nest in June, eggs white, red spots at thick end (*vide* Bewick's description). Alas! nest was destroyed.

Emberiza miliaria, L., common bunting: only species I have seen this year.

Skylark, very common, (*Alauda arvensis*, L.): other species I am not sure about.

Starlings: one day in August, a dozen birds busily catching insects in the air, as the swallows commonly do.

The common jay is seen in the quiet and wooded parts of the Teme Valley, but keepers wage ceaseless warfare against them.

Jackdaws build at Powick Asylum chapel.

The night-jar (*Caprimulgus Europæus*, L.), is frequently to be heard at night.

Gecinus viridis, L., the green woodpecker, is common in the Teme Valley.

A nest of *Picus minor*, L., was found at Powick in a hollow tree, birds not disturbed.

The great spotted woodpecker, *P. major*, is occasionally met with hereabouts.

Inyx torquilla, L., the wryneck, was seen in May once, preceding the cuckoo by a day or two.

The kingfisher is fairly common in the Teme Valley.

I caught a fine specimen of the tawny owl (*Syrnium aluco*, L.), in broad daylight.

A pair of common buzzards (*Buteo vulgaris*, Leach) have been recently shot on Lord Coventry's estate, Croome.

A peregrine falcon (*F. peregrinus*, Tunstall), from the same place, I have seen shot this year.

Ardea cinerea, L., the heron, is not uncommon.

Columba œnas, L., stock dove, breeds at Powick; *C. palumbus*, common.

The corn crake (*Crex pratensis*, Bechst.), is one of the commonest Worcestershire birds.

The moor-hen is also fairly plentiful.

The common sandpiper (*Totanus hypoleucus*, L.), keeps to the Teme very much.

A splendid specimen of the great crested grebe (*Podiceps cristatus*, L.), was shot on the Severn last winter, with rich brown crest in fine condition.

These notes are by no means complete, and I may be able to add to them in the future. Three bullfinches' nests were destroyed this spring in these parts, to my knowledge. A curious local name for this bird is the "nope."

F. G. S.

P.S.—The writer begs to state that these notes were sent more than a year ago. His list now reaches 118—more than double the number given above.

(*To be continued.*)

NOTES ON ECONOMIC BOTANY.

By J. T. Riches.

ZINGIBERACEÆ (GINGER).—This spice is the produce of a plant largely cultivated in the East and West Indies, China, Sierra Leone, etc. (*Zingiber officinale*, Ros.)

The plant has a persistent root-like stem (rhizome) which sends up annually leaf and flower-bearing stems; leaf-bearing stems 3–4 feet in height with linear-lanceolate, subsessile, smooth leaves; flower stems (spikes) elevated; bracts acute, imbricate, single-flowered; anther two-celled, crowned with an incurved beak.

Ginger was the name known to the ancient Greeks; Pliny says it was thought to be the root of Pepper, and called "Zimpiperi."

The young shoots of the rhizome are taken off and

Fig. 146.—Ginger Plant (*Zingiber officinale*).

preserved in syrup, and constitute that most delicious condiment known as "preserved ginger," largely imported from the West Indies and China, although the West Indian production is much more esteemed than that of China. The ripened root-stock after preparation constitutes the ginger of shops. The mode of preparation is simple; the rootstocks are dug up when about a year old, cleansed, dried in the sun, in that state they are known in commerce as "coated ginger," but if the skin is removed previous to drying, they are known as "uncoated ginger." The soft kinds are preferred by merchants, the hard kinds being used for grinding.

The hot pungent taste of ginger is due to a volatile oil; it also contains starch, gum, an acrid resin, yellow colouring matter, etc.

Its uses are numerous and varied. A large amount is consumed in the manufacture of gingerbeer or gingerade; it is also largely used as a spice, and in medicine in the form of powder, tincture and syrup, as an aromatic stimulant, stomachic, rubifacient, etc.

In the Mauritius it is used as a poultice to assist in the removal of thorns, etc.

We cannot refrain from mentioning a peculiarity we have observed in a plant beloning to the family Zingiberacea, now that we are rambling over the same ground, viz.—*Globba bulbifera* (an East Indian plant ?). The peculiarity is that, at the extremity of the axis, where one would expect to find all flowers, a large portion of the axis immediately above the leaves is taken up by a lot of small round buds, each bud subtended by a branch ; beyond these the flowers are developed. A rough sketch taken at the time will be reproduced, and there is no doubt but that it will interest the readers of SCIENCE-GOSSIP.

We should be glad to know if any of the readers of SCIENCE-GOSSIP have observed the same plant, or have seen it figured, with any account of the "reason why" such a peculiarity exists.

We would give more detail, but space forbids it, but we shall look for more information respecting it.

THE BUTTERFLIES OF THE HIGH COUNTRY OF VAUD.

THE following notes have been taken at Château d'Oex, a small mountain village in the Pays d'en Haut Vaudoise (High Country of Vaud), where I have been living for three years. It lies at an elevation of 3,498 feet above the level of the sea, and in consequence the winters are very severe, but, on the other hand, the summers are much warmer than those of Great Britain.

In number, the *Rhopalocera* of Château d'Oex slightly exceed those of the British Isles, but many species rare there are very common here, and there are several which are not found at all in England.

The family of *Papilio* is represented by two species, *P. Podalirius* and *P. Machaon*, both of which are very common during the months of May and June.

Parnassius Apollo abounds in the months of June and July, and in many places they may be seen flying by the dozen ; the same may be said of *Aporia Cratægi*, the larvæ of which sometimes do considerable damage to the fruit-trees.

Pieris Brassicæ, *P. Rapæ*, and *P. Napi* are common, and the rare female variety of *Napi* called *Bryoniæ*, which is common in the Arctic regions and is only found at a considerable elevation in Europe, may be taken in a rocky gorge near here.

Euchloë Cardamines is not very common. I have only seen a few specimens widely distributed over the country. *Leucophasia sinapis* appears in May, but is also rare. *Colias Phicomone*, a species which resembles *Hyale*, but is green instead of yellow and has dark markings on the wings, is common, but is difficult to catch on account of its swift flight ; this is also a true Alpine butterfly. *C. Hyale* is common, but *Eduse* is comparatively rare. *Gonopteryx Rhamni* is scarce ; the principal reason for this is, I think, because its food-plant, buckthorn (*Rhamnus catharticus*), is rare. The family of *Vanessa* is represented by *V. Atlanta*, *Antiope*, *Io*, *urticæ*, *polychlorus*, and *C. album*, they being all more or less common. *Melitæ Cinixia* abounds everywhere all over the country, but *M. Aurinia* is rare, as is also *M. Athalia*. *Argynnis selene* is common, and I have taken a few specimens of *Dia*. *Adippe* and *Aglaia* are two of the most abundant insects here, and the variety *Cleodoxa* of *Adippe*, in which the silver spots are wanting, is also common. *Lathonia* is plentiful, but is difficult to take on account of its swift flight. *Paphia* is common in some woods near the river. By the side of this same river (which is called the Sarine) *Limenitis Camilla* is abundant, and I have taken two specimens of the magnificent poplar butterfly (*L. populi*), both of which were males. *Apatura Iris* is found in the same locality, but is scarce. Continuing along the edge of the river, *Exebia Blandia* and *E. Ligea* are found in plenty in the meadows which border its banks ; I have also taken one or two specimens of the rare *E. Epiphrone*. *Melanargia Galathea* swarms everywhere, from the tops of the mountains to the bottom of the valley. *Satyrus Megæra*, *Epinephele Janira*, and *E. hyperanthus* are all common during the summer months. The blues are numerous; *Polyommatus Arion*, *Cyllarius minima*, *Damon*, *Argiolus*, *Bellargus*, *Corydon*, and *Icarus* are all common ; *P. minima* is very abundant ; I have seen the grass covered with them in damp weather. *Lycæna hippothei* (the purple-edged copper) is common in a damp meadow by the side of the Sarine, and *L. phlœas* is abundant everywhere.

The skippers are : *Cyclopides Palemon*, *Pamphilia comma*, and *P. sylvanus*. This species closes the list ; there may be more, but as yet I know of none ; the butterflies appear about the same time as those in England, and all those which I have mentioned have nearly all been taken within a radius of four miles, most of them within a much smaller area.

THE DEVELOPMENT OF THE LUNG.

By F. NEWHAM.

ONE of the most fascinating and instructive departments of scientific research is the art of tracing the morphological development of the organs of organised beings, and the corresponding physiological specialisation of function consequent upon structure ; this is essentially a modern departure of study which has found its original impetus in the teachings of Darwin. I offer here a few remarks upon the organ of respiration in air-breathing animals, namely the lung, the construction of which is beautifully displayed by successive steps in some of our commonest animals. Adhering to strict morphological lines, the membranous respiratory sac of the slug, or snail, is not a true lung, but appears to be in essence that chamber of the mantle which covers the branchiæ in aquatic species, adapted for breathing the atmosphere. A true lung, therefore, may only be sought for in Vertebrates; and, to commence with the lowest class of fishes, we find under the spine and within the general cavity of the body, a large, strong membranous pouch inflated with gas which appears to be secreted by its walls; ordinarily this swim-bladder, as it is called, has no communication with the exterior, but there are exceptions.

In the Lepidosiren, or mud-fish, the transition from the piscine air-bladder to the Reptilian form of lung is sufficiently obvious, but as we are here concerned with our native animals, this mention of it will suffice. The intimate principle of a respiratory organ consists of a permeable membrane having blood-vessels within its substance, exposed to the atmosphere chiefly for the purpose of supplying the blood with atmospheric oxygen for the sustenance of its vitality, and for the general purposes of oxidation in all living parts of the organism, but partly also for facilitating the escape of carbonaceous and other waste from the body. The air-sac of a fish has very few and scattered vessels in its walls, but if one of our common newts, such as *Triton cristatus*, be dissected, a large improvement upon the bladder of the fish will be evident; there are now two simple transparent sacs communicating with a glottis in the floor of the pharynx, an artery passes down the side of each sac, and a vein collects the arterialized blood along the opposite side. The breathing organs of the triton are therefore wholly devoted to the respiratory function, while the air-bladder of the fish appears to be chiefly an hydrostatic organ. The next step in pulmonary development is well evinced in the lungs of the frog (*Rana temporaria*). Here the triton-type of lung is enlarged, and more especially is subdivided into delicate membranous chambers or cells, having blood-vessels in their walls exposed to the air that passes through them by means of the very abbreviated air-pipe or trachea. The saccules, however, of a frog's lung are, comparatively speaking, very large, and the extent of air-surface they present, though vastly excelling that of the triton's lung, is much smaller than that presented in the lung of a Mammal. Wherein then is the difference between a Batrachian lung, such as that of a frog, and a Mammalian lung, like, say, that of the mouse? Chiefly in this, that while the saccules of the former are few and large, the lung-substance of the latter is a dense agglomeration of an infinite number of minute air-cells. The lung of the frog is obviously cellular, while a Mammalian lung, when cut with a knife, apparently presents a solid parenchyma, but no great magnifying power is requisite to demonstrate the cellular character of the latter. The lungs of birds resemble more or less the Mammalian type in structure. It is impossible in this short paper to describe the collateral development of other parts of the lung, such as the increasing complexity of the trachea, the larynx, and the various means for inflating and compressing the lung.

Fig. 147.—Lungs of *Triton cristatus*.

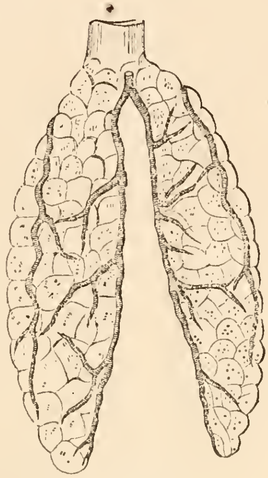

Fig. 148.—Lungs of *Rana temporaria*.

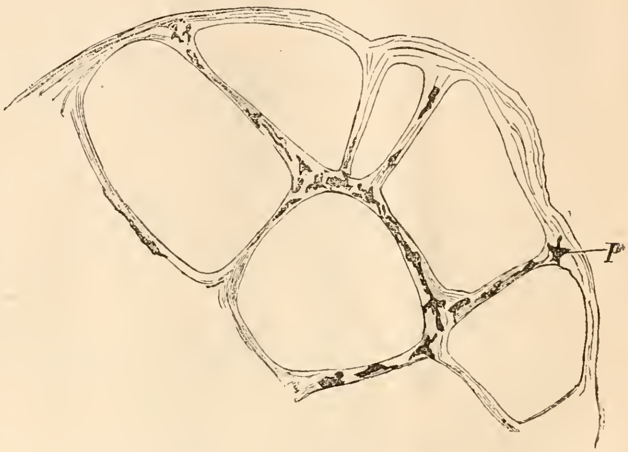

Fig. 149.—Air Cells of the Lung of *Rana*; *p*, stellate pigment corpuscles.

WRIGHTIA COCCINEA.

READERS of SCIENCE-GOSSIP may be interested in the following brief review of a memoir, by Dr. A. Tomes, of the Bengal Medical Service, on the fly-catching habit of *Wrightia coccinea*, which has recently been issued amongst the Scientific Memoirs by the medical officers of the army of

India. Dr. Tomes considers that the fly-catching habit of the plant in question is the accidental result of arrangements of which the object is to secure fertilisation. The stigma of the flower must be reached before the pollen; and pollen adhering to the proboscis of an insect after its extraction from one "trap" would certainly be wiped off upon the stigma of the next flower in which it may chance to be arrested. The formation of the trap by the *andrœcium* is such that its action in seizing flies appears to be purely mechanical.

After repeated experiments, Dr. Tomes could not discover any indication of irritability or sensitiveness of the stamens; and he thinks it possible that while in the act of searching the member of the insect becomes jammed, and once caught, all efforts, except in one direction, directly upwards, only cause it to be held the tighter. A lens reveals no teeth or ridges on the free edges of the wings of the stamens, but they are shown to be finely ridged longitudinally. The flower has strong attractions for insects, owing to its handsome, deep red colour, as well as to a peculiar heavy, vinous smell, and the secretion of a syrupy liquid. The insects found entrapped were almost invariably common house-flies caught by the proboscis, but occasionally a rather large species of ant has been seized by the neck: the grip of the trap is so firm that the struggles of a captured ant were once observed to result in its decapitation. The insects after capture were not digested, but died a lingering death, and were devoured by the ants which swarmed over the trees. Dr. Tomes considers it likely that though flies and ants are obviously not destined to be the agents of fertilisation in this case, stronger insects, such as bees, or butterflies and moths, which have a longer proboscis, may release themselves, and so carry the pollen of one flower to another. He has never actually seen a bee, or other larger insect, engaged in the flower, or in the act of releasing itself from the trap, though all the circumstances appear, in his opinion, to favour the idea of fertilisation by insect agency.

"Such," he concludes, "are the points that I have observed in connection with this apparently wanton destruction of insect-life by the *Wrightia*, and the interpretation they appear to suggest, but I by no means claim to have finally solved the mystery." The memoir is illustrated by a plate.

W. J. SIMMONS.

A DOUBLE MARIGOLD.

IN the theory of the possible ancestry of flowers, everything in the shape of a so-called "monstrosity" is now interesting. These "sports" and "freaks" are no longer regarded as accidents. They are either "reversions" to ancient ancestral conditions, or "prophesies" of possible changes to come. Nobody can study Dr. Masters' "Vegetable Teratology" without seeing how interesting, in the light of evolution or retro-gradation, the sports of flowers have become. We therefore make no apology in presenting our readers with the accompanying singular specimen of a double-flowered marigold. It only requires a stalk to the extra flower to make it resemble a species of hieracium.

Fig. 150.—Double Marigold.

NOTES ON NEW BOOKS.

THE FLORA OF SUFFOLK, by Rev. W. Hind, LL.D., Rector of Honington (London: Gurney and Jackson). The title of this bulky, well-written book is suggestive. Our native wild flowers have a charm for us that no mere horticultural specimens can possess, be they ever so costly. They have grown with the life and growth of the English people. Around them has clustered the folk-lore of the Saxon people. They were the firstlings of our boyhood's days, and they charm us by their spring resurrection from the dead in advanced age. Suffolk is perhaps not such a rich and happy hunting-ground for wild flowers as some other British shires. It has been too long in cultivation. Most of the wild flowers have been banished from the cultivated fields (where they survive as "weeds") into the green lanes. The Suffolk lanes have been floral arks of refuge for them. There they have found sanctuary; there they linger now. But, although there are no Suffolk mountains, except those buried more than a thousand feet beneath the Secondary and Tertiary strata, and therefore no modern mountain or Alpine plants, the flora is by no means a limited one. Nearly forty years ago Professor Henslow and Mr. Skepper published their well-known and accurate "Suffolk Flora." It is a small, unpretentious, but wonderfully reliable hand-book. Suffolk has wild heath and common, a large fringe-land of coast, sea-marsh and fresh-water marsh, and lovely green lanes —than which latter there is nothing better in England out of Devonshire. Henslow's and Skepper's "Flora" gradually grew out of date. The most careful and painstaking botanist in this country for many years past is the Rev. Dr. Hind, of Honington Rectory. Only those who have had to correspond with him on the subject for years past can be aware of the scrupulosity with which he has investigated the occurrence of any wild plant in any locality before he would set it down in his list. The Suffolk wild flowers require 500 pages of description as to their localities alone. Dr. Hind's "Suffolk Flora" will make its mark in the botanical world. It is very carefully compiled. It will perhaps never have a successor, for few men will ever be able to revise this work. Therefore, as a book-speculation, its purchase is a good venture. The late Professor Babington, of Cockfield (one of the most delightfully genial of Suffolk naturalists), assisted Dr. Hind in the production of this volume all he could, and Dr. Hind generously acknowledges the help. Dr. Wheelton Hind (son of the author) has contributed a very clever and concise account of the geology, &c., of the district. Dr. Wheelton Hind has displayed his ability to simply and clearly grasp a complex geological subject, and also to make it auxiliary to his father's work. Dr. Hind's "Flora of Suffolk" should be purchased immediately by every book-buyer who values county works. It is a volume of which genuine Suffolk botanists will be proud.

Mount Vesuvius, by J. Logan Lobley, F.G.S., &c. (London: Roper & Drowley). Geologists throughout the world would be glad to hear of the publication of Professor Lobley's work. He has been a diligent student of this historic volcano for a quarter of a century, during which time he has personally explored every available nook and corner, collected its minerals, and studied its geological structure. The results of these labours are now presented in this handsomely got-up and well-printed volume. No other volcano in the world has such a crowning interest as Vesuvius. It is a sort of type volcano, if we may use the expression, to which all others are more or less compared. It has a written history of more than eighteen hundred years of the greatest interest; but Professor Lobley begins with Vesuvius when it was a pre-historic volcano, and traces it down to its action in modern times. As a literary work, this book deserves honourable mention. Professor Lobley's style is clear and animated, and many parts of this book read like a novel. There are two chapters devoted to the Neapolitan volcanic region and the surroundings of Vesuvius. A third gives a detailed description of the mountain itself. Three chapters are devoted to its history: one to its geology; another to the discussion of volcanic action generally; as well as one to volcanic products. Besides the above, there is a chapter on the minerals of Vesuvius, and another on its flora. The appendix contains some valuable references to the various branches of the subject discussed, and there is a good index. Professor Lobley's work is a decided gain to our English geological literature.

The Rotifera or Wheel-Animalcules, by Dr. C. T. Hudson, assisted by P. H. Gosse (London: Longmans). The above is the supplement to this remarkable and valuable work, whose preciousness must increase as the years roll on. During its progress one of its distinguished authors, Mr. P. H. Gosse, has died; but Mr. Hudson has been fortunate enough to live and see the completion of their joint work. The present supplement contains nearly one hundred and eighty exquisite figures and details of Rotifera. This happily completed work is a credit alike to private research and private enterprise.

The British Moss-Flora, by Dr. R. Braithwaite. Part XII. The present part of this notable work (which can be had of the author, 303, Clapham Road) completes the first volume. It is devoted to the families *Grimmiaceæ* and *Schistostegaceæ*, and contains seven exquisite plates, drawn by the author, setting forth structural and other details of the members of these two great groups. Dr. Braithwaite is one of the chief of living authorities on the subject of Mosses; and the preparation of this first volume must have been to him a labour of love. That he may equally enjoy the production and completion of his second volume is the strong wish of his numerous friends.

Mineral Resources of the United States (Washington: Government Printing-Offices). This is the fifth volume of this series. It gives details of the yields of iron, copper, zinc, lead, tin, manganese, quicksilver, nickel, gold, silver, &c., among the metals, each of which has a special chapter devoted to it, signed by the author's name. The chief part of the volume is naturally given to coal. There are chapters on the manufacture of coke, and others on petroleum and natural gas. Precious stones are separately discussed, as well as the mineral fertilizers which have been raised.

Electricity in our Homes and Workshops, by Sydney F. Walker (London: Whittaker). This is just the very book required as a popular and yet scientific treatise on the subject of electricity in our homes and workshops. Electricity has now become so familiar to all sorts and conditions of men, that a knowledge of its application is essential. Mr. Walker's nicely got-up book contains seven chapters, one of which, the first, is very properly devoted to a glossary of terms. The remaining chapters severally discuss the following subjects:—"The Electric Circuit," "Magnetism," "Galvanic Batteries," "Electric Bells," "Electric Mining Signals," and "Telephonic Apparatus." There are one hundred and twenty-seven good illustrations; the style of the author is simple, without affecting to be too popular, and there can be no question that this book will be as well received as it was much needed.

Lessons in Physiographic Astronomy, by John Mills (London: Chapman & Hall). This is a handy and well-illustrated little work, which all young students will find very useful.

Hygiene, by J. H. E. Brock; *Animal Physiology*, by J. H. E. Brock; *Magnetism* and *Electricity*, by W. Hibbert; *Building Construction*, by Hen. Adams; and *Principles of Agriculture*, by H. J. Webb (London: Chapman & Hall). This is a series of eighteenpenny cloth-bound *brochures*, in which are given the solutions to the questions set at the May examinations of the Science and Art Department for several years past. They read very much like examiners being examined, and consequently will be very useful to the students intending to go in for examinations on the subjects above mentioned.

Manures and their Uses, by Dr. A. B. Griffiths (London: Geo. Bell). This book, published at half-a-crown, is one we cordially recommend to all concerned in agricultural matters. No man has worked more earnestly or more successfully at the subject than its author. Indeed, Dr. Griffiths may be said here to have made his mark. This little book is practically on the art of manuring land, and in the eleven chapters it contains we have copious and even exhaustive details of the principles of manuring, and of all sorts of manures, organic and artificial. Not the least important part of the work is the instruction given as to how and when to use artificial manures; for it is ignorance of these details which has frequently caused them to be stupidly denounced.

On the Creation and Physical Structure of the Earth, by J. T. Harrison (London: Longmans). This is a well got-up book, and contains a great deal of original matter on the part of the author, who is evidently very well read on most geological subjects; but whether geologists will accept his hypotheses one can hardly say. At any rate, it is a book worth reading.

The Photographic Quarterly, edited by Chas. W. Hastings (London: Hazell, Watson & Co.). We are pleased to give this new venture a hearty greeting. It is well printed on good paper, after the style of the "Nineteenth Century," and published at eighteenpence. It contains eleven articles on various subjects connected with photography by well-known writers and workers, and two exquisitely got-up illustrations—one a portrait of James Glaisher, F.R.S., and the other a view of Salisbury Cathedral.

ASTRONOMY.

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

It is good news that Mr. Isaac Roberts, of Liverpool, who has been doing such excellent work in taking photographs of the heavenly bodies, is about removing to Crowborough Hill, Sussex. An observatory can be placed here at a good elevation, and well removed from the sea-fogs of the south coast.

Brooks's comet (d. 1889) is diminishing slowly in apparent brightness, but may be visible in a telescope of good aperture until the end of the year.

The Rev. T. E. Espin, of Wolsingham Observatory, has observed bright lines in the spectrum of R Andromedæ on 25th of September, the F line being very bright.

Very few records of observations of the interesting conjunction of Mars and Saturn have yet been published. Mr. Markwick, of Queenstown, Ireland, observed it with the small aperture of 2¾—a refractor—but states that so long as he was able to observe the conjunction, the planets were easily visible, quite separate to the naked eye; but at 5.25 clouds came up and put an end to further observations.

In November Mercury will be a morning star.

Venus will be a morning star.

Mars will be a morning star.

Jupiter will be a morning star.

Saturn will be almost stationary in Leo.

There will be no eclipses, occultations, or other celestial phenomena of interest during the month.

Rising, Southing, and Setting of the Principal Planets in November.

	D.	Rises. h. m.	Souths. h. m.	Sets. h. m.
Mercury ☿	5	5 15M	10 39M	4 3A
	12	5 48M	10 50M	3 52A
	19	6 24M	11 4M	3 44A
	26	7 3M	11 21M	3 39A
Venus ♀	5	4 35M	10 10M	3 45A
	12	4 56M	10 15M	3 34A
	19	5 18M	10 20M	3 22A
	26	5 41M	10 27M	3 13A
Mars ♂	5	2 34M	8 51M	3 8A
	12	2 30M	8 39M	2 48A
	19	2 27M	8 27M	2 27A
	26	2 23M	8 14M	2 5A
Jupiter ♃	5	11 32M	3 25A	7 18A
	12	11 10M	3 3A	6 56A
	19	10 48M	2 42A	6 36A
	26	10 25M	2 20A	6 15A
Saturn ♄	5	0 16M	7 21M	2 26A
	12	11 48A	6 52M	1 59A
	19	11 21A	6 25M	1 33A
	26	10 56A	5 59M	1 6A

SCIENCE-GOSSIP.

In the "English Mechanic" a series of articles on "Botany for Students" is appearing, by Edward Aveling, D.Sc. Lond. These are on the lines of the Science and Art Department and London University Matriculation Examinations.

Botanists and geologists are now fairly alive to the significance of what were formerly called *lusi naturæ*. It may fairly be claimed for the doctrine of evolution that, if it had achieved no other practical result than in philosophically explaining so-called monstrosities, it would have proved its right to a high place amongst philosophical speculations. Every geologist is aware that we divide herbivorous animals into two great classes, termed relatively the Artiodactyles and the Perissodactyles. These hard words are only Greek coined terms for even-toed and odd-toed animals. At what period and under what conditions herbivorous animals nearly allied to each other acquired these distinctive feet-characters we cannot say, but it was probably in the early part of the Tertiary period. Considerable light, however, is thrown upon their differentiation by the rare occurrence of horses having two toes and pigs having solid hoofs. Solid-hoofed pigs were reported from Texas by Dr. Coues as long ago as 1878; and now Mr. R. C. Auld, in the last number of the "American Naturalist," gives an account and an illustration of a solid-hoofed hog variety which is now being bred at Sioux City, Iowa, which the breeder asserts is the best hog known for the healthy growth of pork. This variety of solid-hoofed pig is frequent enough to go by the name of the "mule-footed hog." Mr. Auld gives an account of several cases of extra-toed horses, particularly of a male colt whose feet were cloven like those of a cow. Any one who is acquainted with the osteology of the horse's foot, or so-called leg, is aware that the two splint-bones are nothing more nor less than disused and aborted digits.

It would seem as if the influence of bacteria and micro-organisms generally upon higher forms of life was only just beginning to be understood. The researches of naturalists are constantly bringing new and unexpected facts to light. For instance, there is nothing better known that the frequent phosphorescence exhibited by marine animals, and especially the crustacea. This phosphorescence is frequently infectious—that is to say, it can be communicated by touch. A French naturalist, M. Giard, has just made known the results of some observations and experiments he has been making with *Talitrus* and other crustacea. On microscopically examining a brightly phosphorescent specimen he found walking slowly on the beach instead of leaping, as its habit usually is, he traced the phosphorescent light to the presence of bacteria in its muscles, which were greatly altered. On inoculating other and healthy individuals of this and other species the same disease was produced amongst them, and M. Giard says that his laboratory was quite lit up at night with these diseased but luminous crustacea. The inoculation was continued to the sixth generation apparently without any attenuation of the microbic action. The disease seems to follow a regular course, and the crustaceans died in three or four days. The phosphoresence, however, always lingered a few hours after death. Crabs were inoculated in the same way.

Wallace's new book on Darwinism has already passed into a second edition. We don't know how many of our readers have read the same author's "Island Life," which has always seemed to us one of the most brilliant of this author's works. We are reminded of this by observing that an American geologist, Mr. Baron, expressed his belief, derived from a personal examination of its flora, that Madagascar was separated from the African mainland before or during the early Pliocene epoch. This agrees with one of Wallace's most striking generalizations, given in the work above referred to. Mr. Baron shows that, while five-sixths of the plant-genera of Madagascar occurred elsewhere, only four-fifths of the species are peculiar to it. The central part of the island is composed of metamorphic rocks, which run more or less parallel to the crystalline rocks of the adjacent continent. The sedimentary strata of Madagascar lie chiefly in the west and south, and comprise lias, oolite, cretaceous, and eocene formations. The highest elevations attained by these beds are usually capped with lava, although there is now no active volcano on the island.

Messrs. Dulau & Co. announce for publication early in December, "A Catalogue of British Fossil Vertebrata," by A. Smith Woodward, F.G.S., & Charles Davies Sherborn, F.G.S. The published price will be 12*s*. 6*d*. net; but those subscribing before December 1st will obtain the work for 10*s*. 6*d*. post free.

Mr. Bussey, Museum Works, Peckham, has brought out "Bussey's Patent Ophthalmic Umbrellas," sunshades, walking-sticks, fans, &c., each having eye-glasses, either single or double, fitting into the handle. They can hardly help being appreciated by people who suffer from defective sight.

The "Catholic Truth Society" is publishing a series of papers on Natural History by the Rev. John Gerard, S.J. No. 1., entitled "Mr. Grant Allen's Botanical Fables," is well worth the penny charged for it, if only to show what the other side has to say on the matter.

The "Entomologist" for October has a very interesting article by the editor, Mr. J. T. Carrington, on

"Investigation of Variation." Mr. Carrington advocates the establishment of a properly-constituted association for the study of variation in the Animal Kingdom.

We are sorry to record the death of Dr. Royston-Pigott, M.D., F.R.S., &c., the eminent microscopist, &c., on September 14th, at Eastbourne. It will be remembered that the deceased gentleman did good work in the improvement of microscope objectives, in recognition of which he was in 1873 elected Fellow of the Royal Society.

On September 14th, Dr. J. E. Taylor delivered an open air lecture to the Essex Field Club at Walton-on-the-Naze, subject: "The Red Crag, its fossils, derivative and indigenous." Lectures by the same lecturer were delivered in October at Hitcham, on "The Circulation of Waters Underground;" at Bildeston, on "The Story of a Flint Pebble;" and at Framlingham, on "Coal."

Dr. Charles Galloway's reprints of his two interesting papers from the Quarterly Journal of the Geological Society are as follows:—"On the Production of Secondary Minerals at Shear Zones in the Crystalline Rocks of the Malvern Hills;" and from the Geological Magazine, "On the Present State of the Archæan Controversy in Britain."

The last number of the Proceedings of the Geologists' Association contains the following papers: "A Visit to the Volcanoes of Italy," by Professor J. F. Blake; "Note on a Chelonian Humerus from the Middle Eocene of Brocklesham," by R. Lydekker (Illustrated); "On the Rocks from the Saas-Thral and Geneva," by Captain Marshall Hall; "Notes on Early References to Geology, mostly before 1800," by E. Lichfield; "The Artificial Unmaking of Flints," by T. Hay Wilson; "The Geology of Upton and Chilton, in Berks," by A. J. Jukes Brown (Illustrated); "On the Estuary of the Thames and its Alluvium," by F. C. J. Sparrell (Illustrated).

Messrs. William Wesley & Son's Catalogue No. 97 contains a number of valuable books on the following subjects—Ichthyology, Reptilia and Amphibia, General Zoology, Anatomy, &c. No. 4 of "The Optical Magic-Lantern Journal and Photographic Enlarger" is full of interesting matter for those who take an interest in Magic-Lanterns and Photography.

Professor Geikie sends us a copy of his Presidential Address, read before the Geological Section of the British Association meeting at Newcastle. This address will long be remembered as perhaps the most useful synopsis of the question of Glacial Geology.

ZOOLOGY.

The Colour of Birds' Eggs.—As Mr. Nunn had declared that he was unwilling to enter into controversy on this subject, I was somewhat surprised to see another and lengthier article from his pen in your September number. As he himself declares, his observations on the eggs of blackbirds are not productive of any very satisfactory results in favour of the theory he advanced so confidently, and the truth of which I had the presumption to doubt. In Mr. Nunn's article we find six instances in which the colour and fertility were both noted. In the first case, two eggs are light, and two darker, but all are infertile. In the second, three are dark and one lighter, and there is one infertile egg, but we are not told whether this was light or dark. Next we have a three clutch, one egg being light coloured, but all are fertile, a similar occurrence being recorded for April 20th. After this we have an instance in which three light eggs are fertile, and the fourth, very dark, is infertile. Lastly, in a sixth clutch the two abnormal eggs are fertile, and the addled egg turns up amongst the normal ones, just where, according to Mr. Nunn's theory, it would be least expected to be found. These six instances, I venture to maintain, all tend to prove that Mr. Nunn's theory has been founded on rather too hasty generalisation, and that however much "trouble he has taken to investigate," he has evidently taken but little in collating and drawing inferences from his facts. The subject is well worth paying attention to, as the reason for the varied colours of eggs has still to be found, and I for one would be heartily pleased should Mr. Nunn succeed in solving the problem, but he must have patience with those who are led to opposite conclusions to himself, until he is able to demonstrate clearly some probability of his deductions being correct.—*J. A. Wheldon, York.*

Vandal-Naturalists.—The practice of egg-"clutching," a very appropriate name for this mode of collecting, is I think, never sufficiently to be condemned. The "clutcher," and the "pot" or hedgerow shot seem to me to stand on a par with each other, and combine to render the rarer species of British birds practically extinct. I cannot see anything in Mr. Nunn's notes to support clutching; the argument is filled with a desire for something better than is possessed by your neighbour, a larger show, a greater number, something that others have not. "Eggs are eggs," says Mr. Blagg, and what difference is there, may I ask, between half-a-dozen eggs of the song-thrush or hedge-sparrow, and one thousand complete clutches, for any scientific purpose? There is a sufficient likeness in all, and the same may be said of the eggs of half the birds in the British list. I know that an assortment of six or even twelve eggs gives an air of completeness to a collection, and allows of varieties, where any variation exists, but surely this may be attained without clutching—the very word has an unpleasant sound. The vandals argue thus: "If I take the whole of the eggs, the birds will immediately build another nest, bring forth a full brood, and are none the worse off; I am so much the better, inasmuch as I have five eggs instead of one or two." This, I take it is the argument. Now for the other side. Imprimis, the clutcher purposely overlooks the fact that, if he took say, two, from a nest of five, the parent-birds would not hatch the three only, but would make up the original number, five, and thus hatch a full brood. Secondly, if he takes the whole of the eggs, and the birds lay a second lot, he has been the means of subjecting them to a severe physical strain, and increases the probability of unfertile eggs; and if there is any truth in the light shell theory, is it any wonder that two of the three eggs of the raven taken at Portland were light-coloured, when we remember that it was the fourth nest? Thirdly, when the first nest has been taken, and the second built, and duly furnished with its full complement of eggs, what of the second vandal? he of course must have his clutch, remarking under his breath, "Of course, the bird will lay another lot." Exactly; but what I fail to see is just this: when does the bird's chance begin to come in? This part of the subject, the most important part, seems to hang fire, and I shall be glad if some vandal will enlighten me. If this cannot be explained, it only shows the rottenness of their arguments.—*Arthur Hollis*, *Grantham*.

Birds' Eggs.—Is it known that the colour of birds' eggs can be removed with soap and water? A lady friend of mine, a short time back, was cleaning some small eggs, and, to her dismay, found she was removing the colour.—*W. W. Reeves*.

Occurrence of the Spotted Crake (*Porzana marnetta*, Leach), near Glasgow.—A fine young male of this species was found dead at Possil, about two miles north-west of Glasgow, on Sunday, September 1st. When found it was still warm, and was supposed to have killed itself by flying against a wire fence near which it was lying. This species, so far as I am aware, has not been recorded for the west of Scotland north of the Clyde.—*J. Macnaught Campbell*, *Glasgow*.

Tadpoles of Frog.—In Science-Gossip for a recent month, page 197, Mr. Ullyett asks whether the tadpoles of the common frog ever go through two seasons before their metamorphosis. I do not think that in a natural condition they ever do remain in the tadpole state for a second year, but if you confine them in an aquarium with glass sides, so that they cannot emerge from the water to breathe air, they will remain for a long time beyond the usual period as tadpoles. I made an experiment with tadpoles in 1887; the bulk of them changed to frogs in the month of June, but one that I confined in an inverted bell-glass remained a tadpole till November, when I unfortunately lost it. I was led to make this experiment because there were some tadpoles of the American bull-frog confined in the Brighton Aquarium, one of which remained a tadpole for more than two years and showed no signs of changing to a frog. On inquiring about it during the summer of the third year, I found, much to my regret, that it had been heedlessly lost when the water was changed.—*J. Jenner Weir*.

Deferred Metamorphosis of the Tadpole.—In reference to Mrs. Ullyett's paragraph last season (1888), I had some tadpoles still undeveloped right into the middle of the winter. They lived under fairly natural conditions, in a small pond formed by a shallow tub sunk in the ground, and containing alisma, lobelia, and other aquatic plants. They grew to a large size, and I hoped to find them in the spring, but they had vanished.—*W. P. Hamilton*, *Shrewsbury*.

The "Crystalline Stylet" in Slugs.—It is a matter for regret that a clerical error of mine respecting the occurrence of the "crystalline stylet" in the stomach of a gasteropod should, owing to various circumstances, have remained uncorrected from the proper quarter until it had given rise to some controversy. When writing the paragraph containing this statement, in "Life-Lore" for March last, I had parmacella in mind, but ought, properly, to have written "bivalves" instead of "slugs" in connection with the occurrence of the "stylet" in the stomach. With the "stylet" in the stomach of pholas and anodonta, I am quite familiar, also with the "stylet" in parmacella; but in parmacella the "stylet" is an accessory to the reproductive organs, not the stomach. It is, perhaps, unfortunate that the name "stylet" should have been applied to these differing organs in the anodons, &c., and parmacella, since it is liable to cause confusion. I am not aware that any of our British slugs possess an organ similar to the "stylet" of parmacella, which is very curious, has long been known, and is well figured by Webb ("Mag. de Zool.," 1836, pl. 76, fig. ii. and fig. v.), also by Sinroth (*loc. cit.*).—*R. Standen*.

Var. of H. aspersa.—Mr. Deny's variety of *Helix aspersa* referred to on p. 215 ante, is probably Picard's var. *conoidea*, which was described in 1840. The description in my "Handbook" is "shell an elongated cone, thin, fragile; mouth small." They are not very common. If Mr. Deny is willing, I should like to see it; I could then positively refer it for him to its right variety-name.—*J. W. Williams*, *Middlesex Hospital*, *W*.

Shells from the North-West London District.—In the September number of Science-Gossip, Mr. Cockerell alludes to *Paludina vivipara*, variety *inflata* (Locard), which he kindly identified as British from specimens I submitted him in 1886; and, as he doubtless had these in mind, I venture to offer the following notes from the series in my collection. This interesting variety is characterised by deeper sutures, more inflated whorls, and a somewhat lower spire than the type; some specimens also have a slightly more open umbilicus—all particulars in which it approaches *P. contecta*; and indeed Tate, in his "Plain and Easy Account," p. 56, mistook them for that species. The above varietal characters are not so marked in the young; the spires of the adults of those from the "Leg of Mutton" pond are much eroded. It is remarkable that while all the specimens from this pond are of the variety inflata, those from the bathing pond on the East Heath are quite normal. The same variety also occurs in the Welsh Harp reservoir, where the environmental conditions are, so far as one can tell, quite dissimilar. The "Leg of Mutton" pond contains, in addition to those mentioned by Mr. Williams, *Planorbis corneus*, of a ruby-red colour, possibly due to the oxide of iron with which the stream flowing into the pond is charged, *Planorbis umbilicatus*, *P. contortus*, and *Sphærium lacustra*. Mr. Williams also seems to have overlooked the *Unio tumidus*, var. *ovatus*, found in the Red Arches pond. Several specimens of *Limnea stagnalis* from the bathing pond have very low spires with shallow sutures, approaching *L. peregra*, var. *intermedia*, in shape; I have seen the same form from Beccles, Hatfield, Wembley, and Sweden, and Mr. Cockerell's variety expansa is somewhat similar. Is this a case of reversion to a low-spired progenitor? Among the rank vegetation that until recently clothed the disused brick-fields on the East Heath, I have found *Arion ater*, *Limax agrestis*, *L. maximus*, *L. lævis* (one specimen), *Zonites alliarius*, *Helix rufescens*, *H. rotundata*, *H. hispida* and *concinna*; *Arion hortensis* and *Zonites nitidulus* occur in Caen Wood; *Zonites cellarius* and *Testacella haliotidea* in my coal-cellar. On the West Heath itself, although I have searched it more closely than any other part of the district, save a few *Arion ater* and *Limax agrestis*, I have found no shells, and their absence here is no doubt due to the abundance of furze, ferns, and coniferous trees, which, together with a peaty soil, render it uninhabitable to them. In the ponds bordering the lane leading from North End to Hendon, *Planorbis vortex* and *Valvata cristata* may be found, and in the same locality *Zonites crystallinus*, *Z. alliaria*, var. *viridula*, *Helix hispida* and *H. rufescens*; *Pisidium pusillum* and *Cochlicopa lubrica* occur in a dry ditch at Child's Hill, while Mr. Cockerell records *Pisidium fontinale*, var. *cinerea*, for Hampstead. The Welsh Harp reservoir contains *Unio tumidus*, *U. pictorum*, *Anodon anatina*, *Limnea peregra* (one specimen having white bands), *L. stagnalis* and *L. auricularia*; in a stream flowing into the reservoir near the railway bridge are *Neritina fluviatilis*, *Valvata piscinalis*, *V. cristata*, and *Sphærium rivicola*. In the numerous streams (feeders of the Brent) about Neasdon and Wembley, *Physa fontinalis*, *Limnea peregra*, var. *intermedia*, *L. stagnalis*, var. *albida*, *Planorbis carinatus*, *Ancylus lacustre*, and *Succinea putris*; and in Wembley Park, *Zonites nitidulus*, *Z. crystallinus*, and *Clausilius rugosa*. Mr. A. H. Shepherd records *Zonites glaber* for Hendon. From the Highgate Woods I have *Z. radiatulus*, *Limax hortensis*, var. *rufescens*, *Helix nemoralis*, var. *interrupta*; this species presents the following band formulæ near Hendon: *rubella* 00300,00000, *carnea* $_{12}345$. On the left of Finchley Road, opposite the Oakhill fields, was a numerous colony of *Helix hortensis*, the varieties *lutea* and *incarnata* (bandless) far outnumbering the type.—*C. Clare Fryer*, 139 *Fellows Road*, *South Hampstead*, *N.W.*

BOTANY.

SUNFLOWERS.—There has long been a doubt in my mind as to whether the old idea, taught in our youthful days, that sunflowers follow the sun in his daily course, was based on fact or otherwise. During the past season, I have made many observations on these plants, so as to find out the truth, if possible. Fortunately this has been a comparatively easy task, as these flowers have been strongly in evidence in South Beds. In some instances, gardens have been occupied almost solely by them. The conclusion forced on one's mind is, that sunflowers do not turn their heads with the sun. The only apparent exceptions are where they are planted close to a dead wall, in which circumstances the faces of the flower-heads are turned from the wall, or, in other words, towards the light. But, even here, the discs are always directed to one point of the compass, and do not make a diurnal semi-revolution. To effect such a mission, there must be a torsion of the peduncle, which does not occur, and on examining a plant it will be readily seen that such a movement would require considerable mechanical force. Wherever they grow in open situations, or even near a low wall, the flower-heads are directed to all points of the compass, and there does not appear to be any greater number facing the south than any other way. They evidently obey the law that governs most flowers, which impels them to present their broadest surfaces at right angles to the incidence of the light; which again is modified by centrifugal development, so that each individual head has its due share of illumination. As to the origin of the common name, may it not have been applied because of the resemblance to the conventional sunflowers of public-house signs, &c. Or was the scientific name Helianthemum coined first, and sunflowers thus only an anglicised form of its generic appellation?—*J. Saunders*, *Luton*.

Sagacious Potatoes.—The following remarkable instance of "sagacity" on the part of the common vegetable, the potatoe, has recently come under my notice, and is, I think, well worth recording in your columns. I have a large garden on my glebe lands, in which I grow several plats of potatoes, amongst which last year I had an excellent strain of some early varieties. When the faded appearance of the haulm denoted that the tubers were sufficiently matured, I got what remained, after having had my table supplied with them for eight weeks, of two particularly good kinds, dug out. And they were spread on the surface of the earth, in order to expose them to the greening action of the sun's rays, that they might keep the better for "seed" for the next season's planting. One lot was of long, white, ash-leaf kidneys, the other was a species like the American Rose, but flatter in shape, whose name I do not know. Well, a few days after my man had raised the crop, and spread it on a border, I went to see how they were getting on, and if they were ready for storing in the root-house. When I was some yards distant from the plat where they had been placed, I became aware that a change had come over them. For, instead of their being the proper dirty yellowish-white and pink colours, I found that all, except a few that were suffering from *Peronospora infestans*, had cunningly made themselves of the same hue as the earth on which they lay. The diseased tubers alone retained their original white or pink colour, being too weak from disease to use any mental or bodily exertion. Now, what was the object in this altered appearance which the potatoes had assumed? And after considering the matter, I can suppose nothing else than that these potatoes of mine intended to try and escape my notice, and that of my man, and so avoid being carried away, and washed, and cooked and eaten. Every tuber, except the sick ones, had good eyes, and they had seen during the summer weeks many a basketful of their companions taken off to the kitchen, and so they determined to avoid such a wretched fate. And I have not the least doubt that the descendants of these sagacious potatoes will be able in the course of time, not only to change the colour of their skins at the approach of danger, but to bury themselves beneath the soil, like the way moles do, at a moment's notice.—*H. W. Lett, M.A.*

The Old Botanical Book.—It is written in the Linnæan method, and now every one possesses one on the national system. Well, if it wont sell to the general public, let us advertise it to the geologist, for it will help him to understand the evolution of the flowers from the ferns, and in tracing the diversity of parts it will explain the change that has come over their families. It is, in fact, an interpolated chronicle from the earlier Tertiary, the time of flowers, with allusions to that which went before: but to understand it rightly, they say, we should begin at the end like Hebrew, and read it backwards. Does any desire to know that the labiates are proud of their history, let him proceed to the water-brink and pluck the water horehound (*Lycopus europæus*), and if he then refers to this book of heraldry, he will discover that he has in his hand a degenerate or undeveloped member of the family, a scrapegrace that, with the naked seeds, square stem, and faint scent of its kind, hangs out whorls of unshaped blossoms, including but a single pair of stamens to pro-create its like.—*A. H. Swinton.*

Linum perenne, L.—In Sir W. J. Hooker's "British Flora," the localities given for this plant are as follows: "Cambridgeshire; Hinton, Northamptonshire; Norfolk and Suffolk; Westmoreland; near Moncktown, Ireland." That would of course imply that it was very local, but nothing is said as to its rarity in its habitats. Northamptonshire and Suffolk must have been then (about 1838) its most southern localities known. In the "Student's Flora" (1884) it is noted as growing "on chalky soils from Durham to Essex; very rare," so that by this time it had been recorded as far south as Essex. If this plant be rare in the sense of its localities being so limited, it would certainly seem to be abundant in one place where it grows, namely, one of the Gog Magog Hills, near Cambridge; I found it there last Whitsuntide (early in June) and the roadside was quite spangled with its bright blue flowers. With regard to its record for Essex, Mr. John S. Carrington, F.L.S., tells me that he found it growing on the roadside between Leigh and Hadleigh, quite in the south of that county. It was early in August, and only half-a-dozen plants were in flower, it being past the flowering time, which is given in the "Student's Flora" as from "June to July." It would be interesting to hear of any record further south, in Kent, for instance; though I suppose in these days, when counties are so thoroughly worked, there will hardly be any chance of such being the case.—*Archibald L. Clarke.*

GEOLOGY, &c.

ALL THE WORLD'S A STAGE;

A GEOLOGICAL PARODY.

All the world's a stage
And all the men and beasties merely players;
They have their exits and their entrances.
And in former ages played they many parts,
Their acts being seven ages. First *Eozoon*,*
Lapped in the bosom of primæval seas.
And then the happy *Trilobite*,† with "compound eyes,"
And "swimming feet," that crept in mud now turned

* Archæan aera. † Cambrian period.

To schoolboy's slate! And then the *Fishes*,*
"Ganoids" with bony scales, and "placoids" like to sharks,
In old red sandstone lakes. Then *Amphibians*,†
Found in the coal and Cheshire sandstone rocks,
Strange fellows they, not bearded like the pard,
Some thought them like to toads, more like the newts,
'Seeking the bubble reputation'
Of footprints on the sand. Then *Deinosaurs*,‡
In fair round belly, with food well lined,
Their eyes severe, erect on great hind legs,
The Lords of Mesozoic times.
And so they played their part. The sixth age shifts
Into the *Bird*,§ a diver, six feet high,
Hesperornis it is called, with teeth in jaws,
Large skull and reptile-like affinities,
And yet a Bird! And his big wingless form
Was known to haunt the shores of all cretaceous seas;
Many fishes did he eat! Last scene of all
That ends this strange eventful history
Is *Man*,‖—his early childhood's mere oblivion,
With teeth, with eyes, with taste, with—everything.

HENRY N. HUTCHINSON.

* Silurian period. † Triassic period. ‡ Jurassic period. § Cretaceous period. ‖ Tertiary era.

NOTES AND QUERIES.

GT. YARMOUTH YOUNG NATURALIST'S SOCIETY.—On July 31st, several young naturalists met together, and decided to form themselves into a society with the above-named title. The members had a ramble on Bank Holiday in very unpropitious weather. On reaching Bradwell a heavy thunderstorm came on, the rain coming down in torrents. The heavy rain had caused the molluscs to come from their hiding-places and take an afternoon stroll, the result being that some were boxed, and afterwards afforded considerable interest and pleasure to the ramblers. The ramblers went to Burgh Castle. Here some good takes were made, several shells new to the locality being found, also one or two rare butterflies. On the wall a pair of wood-doves were seen, and a starling was found in a weak condition, it having its under-beak evidently shot off by some inhuman person, who left it there to starve and die. Having put the poor bird out of its misery, the ramblers made their way homewards, thoroughly satisfied with the results of their day's rambling, although the rain somewhat marred their enjoyment. The first monthly meeting was held on the 4th of September, J. B. Beckett being elected hon. secretary and J. E. Knights hon. treasurer. The business having been transacted, an account of the ramble to Bradwell and Burgh Castle on Bank Holiday was given, and the following species of molluscs, being new to the list, which were collected during the ramble, were exhibited with others—*Physa hypnorum*, *Helix rotundata*, and *H. caperata*. Specimens of molluscs taken individually were exhibited, amongst them being *Helix nemoralis* variety, *hybrida*, *Nucula nucleus* and *Nassa reticulata* v. *nitida*, the former taken at the west end of Caister, and the two latter from a trawl after a drag opposite the north battery, all three being new to the list. Four specimens of the sun star-fish (*Solaster papposa*) were also shown, only one of which was perfect, having twelve complete rays. Of the other three, one had thirteen rays, another eleven complete rays and a double one, and the other had had one of its rays taken off, but was producing another. Specimens of the common sea urchin (*Echinus sphæra*) and a stone covered with *Sabellæ* were also laid before the members. The Secretary's address is Trinity Place, Friars Lane, Great Yarmouth. The annual subscription for honorary members is 2*s*. 6*d*., and corresponding members 1*s*. 6*d*.

LEPROSY.—With reference to the article by "Medica" on "Leprosy" in SCIENCE-GOSSIP for August, has the writer ever noticed that the prevalence of the disease is coincident with the consumption of dried fish, as habitual diet by the people? In India and Scandinavia the custom prevails largely, and it has been asserted, with some show of reason, that it directly causes the malignant disease.—*C. Parkinson.*

LEPROSY.—On p. 193 of the September number is an article on "Leprosy" by "Medica," in which it is given that, in the opinion of the writer, the cause of leprosy is to be sought in a "parasitic lichen." This statement is not in accordance with observed facts. In 1880, Hansan, of Bergen, published his discovery of a bacillus (which he had discovered six years previously), in the Quart. Journ. Micro. Science (vol. xx. p. 92), and since then it has been found by Stevens ("Brit. Med. Journ." July 18th, 1885), Rake ("Path. Trans," 1887), Thin ("Med-Chir. Trans," vol. lxix, pls. 12, 13), Hillis ("Path. Trans," 1883 pl. 22), and by Köbner, Cornil and Babes, and Neisser. There is no doubt, then, that it is due to a microscopic fungus, and the rapidity of the multiplication of the bacilli are almost too well known to deserve mention. The *Bacillus lepræ* is found in the granulation tissue forming the nodules; they are 5 micro-millimetres long, slender, immobile, and stain like the bacillus of lupus. The fact that leprosy is due to a bacillus does away with the never meeting "with cases of leprosy in wood, stone, or mortar, the warp or the woof," simply because these substances would not form a suitable nidus for the bacillus. Doubtless these illustrations of Scripture can be explained away on other grounds. The writer says, "We are unable to determine whether or no leprosy be contagious," but Fagge ("Principles and Practice of Medicine." 2nd edition, 1888, vol ii. p. 1011), says "Notwithstanding the presence of the *Bacillus lepræ*, the disease is, under its usual conditions, non-contagious; it is not transmissible by living in the same house, by contact," or even by the "seed." "It is, however, possible that contact of actually ulcerating leprous nodules with a fissured skin or mucous membrane might produce the disease; and there is reason to believe that a contagious quality is more marked when the disease is newly introduced, as into the Sandwich Islands, and also, according to Dr. Liveing, into Australia by the Chinese immigrants." This last any student of bacteriology will be prepared to admit as feasible, even on theoretical grounds; the bacillus having found a new nidus will propagate itself with new vigour and become of a more virulent character. It is doubtful whether the Septuagint translators were correct in rendering the zaraath of the Hebrews by the Greek word lepra. If the present distribution of leprosy be considered, it will be found that it is more common on the sea coast, around great rivers and inland lakes, and Mr. Hutchinson suggests that it depends—that is to say, the bacillus had its origin—upon eating fish, especially decomposed fish, by persons in a low state of health. In the Middle Ages leprosy was prevalent over nearly all Europe, and salted fish formed in that time almost the only food during the winter months. Whether leprosy can be inoculated is not yet proven. Rake and Köbner have not been successful in their attempts at inoculation in animals, but a case published by Gairdner in the "British Medical Journal" of June 11th, 1887, appears to show that in some cases the disease may be communicated by inoculation, for example, by vaccination.—*J. W. Williams, Middlesex Hospital, W.*

A Tame Squirrel.—A friend writes: "Of course we went to Plas Newydd, were much interested in the old place, particularly in the grounds, which are very fine, and well kept. Here I saw a live squirrel for the first time in my life; it is quite tame, evidently a pet. It hopped about in its pretty graceful fashion, jumping into our laps, begging for nuts or bits of biscuit; unfortunately we had nothing eatable with us, so squirry ran up to the top of a high tree and looked down upon us, no doubt thinking what a shabby lot we were."—*F. S.*

House Martins.—A colony of house martins have built their nests in the porch above our door, and are busy rearing a second brood of young. One afternoon the servant's attention was drawn to a black-headed gull standing on one of the cross-beams, evidently trying to reach one of the nests in spite of the attacks made upon him by the whole of the old birds. Soon afterwards he was seen to fly away with what was evidently a young bird in his beak, pursued by the enraged martins; but whether he got away with his prey, I am unable to say. A few days afterwards, when out walking, I saw a number of house martins chasing a dovecote pigeon, which was evidently quite blind with fear, and did not know where to go. It at last took refuge on the roof of a house close to where a number of persons were standing watching the curious scene, and where its tormentors contented themselves with making sudden dashes at it.—*W. Hannan Watson, Airthrey Croft, Bridge of Arran.*

Prolongation of the Tadpole condition.—Mr. Ullyett says, in Science-Gossip for September, that he had a tadpole which remained in that condition up to January 9th. A friend of mine had a few that had not undergone metamorphosis, or even grown at all, evidently, in November 1888. They were kept in an aquarium in a somewhat dark place, and this may account for the circumstance, for tadpoles require plenty of light to develop into perfect frogs. I believe, however, that some species do hibernate during the larval state.—*F. P. Perks.*

Prolongation of the Tadpole condition.—The larval forms of the batrachia may be kept from assuming their adult stage for a considerable period, and it is no unusual thing to retain them in the first-mentioned condition for a much longer time than that mentioned by Mr. Ullyett. Some years ago, in experimenting in this direction, I kept tadpoles of the common and palmated newts (*Molge vulgaris* and *Molge palmata*) for over two years. I had also a tadpole of the bull-frog which I received from New York, and which I kept in that state for, I think, over that time. I cannot at present lay my hands on my notes regarding it. The late Mr. Darwin, with whom I at the time had some correspondence on the subject, wished me to endeavour to breed them in the tadpole stage, but my efforts in that direction were unsuccessful. Cold and insufficient food will at all times retard their development.—*J. Macnaught Campbell, Glasgow.*

Development of Tadpoles.—Like your correspondent, Mr. H. Ullyett, I have often wondered whether any one has ever noted if tadpoles do sometimes go through two seasons before developing into the frog. I think it is very possible they may do so, as I found some years ago in a pond near here a fairly sized tadpole, early in February. Captain Aitken, who was with me, and myself both came to the conclusion that it must have been of the previous year's hatching. My experience last year has been very similar to that of Mr. Ullyett. From spawn gathered early in April I find from my notes that two were alive on December 3, development having been apparently stationary since October 7. I was away from home during the latter part of December, and on my return on January 5, 1889, I found the aquarium, an inverted bell-glass, and which was in an exposed situation, had been frozen and broken, and so the tadpoles came to an ultimely end, much to my regret, as I thought I was in a fair way to solve the question.—*Albert Morrison.*

Maimed Ants.—It may interest Mr. Bowman to know that I have just observed an ant which had lost its abdomen (how, I do not know) carrying considerable pieces of earth about as if nothing was the matter. I cannot, however, get these insects to take any notice of vibrations on the outside of their bell glass, or to take the trouble to tell each other when any choice article of food is placed within their reach.—*F. Winn Sampson.*

Protective Action of Poisonous Properties and Bad Tastes in Plants.—It is generally supposed that evil-tasting and poisonous constituents in plants serve the purpose of preventing the attacks of enemies. As far as some of the worst of these enemies—snails and slugs—the protection is not always sufficient. Every one must have noticed that slugs will feed upon the leaves of the poisonous foxglove, as readily as a cow will upon cabbage or clover, and with as little injury. This season I have observed that the deadly properties of the common laburnum, which extend to all parts of the tree, afford no protection. The leaves of a young laburnum in my garden have been eaten to such an extent that the tree looks quite shabby, and I have caught both slugs and snails in the very act. As to offensive tastes, it is difficult to imagine anything more repulsive than that of *Vallota purpurea*, known by some as the "Scarborough lily"—an absurd name. Yet this plant, if set out in the garden in the summer months, is eaten by snails to a ruinous extent. On the other hand, the leaves of *Eschscholtzia Californica*, as far as I have observed, escape the attacks of slugs, though their taste is by no means so offensive as that of the Vallota. We are sometimes told that the prickly leaves which the holly bears on its lower and outer branches keep off the attacks of browsing quadrupeds. This is not universally the case. I have seen some lambs nibbling very perseveringly at the twigs of a holly hedge; this was at a time and in a place where there was plenty of other food available. The acrid, poisonous character of the bark of the mezereon is no protection against hares and rabbits. Hence, if plant-poisons have been evolved as a protection against animal enemies, the latter have, in turn, acquired a special immunity from their effects.—*J. W. Slater.*

Query in reference to "The Cuckoo's Song."—Your able correspondent, Mr. W. P.

Hamilton, in the October Number of SCIENCE-GOSSIP, having so particularly noted the cuckoo's song, will be able to state if it is the male or female bird, or both, that gives the pleasing love-call. I see Morris does not speak positively to the fact.—*W. H. T.*

A DESIGN OF THE DAISIES.—I do not know whether it be correct to say purple-eyed, orange-eyed, crimson-eyed or blood-bedropped daisies. Those who consider a daisy as a mere time-piece akin to a watch, would lead us to suppose that these spots were a kind of rouge daubed on to the disk for the sake of ornament, whereas, this natural dye is like the blush on the cheek, a secretion, and shows that modest flower is proud of its lineage. One spring day I strolled out from Bedford towards Sandy, and on approaching the latter town by the Cardington Road, I observed these sentimental daisies in plenty at the way-side, and saw at a glance that they were looking up in their environment, their growth being pre-eminently rank, coarse, and luxuriant; I fancy they will soon be in excess of the silver star of the old régime at Sandy.—*A. H. Swinton,*

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.

DORSETSHIRE RESIDENT.—1. See chapter entitled, "The Story of a Piece of Chalk," in Taylor's "Geological Stories" (W. H. Allen & Co.). 2. You will find the numbers of foraminifera in chalk, and also instructions how to procure them, in "Our Common British Fossils" (Chatto & Windus). 3. Will be found answered by No. 1 query. The "little creature" you sent is *Geophilus longicornis.*

F. J. GEORGE.—Many thanks for your interesting specimens of *Mercurialis autumnalis.*

H. ROBERTS inquires what natural history societies exist near Maida Vale, St. John's, or Kilburn. Perhaps some reader will inform us.

J. T. BAYLEE.—Get Page's "Economic Geology," published by Blackwood. You will therein find much about clays; also in Professor Ansted's books.

W. T. CALMAN.—It is impossible to make out the species of rotifer from the slight and rough sketch sent us. It does not look like a rotifer at all.

T. U. WOODWARD.—You will be able to procure micro-slides of horse-tails from Mr. H. P. Aylward, 164 Oxford Street, Manchester.

S. L. FLETCHER.—The occurrence of "double apples" is not unusual. You will find an illustration and description of them, as well as an explanation of their origin, in Dr. Masters's "Vegetable Teratology."

W. F. JONES.—The force required to separate the Magdeburgh hemisphere could be known by calculating the number of square inches of area, and multiplying by fifteen, which would give the result in pounds.

C. C. WILSON.—See answer to query about double apples. The "red fungus" reached us in too high a state of decomposition to identify it.

F. T. M.—Send us some more specimens, same as last.

R. G. M.—Your specimens are 1 and 2 bryozoan zoophytes. 1 is *Membranipora pilosa*, and 2, *Membranipora membranacea.* The "hooked seed" are the fruits of *Medicago minima.*

EXCHANGES.

RARE British plants in exchange for British land and freshwater shells.—W. W. Reeves, 32 Geneva Road, Brixton, S.W.

WANTED, slides of selected diatoms in exchange for gem air-gun, telescope, air-pump, skates, &c.—Henry Ebbage, 344 Caledonian Road, London.

OFFERED, "Ants and their Ways," by Rev. Farren White. Wanted, good mounts of foraminifera, foreign shells not in collection, or small microtome. What offers?—A. J. Jenkins, 6 Douglas Terrace, Douglas Street, Deptford, S.E.

Hydrobia similis, H. ulvæ, and few British land and freshwater shells for exchange. Wanted, *S. virescens, S. oblonga, Z. purus, Z. radiatulus*, vertigos, *Acme lineata*, and dead or living testacella.—A. J. Jenkins, M.C.S., 6 Douglas Terrace, Douglas Street, Deptford, S.E.

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

OFFERED, twenty chips of rocks (varieties), suitable for making micro sections. Wanted, recent shells or fossils not in collection. Send lists to—J. Smith, Monkredding, Kilwinning.

FOR British examples of *Vertigo alpestris*, I will give a liberal exchange in Continental or other foreign land or freshwater shells.—G. Sherriff Tye, 10 Richmond Road, Handsworth, near Birmingham.

WANTED, fossils from all formations; good micro-slides (various objects) in exchange; also a large quantity of micro-material.—Ernest O. Meyers, Richmond House, Hounslow, W.

WHOEVER will send three species of fossils from any formation (one or two good specimens of each, according to size), will receive one dozen packets of micro material in exchange, or two good slides.—Ernest O. Meyers, Richmond House, Hounslow, W.

WANTED, a secondhand copy of Seboth and Bennett's "Alpine Plants Painted from Nature." State price to—R. B. Postans, Eastbourne.

WANTED, *Helix lamellata.* Land and freshwater shells offered in exchange, or I will give SCIENCE-GOSSIP for 1888, unbound, perfect, for a few specimens.—F. C. Long, 8 Cog Lane, Burnley, Lancs.

WHAT offers for "Journal of the Royal Microscopical Society," from Feb. 1880, vol. iii., No. 1 (14), to No. 70, June 1889, No. 39 missing; also first eight numbers of "English Historical Review." All the journals as good as new.—Lt.-Col. C. Frampton, Portchester, Hants.

SEVERAL species of side-blown birds' eggs from the Bermuda Islands, offered for rarer species of British marine shells, or foreign land shells in good condition. Also a collection of about 120 species of British birds' eggs, side blown, offered for good copies of Jeffrey's "British Conchology," Sowerby's "Illustrated Index of British Shells" (1887 ed.), Sowerby's "Thesaurus Conchyliorum in Monographs," or collections of foreign shells in good condition.—A. Hartley, 8 Cavendish Road, Idle, near Bradford, Yorkshire.

OFFERED, pupæ of versicolor, pyri, paronia, reclusa, *Vinula trepida*, and imagines of adippe, euphrosyne, argiolus, corydon, bellargus, ægon, medon, albicellata, virelata, galathea, hastata, unidentaria, punctulata, connexa, Jacobææ, iquercus, batis, dilutata, ocellatus, tiliæ, populi, elpenor, porcellus, &c.; also *Helix pomatia*, and about thirty other species of land and freshwater shells (send for list), *Mactra solida*, and other marine shells, collection of marine algæ from Bournemouth and Weymouth, spiders in spirits, skins of weasel, long-eared bat and hedgehog, snakes in spirits, ova of lackey moth, &c. Wanted, British and European dragonflies, grasshoppers, and locusts.—W. Harcourt Bath, Ladywood, Birmingham.

BRITISH coleoptera and hemiptera, in great variety, well set and correctly named, for well-mounted slides.—H. Edwards, Lindley Street, Lakenham, Norwich.

WANTED, British grasses. Excellent botanical micro-slides sent in exchange, at the rate of one slide for each grass selected.—B. P., Hill House, Hemel Hempsted, Herts.

OFFERED, tertiary fossil shells (in good condition) from the Paris basin, in exchange for marine, freshwater, and exotic shells, and fossils from all formations.—A. Bonnet, 9 Rue de Mazagran, Paris.

DUPLICATES.—*Z. draparnaldi* (recently added to British fauna), *V. edentula, H. pygmæa, A. fluviatilis*, var. *albida; H. nemoralis*, vars. *castanea, carnea; H. hortensis*, var. *minor, H. arbustorum*, var. *marmorata.* Desiderata: *H. arbustorum*, vars. *albinos, Repellini; H. hortensis*, var. *incarnata*, and other rare helices.—R. Wigglesworth, 13 Arthur Street, Clayton-le-Moors.

WANTED, diatom gatherings from Colon, Ceylon, and other good localities, in good quantities, in exchange for deposits from Jackson's Paddock, Otago, Cannock's rock, Allan's rock (Oamaru), also cementstein from Japan (new), Szent Peter, Kekko, Telzo-Estergaly, Hungary. Send list to—M. J. Tenyrère, 168 rue St. Antoine, Paris.

OFFERED, test haliotidea (alive, in spirit, or shells), eight small shells from Oxford clay, and Nicol's "Mineralogy." Wanted, *Helix lapicida, Scalaria communis, Turritella communis, Cerithium reticulatum*, or many other common marine shells.—Geo. Parish, 124 Kingston Road, Oxford.

WANTED quickly, ants, ecitons, &c., from all parts of the world. State desiderata.—Mark L. Sykes, New Lane, Winton, near Manchester.

Acme lineata and *Vertigo pusilla* offered for *V. angustior*, *V. Moulinsiana*, and *L. involuta*.—W. Hy. Heathcote, M.C.S., Frenchwood Street, Preston.

OFFERED, L. C., 8th ed.:—191, 563, 680, 886, 934, 984, 993, 1055, 1410, 1490, 1491, 1494, 1590, 1618. Desiderata, 79, 115, 137, 138, 147, 221, 297, 300, 330, 339, 354, 355, 373, 621, 634, 733, 751, 824, 826, 1074.—H. Masterman, 26 Belmont Place, Kelso.

DRIED specimens of the flower *Parnassia palustris*, to be exchanged for a living specimen of the black water-beetle *Hydrŏus piceus*.—B. C. Robinson, Oakamoor, Stoke-on-Trent.

DUPLICATE eggs of kestrel, thrush, mistletoe thrush, blackbird, hedge-sparrow, whitethroat, skylark, yellow bunting, chaffinch, house-sparrow, linnet, rook, magpie, guillemot, oystercatcher, partridge, red grouse. Desiderata: hobby, peregrine falcon, teal, cormorant, shag, gannet, raven, quail, dotterel, and others.—F. W. Paple, 62 Waterloo Street, Bolton.

OFFERED, *T. testudinalis*, *L. divaricata*, *L. pallidula*, *T. borealis*, *F. gracilis*, *T. truncatus*, &c. Wanted, other marine duplicates.—F. Simpson, 51 Loch Street, Aberdeen, N.B.

WANTED, a coprolite, polished or otherwise, also *Productus horridus* and *Helix pomatia*. Offered, *Limnæa stagnalis*, *L. peregra*, *Helix aspersa*, *H. hortensis*, *H. arbustorum*, *H. rupestris*, *H. nemoralis*, *H. rufescens*, *Pupa umbilicata*, *Clausilia rugosa*, &c.—A. Whitworth, 65 Talbot Street, Southport, Lancashire.

VOLS. viii. and ix. of "The Boy's Own Paper," in monthly parts, in exchange for fossils, natural history books, or offers.—Ernest O. Meyers, Richmond House, Hounslow, W.

WANTED, *Pinguicula vulgaris*, *P. alpina*, *Primula farinosa*, *P. Scotica*, also American specimens of *Spiranthes Romanzoviana*, living or dried plants (the former preferred), in exchange for *Pinguicula grandiflora*, and other rare and local South of Ireland species. Lists sent.—R. A. Phillips, Ashburton, Cork.

OFFERED, L. C., 8th ed.:—95, 271, 366*c*, 367, 379, 621, 639, 639*b*, 666, 721, 774, 886, 1180, 1203, 1211, 1247, 1339, 1429, 1745, in exchange for others. Wanted, British and foreign specimens of *Hypnum Swartzii*, *hians*, and *dispalatum*, also *H. abietinum* (Scotch).—H. W. Monington, 167 Broomwood Road, Clapham Common, S.W.

OFFERED, *P. vivipara*, *L. truncatula*, *Unio tumidus*, *D. polymorpha*, *Sph. rivicola*, *H. pulchella*, *arbustorum*, *ericetorum*, *caperata*; *B. obscurus*, *C. tridens*, also quantity of micro material and slides. Wanted, a few good diatom slides, botanical, biological, and shorthand works, bound.—J. C. Blackshaw, 4 Ranelagh Road, Wolverhampton.

OFFERED, Jardine's "Nat. Library" (Humming-birds and other vols.) and Wilson's "American Ornithology." Wanted, Ellicott's "Commentary on Old Testament."—J. H. K., 1A Penn Road, Holloway, N.

OFFERED, *Clausilia Rolphii*, *Helix Carthusiana*, *H. caperata major*, *H. virgata*, *alba* and *picta*, *Clausilia laminata*, *albinos*, and others. Wanted, other rare and local species, or varieties.—J. H. A. Jenner, 4 East Street, Lewes.

WANTED, British hymenoptera, fossores, and anthophilæ. Micro-slides given in exchange. Write first.—H. Francis, 14 York Place, Clifton, Bristol.

OFFERED, dredge, with net complete, 23 by 8½ inches, weighs 10½ pounds. Wanted, cabinet cork, or what offers?—T. W. Paterson, 18 Polwarth Crescent, Edinburgh.

WANTED, back volumes of SCIENCE-GOSSIP, "Nature," "Mind," Reviews, &c.; also Darwin's, Spencer's, Huxley's, Lubbock's, Allen's, and other scientific works.—H. Roberts, 60 Princess Road, Kilburn, N.W.

TRANS-SECTIONS of spine of hedgehog, in exchange for other mounted slides or material.—W. J. W. Stocks, High Street, Uppingham.

RARE objects for the microscope, British shells, thin sections of corals and sponges, Haldon greensand fossil shells. Wanted, a secondhand silver watch, to give to a boy. Will anyone oblige me with one in exchange for any of the above?—Thomas Sclater, Bank Street, Teignmouth, Devon.

WHAT offers for Cuvier's "Nat. History," 4 vols., 800 coloured plates; Buffon's "Nat. Hist." 9 vols., 300 copper plates, and Buffon's "Nat. Hist. of Birds," 9 vols., 200 copper plates? Wanted, Sowerby's "British Wild Flowers," and works on fungi.—John E. Winkworth.

EGGS.—Duplicates of dipper, l. redpole, swift, red grouse, g. plover, c. guillemot, razor bill, cormorant, roseate tern, laughing gull, h. gull, and others. Desiderata: stonechat, black grouse, ptarmigan, ducks, or others not in collection.—Jas. Ingleby, Eavestone, near Ripon.

OFFERED, insect setting-boards, butterfly net, last three vols. of "Northern Microscopist," and Davis's "Practical Microscopy." Wanted, Spry and Shuckard's "Coleoptera," and coleoptera, or fossils.—J. B. Mayor, Grange Avenue, Levenshulme, Manchester.

WANTED, clean copies of "Nature" (complete vols.), bound or unbound, vols. 25-39, both inclusive, any or all.—A. G. Tansley, 167 Adelaide Road, London, N.W.

OFFERED, fifty foreign stamps, including Cape of Good Hope, Brazil, Finland, Barbados, Jamaica, Turkey, &c., all different, in exchange for a few British fossils.—Richard B. Corbishley, Poulton-le-Fylde, Lancs.

WANTED, a microscope, with or without accessories, in exchange for Argau materials.—A. Cox, 8 Victoria Street, Brighton.

WANTED, good microscopic slides or fossils, in exchange for vol. i. "Prestwich Geology."—G. Jervis Smith, Ennerdale, Rydal Road, Streatham, S.W.

WANTED, *Harpa nobilis*, *Triton anus*, *Polydonta radiatus*, *Turri bicingulata*, *Terebra duplicata*, *tigrina*, *Haliotis iris*, *Pleuro babylonica*, *arcta*, one good specimen of each. Offered, a fashionable gold scarf pin.—W. Jones, jun., 27 Mayton Street, Holloway, N.

EGGS for exchange: capercaillie, ptarmigan, black grouse, cuckoo, woodcock, owls, buzzards, whimbrels, golden eye, shieldrake, and many others. Wanted, telescope, books, and many other species of eggs.—J. Ellison, Steeton, Keighley.

HAIRS of any of the following in exchange for objects of interest, or twelve varieties for good mounted slide: lion, tiger, leopard, black and white bear, hyæna, racoon, jackal, white and blue fox, wolf, sea-calf, red and grey squirrel, and others.—A. Draper, 179 Cemetery Road, Sheffield.

STUDENT'S microscope (good) for exchange.—W. T. Calman, 80 Nethergate, Dundee.

WHAT offers for biological atlas, by D. M'Alpine? A few black, first red and first impressed penny postage, also some first receipt stamps for exchange.—Walter Hollebon, Newark House, Eastbourne.

WANTED, to exchange a nice flat box, grooved to hold 250 microscope slides, for a double nose-piece or a B eye-piece.—E. B. Fennessy, Pallasgreen, Co. Limerick.

BOOKS, ETC., RECEIVED.

"The Rotifera; or, Wheel-Animalcules," by C. T. Hudson, assisted by P. H. Gosse (Supplement), (London: Longmans, Green & Co.).—"The British Moss Flora," by Dr. R. Braithwaite.—Part XII. "Glimpses of Animal Life," by W. Jones, F.S.A. (London: Elliot Stock).—"On the Production of Secondary Minerals at Shear-Zone, in the Crystalline Rocks of the Malvern Hills," and "The Present State of the Archæan Controversy in Britain." "Lessons in Elementary Physiographic Astronomy," by John Mills.—"Solutions to the Questions set at the May Examinations of the Science and Art Department" (1881-86).—"Building Construction," by Henry J. Webb.—"Animal Physiology," and "Hygiene," by J. H. E. Brock.—"Magnetism and Electricity," by W. Hibbert (London: Chapman & Hall).—"Electricity in our Homes and Workshops," by Sydney F. Walker (London: Whittaker & Co.).—"Mr. Grant Allen's Botanical Fables," by Rev. J. Gerard, S.J. (London: Catholic Truth Society).—"Mount Vesuvius," by Prof. J. L. Lobley (London: Roper & Drowley).—"Report and Transactions Guernsey Society of Natural Science for 1882-88."—"Toilers in the Sea," by M. C. Cooke (London: S.P.C.K.).—"The Zoo," second series, by Rev. J. G. Wood (London: S.P.C.K.).—"'Wayside Sketches," by F. E. Hulme (London: S.P.C.K.).—"Diseases of Plants," by H. Marshall Ward (London: S.P.C.K.).—"Time and Tide; a Romance of the Moon," by Sir R. S. Ball (London: S.P.C.K.).—"The Story of a Tinder Box," by C. M. Tidy (London: S.P.C.K.).—"Manures and their Uses," by A. B. Griffiths (London: Geo. Bell & Sons).—"On the Creation and Physical Structure of the Earth," by J. F. Harrison (London: Longmans, Green & Co.)."—"The Optical Magic Lantern Journal."—"Journal of Conchology."—"Annals and Magazine of Natural History."—"Insect Life."—"Photographic Quarterly."—"Eighteenth Annual Report of the Chester Society of Natural Science and Literature."—"Canadian Entomologist."—"Research."—"The Century Magazine."—"The Amateur Photographer."—"The Garner."—"The Naturalist."—"The Botanical Gazette."—"Belgravia."—"The Gentleman's Magazine."—"American Monthly Microscopical Journal."—"Wesley Naturalist."—"The Midland Naturalist."—"Feuille des Jeunes Naturalistes."—"The American Naturalist."—"The Microscope."—"Cassell's Technical Educator," &c., &c.

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

NOTES ON WORCESTERSHIRE BIRDS.

[*Continued from page* 250.]

IT may be useful to add a supplementary list of the birds in this county, including all my observations to date; thus, in a measure, completing the notes published in SCIENCE-GOSSIP for November. The locality has been strangely neglected by ornithological authorities, presumably through lack of local observation. I have no doubt the records might be considerably extended, especially among the waders and winter visitors on the rivers.

Turdus merula, L., blackbird.

Saxicola œnanthe, L., wheatear; occasional visitor on the hills.

Sylvia curruca, L., lesser whitethroat; at Powick.

Sylvia atricapilla, L., blackcap; fairly common. One bird remained last winter; it was taken at Astwood Bank, in February, dying shortly afterwards in confinement.

Regulus cristatus, Koch., gold-crest. A pair seen in June.

Phylloscopus sibilatrix, Bechst., wood wren. One pair seen.

Acrocephalus schœnobænus, L., sedge warbler; common.

Parus major, L., great tit; common.

P. ater, L., cole tit; less common.

P. palustris, L., marsh tit; seen at Malvern.

Motacilla melanope, Pall., grey wagtail; seen once in winter on the Malvern Hills.

Anthus trivialis, L., tree pipit; Powick.

Lanius excubitor, L., great grey shrike; shot in winter at West Malvern.

L. collurio, L., red-backed shrike; Powick, young birds this summer.

L. auriculatus, Müll., woodchat shrike; recorded in Yarrell, in the county; once seen near to a wood by the Teme.

Muscicapa atricapilla, L., pied flycatcher; cock bird shot at Spetchley, summer of 1888.

Hirundo rustica, L., swallow; common.

Chelidon urbica, L., martin; very common.

Cotile riparia, L., sand martin; banks of the Teme.

Carduelis elegans, Steph., goldfinch; sparingly distributed.

Chrysomitris spinus, L., siskin; every autumn in the Teme Valley.

Coccothraustes vulgaris, Pall., several seen; a nest on side of Malvern Hills.

Passer montanus, L., tree sparrow; a pair seen last summer at Powick.

Fringilla cœlebs, L., chaffinch; common.

F. montifringilla, L., brambling; two winters in succession at Bransford.

Linota flavirostris, L., twite; uncertain, but I think it occurs on the Malvern Hills.

Loxia curvirostra, L., crossbill; a flock seen last winter quite close to Powick.

Emberiza citrinella, L., yellow bunting; common.

E. cirlus, L., cirl bunting; recorded by Saunders in the county in his recent work.

E. schœniclus, L., reed bunting; Powick.

Alauda arborea, L., woodlark. I have reason to think it breeds near Powick.

Sturnus vulgaris, L., starling; everywhere.

Garrulus glandarius, L., jay; common.

Pica rustica, L., magpie; common.

Corvus corone, L., carrion crow; common.

Corvus frugilegus, L., rook; common.

Cypselus apus, L., swift; common, builds at Powick.

Caprimulgus Europæus, L., nightjar, Powick.

Cuculus canorus, L., cuckoo; common.

Scops giu. Scopoli, Scop's owl; recorded in Worcestershire; taken at Fladbury by Dr. Hastings, 1837.

Noctua passerina (= carine noctua, Scop.); recorded in the county. Yarrell, vol. i. p. 179.

Asio vulgaris, L., long-eared owl; specimens not unfrequently taken to bird-stuffers.

Asio accipitrinus, Pall., short-eared owl; one or two specimens at the bird-stuffer's, taken in the county.

Accipiter nisus, L., sparrow hawk; fairly common.

Falco tinnunculus, L., kestrel; common.

Pandion haliaëtus, L., osprey; not in the county, but a specimen taken in the Severn estuary, autumn, 1888, flew into a fishing-boat.

Ardea cinerea, L., heron; fairly common.

Platalea leucorodia, L., spoonbill; recorded in Yarrell.

Anser cinereus, Mayer, grey goose; occasional flocks overhead; perhaps also the bean goose.

Querquedula crecca, L., teal; on the Teme.

Mareca penelope, L., wigeon; on the Teme.

Anas boschas, L., mallard; in winter.

Turtur communis, Selby, turtle dove; summer visitor at Powick.

Pheasant, partridge, red-legged partridge (Eversham).

Rallus aquaticus, L., water-rail; difficult bird to see. One single bird over the Gloucestershire border.

Gallinula chloropus, L., moor-hen; common.

Fulica atra, L., Coot; Westwood Park.

Œdicnemus scolopax, Gruelin, stone curlew; recorded by Mr. E. Blyth, who obtained the young (Yarrell).

Vanellus vulgaris, Bechs, lapwing; common.

Woodcock, snipe, jack snipe.

Tringa | *Temminckii*, Leiol., Temminck's stint; recorded in SCIENCE-GOSSIP last February.

Totauanus hypoleucos, L., sandpiper; the Teme in summer.

Charadrius pluvialis, L., golden plover; in winter.

Podiceps fluviatalis, L., little grebe; the Teme.

Larus canus, L., common gull; the Severn.

Sterna fluviatalis, tern; the Avon, Pershore.

Sand-grouse; recorded in SCIENCE-GOSSIP. Four shot in December.

The writer would be pleased to hear of further records.

SOME NEW AND LITTLE-KNOWN ROTIFERS.

By W. BARNETT BURN, M.D.

No. 4.—PHILODINA TUBERCULATA.

THIS rotifer, shown in Fig. 151, is of large size and occurs frequently in pools, yet it is not well known, and I do not think has been figured before. It is curiously like the *Rotifer tardus*, though in important points so different; whereas, though in all essential details coming very near *Philodina aculeata*, in aspect it is quite dissimilar.

In considering the points of resemblance of this species with *Rotifer tardus*, we notice the general outline, the brown colour, the deep folds in the body, the proportion of the width of the wheels to the neck, and the habits and movements of both are the same; also the toes are somewhat alike, but here we come to the distinctive character of *Philodina tuberculata*; it differs from all its relatives in its long and slender spurs, and by this alone it may be recognised.

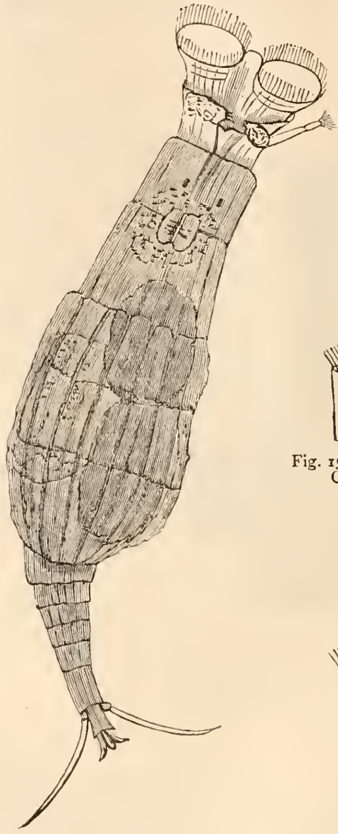

Fig. 151.—*Philodina tuberculata*.

Fig. 152.—Frontal Column.

Fig. 153.—Antenna.

Rotifer tardus approaches nearest to it in this particular, but the spurs are thicker, and the toes longer in proportion to them; in the former the last joint of the foot comes down over the toes, acting as a sucker, and, in doing so, flattens out, giving the appearance of the animal having four or five toes. Then there is the radical difference of the position of the eyes, being in the rotifer in the frontal column and in the Philodine in the neck; also, the former has only two teeth each side, the latter has three teeth on one side, if not on both. Sometimes many will be found having only two teeth on one side. I have counted sixty in succession with this peculiarity, and at other times have seen three on both sides always. Lord Osborne, who specially studied the teeth of rotifers, observed the same variation in *Philodina roseola*, and other observers in other species. It may be a case of knowledge coming and wisdom lingering, the third tooth being only cut late in life when versed in the ways of the world.

Two eyes may sometimes be seen in *Rotifer tardus*, in the neck, just above the mastax, which possibly might cause confusion; these belong to a fœtal animal; but one has to look so far down before one comes to the second mastax, that it might be taken for a Philodine. It is worth observing if the fœtal position is always the same, if so, it might be a means of easily separating closely allied species. The head is upwards in *Rotifer vulgaris* and *tardus*, downwards

Fig. 154.—*Distyla flexilis* (front view).

Fig. 155.—*Distyla flexilis* (side view.)

in *Philodina aculeata*, *Philodina tuberculata*, and *Rotifer macrurus*, but is this invariable?

The colour of this rotifer varies considerably, probably chameleon-like from the tint of the flocculent deposit in which it lives; some may be found quite a light yellowish-brown: these are the younger ones, in these the internal organs are more easily seen; the mastax is surrounded by a considerable glandular mass, the buccal funnel stands out like a pouch from the front of the animal, its margin fringed with cilia, and leads straight down to the mastax, immediately under which is a large oblong stomach separated by a constriction from a similar shaped but smaller intestine, on the other side an oval ovary fills up the body.

The antenna (Fig. 153), is long, two-jointed, the joint very faintly marked; at the end are three small lobes fringed with cilia. The frontal column (Fig. 152), is rather wide in proportion to its length; among the cilia a small cleft proboscis may be seen immediately before the wheels expand. The tubercules are not well marked, and appear to be formed by the folds of the trunk; in its fully extended state, when it becomes worm-like, resembling *Rotifer vulgaris*, the tubercules almost disappear.

Philodina aculeata, frequently found with the one under consideration, is of a yellow hue, has the distinctive spines, the wheels do not exceed the width of the body, the spurs are small, and the end joint of the antenna is wedge-shaped, base forward.

No. 5.—Distyla Flexilis.

This rotifer, belonging to the family Cathypnadæ, which includes the common *Cathypna luna*, is represented in front view, Fig. 154, and in side view, Fig. 155. Mr. Gosse places it in the genus Distyla with some hesitation; there is indeed but little distinction between Distyla and Cathypna, the former being longer in proportion to width; and the curious lateral, bellows-like, infolding characteristic of the family being less marked.

In this group may be observed something like a state of sleep; the animal perches on its claw-like toes, bent at an angle under its body, and remains motionless for a time, as if visited by that "gentle sleep beloved from pole to pole," which most rotifers seem not to require. The little rotifer has to exercise greater perseverance than the little ant to acquire its daily provender, and, examine it when you may, from morn to dewy eve, or in the silent watches of the night, it is ever in a state of ceaseless activity. This group is interesting from being an exception to this general rule.

Distyla flexilis is small, about $\frac{1}{180}$ inch long and without colour, except the one rose-red oblong eye, and a yellowish tinge in the stomach. The body is covered with folds, giving it an irregular tesselated appearance and making the outline fuzzy under a low power. It is active in its attacks on food, but remains near one spot for a long time, occasionally swimming about to seek "fresh fields and pastures new," yet I have left it under a $\frac{1}{5}$ objective, and at the end of an hour have found it still in the field.

This rotifer separates its toes laterally like pincers, and seizes objects between them as if to get a better hold. The one figured came from Wimbledon Common, and was abundant in some water given me by G. Western, Esq.

A DAY AMONG THE TERTIARY DEPOSITS OF MALTA.

By John H. Cooke, B.C., F.R.G.S.

ACCOMPANIED by a boy, whom I had engaged for the purpose of carrying my geological paraphernalia, consisting of a well stocked provision-bag and my two favourite hammers, I left Valletta just as the dawn of a cloudy September day was asserting itself in the east. In England, a necessary accompaniment to a fine day is the sun; but here a bright sunshine and a cloudless blue sky are the reverse of pleasant to those who are undertaking bodily exercise of any kind. A heavy bank of grey, leaden-hued clouds slowly rising athwart the horizon indicated not only a breezy day, but also a cloudy one; and, as the morning wore, they spread like a pall over the surrounding country, and effectually shielded us from any unpleasant inconveniences we might otherwise have experienced from the burning rays of a tropical sun. My object in undertaking this tour was to visit the fossiliferous deposits of the south-west of the island, ground already rendered classical by the researches of several eminent geologists, and which, though I had visited it upon several previous occasions, still retained charms for me, both on account of its unique scenery and the great abundance and variety of the fossils that are to be met with in its strata.

On the outskirts of the city, I hired a carrozze, and jumping in, was soon moving at a brisk pace towards the little village of Crendi, which place I purposed making my starting-point. Crossing the flat alluvial tract of country yclept the Marsa, known alike to the botanist, geologist, and other lovers of nature; and which, if we are to judge by its conformation and the large numbers of semi-fossilised land shells, such as *Clausilia syracusana*, *Helix aspersa*, *Bulimus acutus*, etc., that are constantly being exhumed from the breccias of the caves and gorges, seems to have formerly been either the bed of an estuary or the basin of a lake, we ascended the side of the hill that forms its western boundary, and from this coign of vantage obtained a magnificent view of the topography of the island.

"Away behind,
Like a gem set in a silver sea,"

lay the city of Valletta on the lofty eminence known as Mont Scebberas. Its old grey bastions and impregnable fortifications, heirlooms of the Knights of St. John, and the scene of many a tough and bloody battle between them and the Turks, now in the grey morning light appeared even more grey and grim, and seemed to frown at the efforts of the blue limpid waves that flung themselves restlessly upon the weather-worn and rock-bound coast beneath. Towards the north, like huge monsters keeping watch over the surrounding country, lay the Binjemma Hills, their tops wreathed in thin streaks of mist, and their craggy escarpments thrown out in strong relief against the green verdure of their slopes. One cannot look upon their fretted, cavern-worn faces without wondering what were the conditions that endured at the time when they were undergoing the process of formation.

As I gazed upon the escarped sides of the hills, the geological history of the islands in past ages arose vividly before me. From the extreme southern limit of the Great Sahara on the south, to the Carpathians on the north, there extended a vast expanse of water from whose depths the summits of the mountains of Northern Africa, Italy, Switzerland and Turkey appeared but as so many islands.

It was during this period that the strata of which the Maltese Islands is now composed was formed. It was in this Miocene Sea that the countless myriads of animals whose remains enter into and form the component parts of the limestone and freestone rocks, lived and died. Huge carnivorous whales, and sharks of equally gigantic proportions, whose name was legion, disported themselves in its waters. A change then took place; the bed arose slowly, and in course of time a continent was formed where an ocean formerly existed. Then it was that Northern Africa, Malta and Sicily formed one extensive tract of country, on the sides of whose slopes elephants browsed, and crocodilians and hippopotami basked in the waters of its rivers.

Another great change, wrought by Nature's herculean forces, left Malta isolated in the midst of the waters now known to us as the Mediterranean. Gradually the arboreal vegetation in this restricted locality dwinded away under the constant attacks made upon it by the immense herds of huge monsters that had been driven to seek a refuge on its heights from the roaring waters around, and slowly but surely did they, for the want of proper sustenance, perish and leave their bones in such quantities as to form breccias of considerable extent and thickness. Their remains lie in pell-mell confusion, and in such a rolled and comminuted condition are some of the larger tusks and bones, that they show but too conclusively the fearful character of the catastrophe.

Whilst thus linking together these chains of geological evidence, I was recalled somewhat abruptly from my reverie by a most unpleasant accident that befell my attendant sprite and his charge. Oblivious of all around him, he had gradually succumbed to the influence of sleep, and the carriage, passing over a somewhat larger rut than usual, had precipitated him, bag, provisions and all, into the road, in close proximity to the carriage wheels. Had an earthquake, or something equally appalling, then occurred, he could not have looked more horror-stricken than he did as he picked himself up and rubbed the dust from his eyes, ears and nostrils. Happily the mishap was attended with no serious consequences beyond a severe shaking, and, after gathering together the miscellaneous contents of the bags with which the road was strewn, Paolo looked none the worse for his escapade. The accident had occurred within sight of the quarries of Casal Luca, and, as a visit to these would effect the twofold object of allowing Paolo to pull himself together again, and at the same time afford me an opportunity of examining the strata of the district, I gladly acquiesced to his proposal that we should adjourn to the nearest one and search for "antiqua."

The quarry which we entered had been worked to a depth of 400 feet; the strata teemed with the remains of echinæ, pectens, and other mollusca, consolidated by means of the sand and mud into which they had fallen, thus forming a friable sandstone of varying degrees of hardness and thickness. I at once directed my attention to the débris that had been left lying about by the quarrymen, and, after a patient search, my efforts were rewarded by finding a fine specimen of a tooth of the great carnivorous whale (*Zeulogdon*), now extinct, and numerous specimens of pectens, among which may be noted *Pecten cristatus* and *Pecten squamulosus*.

At the entrance to the quarry was a cliff about sixteen feet in height, the face of which showed in a striking manner the susceptibility of the sandstone stratum to the disintegrating powers of the atmospheric agencies, chief among which we may note the moist sirocco, succeeded by a burning tropical sun.

Standing out in bold relief on the crumbling sides were the hard calcareous remains of myriads of echinæ awaiting only a touch to send them tumbling down to the débris beneath. A little discrimination was here necessary, as by far the majority of them consisted of the species *Eupotagus koninchii*, of which I transferred a few of the finest to my bag, together with *Clypeaster folium;* though this latter, in consequence, no doubt, of having been subjected to great compression, was in a sadly dilapidated condition. Fully satisfied with the results of my visit, I left the quarry and proceeded towards the highway, examining en route the blocks of stone that had been removed from the quarry and piled up by the pathside prior to being sent to the mason. My attention was arrested by a dark ferruginous red protuberance in one of the sandstone blocks, which a closer inspection convinced me was a fossil of some considerable size. Paolo at once went in search of the foreman of the works, and obtained from him the necessary permission to cut off the portion of the block that contained the treasure. A quarter of an hour's labour revealed a magnificent cast of a Nautilus, measuring eight inches and a quarter in length, and three and a half inches in diameter, surrounded by large numbers of the casts of a small mollusc (Hylæ) about the size and shape of a hemp seed. Just as we had extracted the prize, the obliging foreman came up, and, in broken English, gave me to understand that if I followed him, he would conduct me to a spot where I should find other remains which he designated "antiqua." He conducted us to a quarry in the immediate vicinity, and there showed me several layers of what is popularly known as "petrified" seaweed. This seaweed, like many mosses of the species Bryum, etc., which are to be met with in various localities in the British Isles, had become incrusted with the carbonate of lime which was held in solution in the sea-water that formerly covered them, and which, by a process of elimination, is extracted, and thus renders them hard and brittle.

The layers occurred at irregular intervals, both in this stratum and the limestone beneath it, and they served to indicate, not only that alternations of level have taken place, but likewise approximately the number of times and the length of the period of such submergences. A half-an-hour's ride brought us with our partly-filled bag to the locality in which it had been my original intention to spend the day; and, after a further half-an-hour of walking over the rough, weather-worn surface of the lower limestone, we reached the top of the mural cliffs, which here descend to a depth of 400 feet to the sea level. There are few fairer scenes in the Mediterranean than that which is to be obtained from the top of these cliffs upon a favourable day. The variegated strata of all hues, alternating with the green of the cultivated patches on the sides of the gorges and valleys; the rugged, sterile outlines, fretted into various fantastic shapes by the ceaseless action of the waters around them, and the wild rugged character of the scenery in the immediate vicinity of the beholder, all go to make up a picture containing the most essential elements of the picturesque; whilst away to the south, at a distance of about three miles, rearing its massive limestone cliffs high above the surrounding waters, lay, in majestic loneliness, the islet of Fifla.

We descended the cliff side and devoted our attention to objects which, though more prosaic, contained none the less the elements of the beautiful and picturesque. The stratum in which we were about to work was that which occupies the lowest place in the known series of the Maltese beds, and which, whilst rising to a maximum height of about 400 feet above sea level, descends to an unknown distance in the depths around. It consists of a hard, compact cherty limestone of varying qualities, and is known to local geologists as the lower limestone, to distinguish it from that stratum which, as the uppermost, is known as the upper limestone.

The characteristic organic remains are Orbitoides, Orbiculinæ, and small Scutellæ, together with the remains of Nulliporæ, thickly intermingled. The formation corresponds to that of Befforte and Carcare in Italy, the Pectunculus beds of Hungary, Merignoc in France, and the Marine Molasse in Bavaria. After a short search we found the caves from which, twenty-three years ago, Professor Adams and the late Admiral Spratt exhumed some of the first Mammalian remains, and which by a comparison with those found in Sicily and Africa proved the former geological relationship that existed between those areas and these islands. I visited these same caves, known locally as the Malak and Unadræ caves, but the work of excavation had been but too well done, for not a vestige of the remains of its former denizens remained. Within two hundred yards of the former cave, I was fortunate enough to find a vestige of the elephant bed, and a little diligent search was amply repaid by a large number of elephantine and hippopotamine remains, from among which I secured several molars in an excellent state of preservation.

The extreme hardness of the surrounding matrix made the extracting of them a matter of considerable difficulty, and we had to crack many of them to get a few whole and entire. Fragmentary bones of varying sizes occurred in great abundance, all of which were firmly embedded in a dark, red-coloured earth, intermixed with rolled pebbles and other débris. Further on this same red soil occurred, partly consolidated with infiltrations of carbonate of lime, and literally teeming with the teeth and vertebræ of dormice (*Myoxus melitensis*), and the bones of an immense swan (*Cygnus falconeri*). They occurred in such vast quantities that my only trouble was which to choose from among so many fine specimens.

Descending lower still, to a cutting that was being worked by some quarrymen, I was enabled to add to my bag several Spirifers, and a fine *Ostrea navicularis*. An appeal to the labourers was the means of adding several sharks' teeth (*Carcharadon megalodon*), the largest of which measured three and a half inches in perpendicular length, with a base of two and three-fifths inches. Larger than this have been discovered in the upper beds, but even this size affords sufficient testimony of the gigantic proportions of its owner in bygone ages. The downward progress of the sun now warned us that day was closing, and that it was time to retrace our steps. Collecting our accoutrements, the weight of which had been very considerably augmented by the additions I had made, we commenced the ascent of the cliffs, and two hours later I was snugly ensconced in my easy chair at home, thinking over the wonders and beauties of the day's trip.

The Lyceum, Malta.

THE BEE AND THE WILLOW.

I HOPE I am not trespassing too much on your valuable space in just making a few additional remarks to Mr. Bulman's paper on the above subject.

One would at first sight imagine that the willow was anemophilous, from the mere fact that its flowers appear before its leaves; but, on closer examination and observation, it becomes apparent that for fertilisation the willow depends essentially on insects, and especially on the bee. For one thing, I do not think the willow produces enough pollen to depend entirely on anemophily.

Professor Hermann Müller, one of the greatest authorities on fertilisation living, says, "The willows possess special modifications, which bring them great variety of insect-visitors in the first sunny days of spring, and insure them abundant cross-fertilisation."*

The "special modifications" above referred to by Professor Müller are briefly the following:—1. Union of many flowers on one inflorescence, which is therefore more conspicuous, and more easily sucked by insects, than single flowers. The male flowers are more conspicuous than the female flowers, owing to the light yellow colour of the anthers. 2. The flowers are developed before the leaves, and are thus rendered very conspicuous amongst the bare twigs, without being equipped with any coloured envelopes. 3. There is a large store of honey and pollen. 4. The flowers of the willow appear early in spring, when the bees have hardly any other flowers on the honey of which they could feed their young.

Mr. Bulman has already touched on the question as to how the female flowers are fertilised by insects, when the male flowers are so much more conspicuous. Do the bees alternately visit first a male and then a female flower, or do their visits to male and female flowers merely depend on chance?

To say fertilisation were entirely dependent on "chance" would be unscientific, and some reasonable explanation ought to be offered. I believe the following to be a possible explanation.

A bee visits first the male flower as being the more conspicuous, and during this visit it takes up a good deal of pollen. This must be more or less of an incumbrance to the animal, and it seeks to get rid of it. By experience (called instinct with lower animals), it knows it can do so best by visiting a female flower. By thus visiting the female flower, the insect gets rid of its pollen, takes up some honey, and the stigma is pollinated. As soon as it has been freed of its yellow burden, it again has the choice before it, and visits the conspicuous (male) flowers. In this manner cross-fertilisation is secured.

Far from the willow being a degenerate entomophilous plant, as Professor Henslow says, Professor Müller considers it to be a more highly developed descendant of anemophilous phanerogams. The hypothesis that the willows were at one time anemophilous explains the fact that the flowers appear before the leaves, which is very characteristic of such plants.

When the anemophilous plants gradually became frequented by insects, which was probably done on account of the willow being almost the only plant in flower in early spring, the appearing of the flowers before the leaves was an advantage for entomophily, as rendering the otherwise inconspicuous catkins conspicuous, and thus did not pass into a state of degeneracy.

Of course, I do not say that anemophily does not

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* "Fertilization of Flowers," Eng. ed., p. 524.

still take place in the case of the willow, but I maintain that entomophily is that method of cross-fertilisation on which the willow depends essentially, and that it is a later, and probably a higher, stage of development in the methods of cross-fertilisation.

OTTO V. DARBISHIRE.

Balliol College, Oxford.

A NEW FORM OF MOUNTING CLIP.

THERE are, I suppose, few microscopists who have not tried the use of various forms of spring clips for mounting in Canada balsam, but there are few microscopists who have not abandoned them because they do more harm than good. The pressure produced by the ordinary clips being far from uniform, some mounters have invented spring-clip boards or arrangements in which the pressure is produced by weights. But all of these possess this disadvantage, that delicate objects are ruined by the pressure, while those that are more elastic

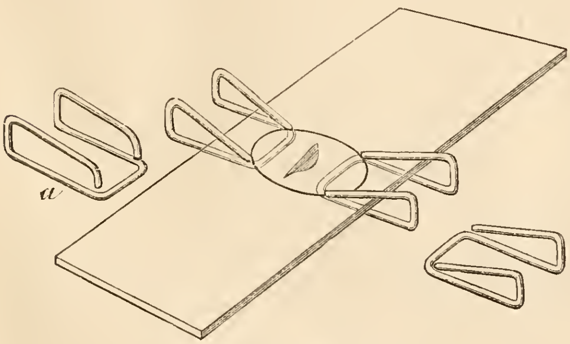

Fig. 156.—Pressureless Mounting Clips.

will lift the cover up as soon as the pressure is removed, thereby admitting air. In order to keep the cover in position while the balsam is "setting" without producing pressure, I devised, early in 1887, the clips shown in the accompanying illustration (Fig. 156), to which I give the name of "Pressureless Edge Clips." Their use will be obvious from the figure. Two are required for each slide, and their points are brought to bear against the edge, not on the top of the cover, which is thus held fixed. They are made of brass wire, of different sizes according to the size of the cover; the form marked *a* will be found especially useful for thick objects. When applied to newly-mounted balsam slides, a great deal of the superfluous balsam may be scraped from round the edges without shifting the cover, and the slide then "baked" on a hot-water cistern or elsewhere for a week or more, and there being no pressure there is no danger of "springing" when the clips are removed. I now find the clips invaluable, and several friends have also adopted them.—*G. H. Bryan, B.A.*

NOTES ON NEW BOOKS.

TOILERS IN THE SEA, by M. C. Cooke, M.A., LL.D. (London: S.P.C.K). There is no necessity to introduce Dr. Cooke to the readers of our magazine. To him was due its foundation, and the vigorous spurt it received in the days of his editorship down to those of our own. Dr. Cooke is well and widely known as a skilled specialist and authority in his own immediate departments of research. He is also one of the most graceful and pleasant writers on popular science. The above handsomely got-up volume is his latest production in this direction. The *Toilers in the Sea* (nothing to do with Victor Hugo) is a delightful book, devoted to a popular description of the foraminifera, polycystina, sponges, zoophytes, corals, sea-mats, tube-worms, and burrowing marine animals. It is illustrated by a large number of excellent wood-cuts, and four exquisitely-drawn plates of foraminifera, polycystina, sponge spicules, and gorgonia spicules.

Romance of Science Series. (London: S.P.C.K.) Under this attractive title the above energetic society are bringing out a series of popular science books, each written by a distinguished scientist. The first is *Time and Tide, a Romance of the Moon*, by Sir Robert S. Ball, the Astronomer Royal for Ireland. It is in reality the publication of the two lectures given by this well-known popular lecturer in the London Institution last winter. As its name imports, it deals chiefly with the theory of tidal evolution, but it goes much further afield, and gives us a very delightful and instructive account of the satellite system of other planets. It is altogether a very delightful book:—

Diseases of Plants, by H. Marshall Ward. This is another little volume of the same series. Professor Ward is doubtless the chief scientific forester in Great Britain, as his admirable papers on the diseases of timber which recently appeared in "Nature" amply prove. He was therefore very sagaciously selected to write the present little book, which deals entirely with the fungoid diseases of serials, tubers, fruits, hops and garden plants:—

The Story of a Tinder Box, by C. M. Tidy. This third issue of the above series, although not so bulky as its predecessors, is of equal interest, and is made up of the well-written notes which Professor Tidy used in the course of lectures he delivered before a juvenile audience at the London Institution during the last Christmas Holidays. 'Tis a great pity, however, that the usefulness of this little book should be diminished by the absence of an index and chapter contents.

The Zoo. (London: S.P.C.K.) This is the second part of the pretty brochures written by the late J. G. Wood, and illustrated by Harrison Weir. A more attractive gift book to children of natural history tastes can hardly be imagined.

Introductory Lessons on Quantitative Analysis, by John Mills and Barker North.

Machine Construction. (Solutions to the questions set at the May examinations, Scientific and Art Department 1881 to 1886), by Henry Adams:—*Elements of Physiology*, by J. H. E. Brock (London: Chapman & Hall). These are a further series of the useful and cheap little handbooks for the South Kensington Examinations we recommended last month.

The Vertebrate Animals of Leicestershire and Rutland, by Montagu Browne, F.Z.S. (Birmingham: Midland Educational Company.) This is a very important work on county natural history—a subject we are glad to see (thanks to the establishment and multiplication of provincial societies), is gradually being worked out very accurately and very scientifically. Mr. Montagu Browne is well known as a zoologist. On all matters connected with taxidermy he is an authority. On account of his large and widely extended knowledge, he is eminently entitled to the designation of "naturalist." The admirably arranged museum at Leicester, which is under his curatorship, convinces every visitor that its chief is an all-round and enthusiastic naturalist. In the present volume Mr. Browne has availed himself of the numerous contributions to the natural history of the above two counties, among whose authors we find the names of Mott, Professor Babington Macaulay, and others. The author has been very generous in his acknowledgment of indebtedness to all local naturalists whose papers and contributions have helped to make the present work so valuable. The volume before us is attractively and beautifully bound; printed on good paper; and its artistic merits are increased by four full-page chromo-lithograph plates. Although the mammals are dealt with, recent as well as extinct, the greater part of the book is naturally occupied by birds. The reptiles and fishes come in for lengthy notices; and among the latter the fossil fishes of the Lias formation, for which Leicestershire has been so long famous, and specimens of which have been distributed to perhaps every museum in Great Britain—come in for very useful notices. Mr. Montagu Browne's monograph is an undoubted acquisition to the natural history of our time.

The Birds of Oxfordshire, by O. V. Aplin (Oxford: Clarendon Press). This is another valuable contribution to local zoology. Mr. Aplin is well known as an accurate and painstaking ornithologist. Hitherto no work upon the birds of Oxfordshire has been published. The ornithology of the central parts of England farthest removed from the sea-shores has an interest peculiarly its own, and no county in this respect can lay claim to greater attractiveness than Oxfordshire, on account of its undisturbed sylvan characters. Mr. Aplin has been engaged upon this work for some years past, and he has produced a monograph which cannot fail to possess a high interest to ornithologists generally. There is an admirably written introduction, which has enabled the author to review the very large number of papers relating to the natural history of the county and to acknowledge his indebtedness to them. The glossary of local names of birds will prove very useful; and there is a good index. The printing, illustrations, and general get-up of the volume are worthy of the Clarendon Press, from which it is issued. It also includes a good map of Oxfordshire.

Wayside Sketches, by F. E. Hulme, F.L.S., F.S.A. (London: S.P.C.K.) Mr. Hulme is well known as a naturalist who has studied nature from the artistic side, and this charming little book, excellently printed, with its numerous illustrations, sustains his high character in the particular department of research he has devoted himself to. It deals with the multitudinous objects to be seen by eyes on the look-out for them in our daily country-side walks, such as branches, leaf-buds, leaves, wild flowers, plant-drawing, butterflies, moths, beetles, wasps, spiders and their webs, water-plants, common flowering plants and their folk-lore, fungi, wild fruits, &c., &c. One of the chief charms of the book is the admirable series of woodcuts, which are microscopically correct in every detail, without the sacrifice of a single artistic effect.

The Life of John Davis, by Clements R. Markham (London: Geo. Philip and Son). Among all the literary ventures of the day there is none likely to be of such intrinsic value and importance as the series which Messrs. Philip are issuing, and of which this volume is the first instalment, under the title of "The World's Great Explorers and Explorations." The series will form a library of intense historic and geographical interest, as well as of fervid patriotic stimulation. The present volume has been very properly put in the hands of Mr. Clements R. Markham, who is himself both a well-known writer and distinguished explorer. This life of John Davis the navigator reels off as delightfully as one of Mr. W. Clark Russell's modern sea novels.

An Introduction to Chemical Science, by R. P. Williams and B. P. Lascelles (London: Ginn and Co.). Of the writing of the books on chemistry there has of late years been no end. This addition to the literature of the subject is practically a revision of Mr. Williams's work published some years ago in the United States. The matter is very lucidly set forth, and the arrangement of the subjects is admirable.

The Eighteenth Annual Report of the Chester Society of Natural Science and Literature shows that the society is in a very flourishing condition, and the lists of donations to the Museum and Library prove the generosity of the members.

OUR SCIENTIFIC DIRECTORY.

[The Editor will be obliged, if, for the benefit of his numerous readers, secretaries of scientific societies will send notices like the following, also place and time of meeting.]

East London Natural History and Microscopical Institute: President, W. Smart, M.P.S., M.Q.M.C.; Hon. Secretary, A. Dean, M.Q.M.C., 57 Southborough Road, South Hackney, N.

Hackney Photographic Society: President, Dr. Roland Smith; Hon. Secretary, W. F. Jones, 12 King Edward Road, Hackney, N.E.

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

In the present day when the microscope and the scalpel are revealing so much, they may both assist in elucidating the following zoological fact, *i.e.*, that the eggs of the Falconidæ are so much more frequently coloured at or around the smaller end than those of any other bird.

I regret I am unable to state anything positively as to the eggs of the larger Falconidæ, but the specimens I have show a very strong tendency in that direction.

Taking the eggs of the sparrow-hawk as typical eggs of this family, I find that at least 40 % show the peculiarity to which I refer. Some of these eggs are most beautifully blotched with two or three shades of brown, quite covering the smaller end of the shell, leaving the remaining portion almost spotless.

In a series of clutches of the rook and the magpie, 10 % of the eggs show the smaller end marking. In ten clutches and some odd specimen of the eggs of the red-backed shrike it only occurs once. I mention this, as I see Mr. H. Seebohm gives a beautiful illustration of one of these eggs in his last work.

The eggs of the tree-sparrow (*Passer montanus*), which are very erratic both in colour and size, show the small end marking to at least 10 %. In one clutch of five eggs I see three examples, but curious to relate that in 1000 specimens of the eggs of the common sparrow (*Passer domesticus*), there is not a single example. The corn bunting (*E. miliaria*) which lays a large egg does not show it, but the yellow bunting (*E. citrinella*) does, in having a zone of lines around the smaller end, but not blotched.

This phenomenon may have been thoroughly explained, if so, I plead great ignorance, but as I have not at present met with it in print, I beg to offer the following remarks, which may perhaps "be laughed to scorn" by physiologists.

I think it may fairly be taken for granted that the Falconidæ and the Corvidæ lay eggs which are small in proportion to the relative weight and size of their bodies; then, if their internal organs are formed in relative proportion to their size, the oviduct or cloaca —I do not know which term is the most correct—must be sufficiently large to allow the egg before it receives its hard shell to turn and give an unnatural presentation which would bring the smaller end in contact with the colouring glands. There can be but little doubt that all eggs, when first formed in the oviduct, have the folliculus aëris in the larger end and pointing to the vent; consequently, to cause unnatural presentation the egg must turn when enveloped only in the albuminous membrane.

Now, turning to the eggs of the guillemot, gulls, terns, curlew, oyster-catcher, snipe, &c., which lay very large eggs, this phenomenon does not appear, owing, I believe, to the eggs being so large in proportion to the birds, they are held—all through their development—more firmly in the oviduct.

A great deal more may be said on this subject, but I shall be making this paper too long; however, I must state that the figures I have given are taken from the clutches of eggs in my own collection, of all of which I know the history. Those who have a series of reliable clutches of the eggs of the birds mentioned above can either confirm or refute what I have said, but no reliable information can be obtained from a lot of odd specimens.

Joseph P. Nunn.

NOTES ON ECONOMIC BOTANY.

By J. T. Riches.

Cruciferaæ (Mustard). — This well-known condiment and rustic medicine is the produce of two species of Sinapis, a genus belonging to the cabbage family, possessing that characteristic pungency to a great extent. Both species are natives of this country (*S. alba*, Linn.), have nearly smooth leaves, pinnated, silique valves five-nerved with a ord-swshaped apex, seeds yellow. The seed leaves—cotyledons—of this species are eaten with garden cress (*Lepidium sativum*), as a salad. The seeds sometimes are taken whole as stomachics and laxatives, and crushed between rollers, sifted two or three times, constitute "flour of mustard;" from the residue a fixed oil is obtained by pressure. The seeds of black mustard are also mixed with them, and probably are very often used in the greatest proportion.

S. nigra, Linn., is a native of, and is largely cultivated in this country, about Yorkshire and Durham. The plant is covered with trispid hairs. Leaves lyrate, silique short, bluntly quadrangular, seeds reddish-brown, smaller than the seeds of *S. alba*. The chemical constitution of mustard is very complex; among the various ana numerous ingredients is a peculiar acid called myronic acid, containing a small proportion of sulphur, and which, when mixed with water and a peculiar substance also present called "mysorine," yields volatile oil of mustard; which, it is said, has not separate existence in the seeds, but is formed by the chemical union of the substances mentioned above. This oil is very acrid, and has been employed as a rubefacient, while the fixed oil obtained by pressure from the seeds has no acridity, and has been used as a purgative. The use of mustard as a medicine dates from very early times. Hippocrates is said to have used it as a medicine. In modern use it is employed as a

Fig. 157.—Portion of *Globba bulbifera*, showing buds and true flowers on the same axis. (See page 251.)

Fig. 158.—*Globba bulbifera.* One of the buds more advanced

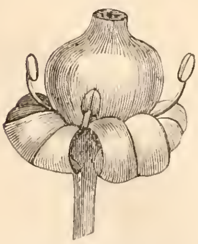

Fig. 159.—*Salvadora persica.* Flower magnified.

Fig. 160.—*Salvadora persica.*

poultice, and often ensures speedy relief; but persons with tender skin are very apt to suffer from it. It is used internally as an emetic. As a condiment it is valuable for persons of weak digestive faculties, and as a desirable adjunct to fatty or indigestible food of any kind.

There is great difference of opinion respecting the mustard plant referred to in Scripture. A plant growing about Arabia, India, etc., known as *Salvadora persica*, was thought by Dr. Royle to be the true mustard-tree of Scripture, owing to the fact that it attains the size of a small tree, and produces small fruits of a very pungent nature. This view, however, is not accepted by many whose authority is high, considering that in Syria the mustard reaches the enormous height of from fifteen to twenty feet. But as the indentification of Scripture plants is a difficult task, we must content ourselves with our present knowledge of them. It is worthy of remark that Dr. Royle found that *Salvadora persica* bore the same Arabic name as the common mustard, viz :—"Khardal."

ASTRONOMY.

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

At the meeting of the Royal Astronomical Society held on November 8th, Captain Noble gave an account of his observation of the occultation of Jupiter by the moon on August 7th, at Maresfield, Sussex. The disappearance of the planet was observed through drifting clouds in daylight. The reappearance was seen in a clear sky after dark. As the planet emerged from the bright limb of the moon, the equatorial belts were sharply defined; but a band of darker shading appeared on the disc of the planet following the outline of the moon.

Mr. E. J. Stone stated that a similar appearance had been observed at the Radcliffe Observatory at Oxford. A long discussion took place as to the cause of the dark band, and it was generally considered that it was due to an optical illusion, the result of the difference between the brightness of the moon and that of the planet.

A paper by Dr. Otto Boeddicker was read, which referred to some drawings he had made, and which were exhibited, of the Milky Way, at the Observatory of Earl Rosse, at Parsonstown. Mr. Wesley confirmed the accuracy of some portions of the drawings, particularly in the region near Cygnus.

Mr. Thackeray stated that humidity of the atmosphere has less effect in producing variation of refraction than is generally supposed, and that changes of temperature chiefly affect the places of the stars by causing changes in the temperature of the instruments, more than changes in the atmospheric refraction.

On December 7th Mercury will be at the greatest distance from the earth at 7 aft.

December 21st, the sun enters Capricornus, and winter begins at 3 aft.

Rising, Southing, and Setting of the Principal Planets in December.

	D.	Rises. h. m.	Souths. h. m.	Sets. h. m.
Mercury ☿	3	7 39M	11 39M	3 39A
	10	8 13M	11 59M	3 45A
	17	8 40M	0 20A	4 0A
	24	9 0M	0 42A	4 24A
	31	9 11M	1 3A	4 55A
Venus ♀	3	6 3M	10 34M	3 8A
	10	6 24M	10 42M	3 0A
	17	6 45M	10 52M	2 59A
	24	7 3M	11 2M	3 1A
	31	7 18M	11 12M	3 6A
Mars ♂	3	2 19M	8 2M	1 45A
	10	2 15M	7 50M	1 25A
	17	2 10M	7 37M	1 4A
	24	2 5M	7 25M	0 45A
	31	2 0M	7 12M	0 24A
Jupiter ♃	3	10 4M	1 59A	5 54A
	10	9 42M	1 38A	5 34A
	17	9 21M	1 18A	5 15A
	24	8 59M	0 57A	4 55A
	31	8 36M	0 36A	4 36A
Saturn ♄	3	10 29A	5 36M	0 39A
	10	10 2A	5 9M	0 12A
	17	9 34A	4 41M	11 44M
	24	9 7A	4 14M	11 17M
	31	8 37A	3 45M	10 49M

December 22nd, there will be a total eclipse of the sun, invisible at Greenwich.

There will be no occultations of interest during the month.

Mercury will be an evening star in the latter part of the month.

Venus will be an evening star throughout the month.

Mars will be in Virgo, near Spica, on the 15th.

Saturn will be stationary in Leo.

SCIENCE-GOSSIP.

Messrs Gurney and Jackson announce the speedy publication of "A Handbook of European Birds," by James Backhouse, Jun., F.Z.S. We believe the book will be a most useful one to ornithologists, and certainly cheap, the prices being 7*s.* 6*d.* and 10*s.* 6*d.* before publication, and 10*s.* 6*d.* and 12*s.* 6*d.* after.

We are always pleased to see any new contribution to "County Faunas." It is therefore with great pleasure we announce that Mr. W. E. H. Pidsley is about to publish his work on "The Birds of Devonshire."

The August number of the "Proceedings of the Geologists' Association" contains the following papers—"A Visit to the Volcanoes of Italy," by Professor J. F. Blake; "Note on a Chelonian

Humerus from the Middle Eocene of Bracklesbarn," by R. Lydekker (illustrated); "On Rocks from the Saas-Thal and Geneva," by Captain Marshall Hall; "Notes on Early References to Geology, mostly before 1800," by E. Litchfield; "Notes on the Artificial Unmaking of Flints," by T. Hay Wilson; "The Geology of Upton and Chilton, in Berks," by A. J. Jukes-Brown (illustrated); "On the Estuary of the Thames and its Alluvium," by F. C. J. Spurrell (illustrated).

WE are also pleased to see that Mr. Miller Christy, F.L.S., is preparing for the press "The Birds of Essex." The volume, which will be illustrated, will form the second of the "Special Memoirs" of the Essex Field Club. Before publication, the price will be 10*s*., and intending subscribers should send in their names at once to Messrs. Durrant & Co., 90 High Street, Chelmsford, as, should a sufficient number of subscribers not be obtained, it will not be published.

MESSRS. L. REEVE & CO. announce for publication in monthly parts with coloured plates, "Lepidoptera Indica," by Frederic Moore, F.Z.S., F.E.S., &c. Mr. Moore is a well-known authority on the subject, and we have no doubt but what the book will be a great success. The price of each part will be 15*s*.

THE Report and Transactions, 1882-88, of the Guernsey Society of Natural Science contains, amongst other matter, the following papers:—"The Geology of Guernsey," by Rev. E. Hill; "The Ferns of Guernsey;" "An Excursion to Icart Point," and "On Changes in the Relative Level of the Sea and Land" by A. T. Derrick; "On the Occurrence of Calcite in Guernsey" by A. Collenette; "The Butterflies of Guernsey and Sark," by W. A. Luff.

WE were informed that the late Dr. Royston Pigott was 72 years old, but his accurate age seems to have been 70.

MR. C. A. WITCHELL sends us an interesting paper on "The Reptilia and Batrachia of Gloucestershire," read by him before the Cotteswold Naturalists' Field Club. Mr. Witchell is a keen observer of nature, and has managed to condense much interesting matter into a small compass.

A PHYSICAL society is to be formed at Liverpool, for the studies of the various sciences in which a knowledge of physics is included. The preliminary meeting was held in the Physics Theatre, University College, on Wednesday, November 6th, at 8 P.M. The secretary (*pro tem.*) is Mr. T. Tarleton, 1 Hyde Road, Waterloo, Liverpool.

MR. SUCHETET, the well-known naturalist, writes from Rouen (Seine Inférieure), France, to say that he would be much obliged by any person informing him of any hybrid animals they possess, or that they have observed, whether living or stuffed.

MR. W. HARCOURT BATH has brought out a series of new data blanks, leaving room for name, locality, collector, date, &c. They are published by the Naturalist Publishing Company, 112 Rann Street, Birmingham. They are very cheap, being only 6*d*. per 100, or 4*s*. per 1000.

THE Society for the Prevention of Hydrophobia, and Reform of the Dog Laws, held a meeting at St. James's Hall, on October 24th, under the presidency of Sir Henry Roscoe, M.P., when Mr. Frank Kerslake read a paper upon the "Cause and Prevention of Hydrophobia."

THE South London Entomological and Natural History Society held their Annual Exhibition at the Bridge House Hotel, S.E., on Wednesday and Thursday, October 30th and 31st.

MICROSCOPY.

NEW SLIDES.—We have received from Mr. F. Enock a beautiful and highly interesting and instructive preparation of the three legs of our most beautiful British bee, *Dasypoda hirtipes* (Hairy Bee), the only species which possess clubbed-shaped hairs, seen on the third leg with two-thirds or higher. On the first leg is shown the semicircular comb for cleaning the antennæ, etc. On the second are various brushes and combs to assist in gathering pollen.

THE LAST NUMBER OF THE "JOURNAL OF THE ROYAL MICROSCOPICAL SOCIETY" contains, besides their usual "Summary of Current Researches," the following papers: "Notices of New Peritrichous Infusoria from the Fresh Water of the United States," by Dr. A. C. Stokes; and "Additional Notes on the Foraminifera of the London Clay exposed in the Drainage Works, Piccadilly, London, in 1885," by C. Davies Sherborn, F.G.S., and F. Chapman.

LEPROSY.—In my note already sent to SCIENCE-GOSSIP I stated Dr. Gardner's case of inoculated leprosy as proving that the disease, under certain circumstances, might be contagious. A final proof has now been given of its contagiousness by Dr. Arning, who inoculated successfully a condemned criminal at Honolulu. The period of incubation was very prolonged.—*J. W. Williams*.

THE JOURNAL OF MICROSCOPY for October, amongst other matter, contains the following papers: "Microscopical Imagery," by Dr. Royston Pigott. "The Development of the Tadpole," by J. W. Gatehouse; "Practical Notes on Histology," by V. A. Latham; "Two Important Biological Experiments," by Mrs. Alice Bodington; "Cements, Varnishes, and Cells," by H. N. Lyon, &c.

ACHROMATIC CONDENSERS.—I have Ross's large microscope stand, with the Zentmayer swinging tailpiece, and my highest power objective is Powell and Lealand's $\frac{1}{25}$th oil-immersion, N.A. 1·38. Will any of your readers experienced in the use of high powers please give me the benefit of their opinion as to the best kind of achromatic condenser to be used with such a stand? Is it necessary that, in order to obtain the full value of the objective, a condenser of somewhat similar aperture should be used; or would a condenser of much smaller aperture suffice (say, Ross's $\frac{4}{10}$ths combination of 110°), the value of any higher angle being obtained by the obliquity of the swinging tail-piece?—*P. B. J.*

PHOTO-MICROGRAPHIC LANTERN SLIDES.—The lantern is rapidly superseding all other methods for lecture illustration. Mr. L. Ratcliffe, Carr Terrace, Luddenden, has forwarded us specimens of his own mounting, to which we are glad to call attention on account of their faithful and yet artistic effects. The "Pond Life" slides include *Alcyonella fungosa*, *Paludicella articulata*, *Stephanoceros Eichornii*, diatoms magnified to a diameter of two inches, so as to show every dot and line, insect structures and organs. We cordially recommend Mr. Ratcliffe's lantern slides to lecturers.

BOTANY.

NOTES ON DAMASONIUM STELLATUM. — As SCIENCE-GOSSIP is an excellent medium for recording the occurrence of rare plants in fresh localities, I would, in these notes, first state the discovery of a habitat for it in a previously unexplored nook in the western extremity of Sussex. When searching for molluscs in Chidmere, a large marsh or swamp at Chidham, in September last, Mr. W. Jeffery brought it me for determination; and, as not before met with in Sussex, west of the Adur, it proved the best floral find in that county for the year. It was growing with *Alisma ranunculoides* and was out of flower, but had abundance of its curious, peculiar, star-like fruit. As to its distribution, only few counties are given by Watson, and all our botanists agree in considering it a scarce species. Since little is said about it by our great authority, Syme, I would also offer a few observations on its English names and its scientific synonyms. Apparently, its earliest designation was Thrumwort, doubtless in allusion to its roots of many fibres, consisting like the water plantain, as an old botanist observes, of "a tuft of threds or thrums." Johnson defines "thrum" as the ends of weaver's threads, and as all know, Bottom as Pyramus, thus invokes the Eumenides to end his grief at the death of Thisbe:

> "O fates! come, come;
> Cut thread and thrum;
> Quail, crush, conclude, and quell."

Its other excellent appellation, star-fruit, may have been borrowed from its description by old Gerarde, who has, by the way, a capital woodcut of it. "This plant in his roots and leaves, is like the last described *Alisma plantago-aquatica*, as also is the stalke; but much lesse in each of them, the stalke being one foote high, at the top whereof stand many pretty starre-like seed vessels containing a yellowish seed." He speaks of it as rare, and says: "I found it a little beyond Ilford, on the way to Romford, and Mr. Goodyer found it upon Hounslow Heath," describing it as *Plantago aquatica minor stellata*. "Starry-headed, small water Plantine," he observes. Lobell calls it *Alisma pusillum angustifolium muricatum*, and in the Hist. Lugd. it is called *Damasonium stellatum*. Under this last title it now stands in the last London Catalogue, as its earliest designation. One almost regrets that its excellently expressive name, *Actinocarpus*, has to be abandoned, and hopes that this pretty plant may have not have a more ancient name discovered for it than any of those which it has previously rejoiced in.—*F. H. Arnold.*

MATTHIOLA INCANA.—In Bentham's British Flora he says of this plant, "fully established as a wild plant on the cliffs in the Isle of Wight, and perhaps in some other parts of the south coast, although probably originally escaped from cultivation." Withering speaks of this species as "growing on rocks near Hastings," but "not truly wild" there. It has, however, long since been extinct in the last named locality, and so far as I can learn there is now no acknowledged station for incana except that in the Isle of Wight; yet Bentham evidently seemed to have heard of some other place on the south coast where the plant was supposed to occur. I have for some time wondered whether that place could be the cliffs at Rottingdean, near Brighton, where the plant has certainly been "fully established as a wild plant"—although perhaps "escaped from cultivation"—for at least thirty-five years. It is now more than five years ago since I first saw it at that place, and identified it by means of Bentham's Flora. I did not then know how very rare incana really is, nor did I then make a careful inspection of the locus with the view of ascertaining the precise area occupied by the plants, though I did observe that they were of all ages and sizes, and that they were distributed over the cliff from top to bottom for a distance of several hundred yards. About eighteen months ago, I first became aware that Sussex botanists know nothing of the locality in question as a station for incana, but it was only last spring that I had an opportunity of making a more careful survey of the locus when I obtained plants which have since flowered and seeded. I have submitted flowers and seed pods to the Rev. F. H. Arnold—author of a Sussex Flora—and he tells me there can be no doubt about the plant being *Matthiola incana*. The new locality begins about a quarter of a mile west of Rottingdean, and from that point colonies of it may be seen at intervals all over the cliff from top to bottom for about 750 yards. It would be impossible to say how many plants there are altogether, but small, and great, there must certainly be hundreds of them. The cliff for about 600 yards out of the 750 is something like 70 feet high, and the remaining 150 yards vary in height from 70 to about 20 feet. A simple calculation will show, therefore, that the superficial area over which the plant extends is more than three acres. Two questions will naturally arise in regard to this new locality; first, how did the plant get to the spot? and second, how long has it been there? It appears to me that the plant may have got there in one of three ways (*a*), seed may originally have been carried by the wind from the garden of the—only—cottage on the cliff above; or (*b*), the seed may have been thrown over the cliff with sweepings from the garden; or (*c*), seed may have been carried to the spot on the feet of one of the numerous jackdaws which frequent and nest in the cliffs here, and which are continually flying backwards and forwards between Brighton and Rottingdean. This last means does not seem to me at all improbable, nor will it, I think, appear so to any one who knows how sticky the soil thereabouts becomes after a little rain, and how easily light seeds might be thus carried. I don't think the plants could have originated from seeds blown or thrown over the cliff from the cottage-garden, because this is situate almost exactly midway between the east and west boundaries of the locality, and it seems to me in the highest degree improbable that the plant would have spread in a westerly direction as fast as it has gone eastward, considering that the prevailing winds in the autumn—when the seed could be scattered—are westerly and south-westerly: winds which would certainly, as one would think, cause the plant to travel eastward at a far greater rate than westward. As to the period during which the plant has been here growing wild, I felt certain when I first saw it there that it must have been established for a good many years; and I have recently been informed by Colonel Stead—son of the late Rector of Ovingdean—that he has known the plant there for at least thirty-five years, and he says that when he first observed it, it had then already spread over a considerable area. I think, therefore, it may be safely assumed that the plant has been growing there for at least fifty years.—*R. B. P., Eastbourne.*

MERCURIALIS PERENNIS, FORM AUTUMNALIS.—I have once more obtained, in flower, this interesting plant, notes on which I communicated to "Journal of Botany" last autumn, making about the sixth successive year of gathering since I discovered it; and, so far as I can learn from diligent search, it is still found only in one locality. As I passed the place on Saturday, October 5th, the young plants were full of life and vigour, and apparently spreading. Ditching operations, however, have disturbed it, and will retard its time of flowering this year. From the description given below, compiled from notes taken on the spot, it will be seen that the new form differs in some points from the normal spring-flowering form. Specimens of the plant were sent to Kew Herbarium in September, 1889, where I suppose it may still be seen by any one interested. Description of plant as growing: perennial; rootstock short, stoloniferous; stem simple, decumbent, then ascending, sometimes rooting at the nodes; 1 to $3\frac{1}{2}$ feet; angular, very slightly hairy, leafy to the root; leaves 2 to 6 inches opposite, shortly petioled, oblong ovate-lanceolate, crenate-serrate, ciliate, faintly pubescent on upper surface, stipules very minute. Male flowers in axillary, interrupted spikes; peduncle 1 to 2 inches; flowers very shortly pedicelled. Time of flowering, latter part of August, or early September to November.—*F. J. George, Chorley, Lancs.*

COMPARATIVE RARITY OF THE LESSER PERIWINKLE.—I am obliged to your correspondent for drawing my attention (in the August number) to the fact that *V. minor* occurs far more frequently than I had supposed in the Tunbridge Wells District; but the locality "Tovil" is certainly not in the neighbourhood to which my remarks were confined; it being, as is not mentioned, an immediate suburb of Maidstone, which is nearly twenty miles distant from Tunbridge Wells. I only mention this so that those interested in the question, but unacquainted with the details of Kentish geography, may not be misled.—*Archibald L. Clarke.*

SPOTTED DEAD-NETTLE.—Can any of the readers of SCIENCE-GOSSIP give me a little information concerning the Spotted Dead-Nettle (*Lamium maculatum*)? To me, though not a very common plant, it has never seemed a very rare one. At present, where I am now living, in North Staffordshire, I have met with it in three large clusters at a distance of only a few miles from each other. One cluster was at the end of a little wood near a once-cultivated garden, another also at the end of a cultivated garden, while the third was in a hedge near a roadside bearing beautiful large reddish purple flowers; the leaves of all the clusters had a long white streak up the middle. Professor W. J. Hooker places it under *Lamium album*, calling it a third variety of *L. album*, and names Fifeshire as its locality, where it was found by Dr. Dewar. Sir J. E. Smith, in his "English Flora," places it quite distinct from *L. album*, calling it "perhaps a naturalized plant," and naming three places where it had been found. When talking to friends in the neighbourhood, who are interested in botany, about this plant, I have always been told that they have not found it a rarity. I shall be grateful for information upon this subject, and to know if it is ever a cultivated plant or not, and if others have also found it fairly common.—*B. C. Robinson.*

THE CUCKOO'S SONG.—The male birds are the singers, but I do not state this from my own observation.—*W. P. Hamilton.*

ZOOLOGY.

Preserving Butterflies.—Dr. F. Roderberg, of Lower Belgium, has taken out a patent in the United Kingdom for a method, devised by him for preserving butterflies and other natural history specimens. The following is the method: The objects or specimens to be preserved, unless they are already flat, are first pressed out and dried. In the case of butterflies, for instance, the body which is cut open and emptied of its contents, is flattened out by gradually applied pressure, the wings, etc., being previously fixed in the desired position, and the butterfly thus treated is allowed to become thoroughly dry. A piece of material, such as cardboard, wood, or the like, to form a mounting or backing, is then moistened with water, with which antiseptics may be mixed, and the prepared butterfly is laid on this backing; a clean, colourless leaf of gelatine is placed over the butterfly and backing, and the whole is pressed together, so that the gelatine leaf shall firmly adhere to the backing, securing the butterfly thereto. To prevent the gelatine adhering to the pressing and the supporting surfaces, instead of the backing, the surfaces are treated with fat, vaseline, or the like. To prevent warping or shrinking and bending of the backing, its underside may be coated with a solution of gelatine, or a leaf of gelatine may be applied thereto. The card covered with gelatine is, after having been well cleaned from fat, etc., sprinkled or moistened on its upper side (*i.e.* the side to which the butterfly is secured) with water, and afterwards thoroughly dried. Finally, the whole is coated with a suitable hard, colourless, drying or siccative varnish (for instance, with an alcoholic solution of red arsenic, to which has been added a small quantity of castor oil). This coating protects the gelatine and the object or specimen to be preserved from the injurious action of moisture, mildew, or insects. Butterflies and other objects prepared in this manner can be kept in albums, and be transported and examined at any time without liability to injury. There is evidently springing up a fine art among collectors, which will soon transform dried plants and wizened butterflies into the objects of real and graceful beauty they ought to be, and as they are in a state of nature.

A Surrey Naturalist.—We regret to record the death of the veteran Surrey ornithologist, Mr. William Stafford, of Godalming. Mr. Stafford was one of a group of self-taught village naturalists, two of whom —the late Edward Newman (author of "British Butterflies and Moths," &c.), and J. D. Salmon ("Flora of Surrey"), his friends and fellow-townsmen —have become well-known through their published works. Mr. Stafford never published anything, but —like the late Mr. Newbould, the eminent botanist —his great local knowledge was chiefly dispensed through others of more literary habits. The vertebrate fauna were his favourite study, and he was the chief authority on the birds of Surrey, of which he has left a magnificent and unique collection, obtained by himself during more than fifty years of observation, and stuffed and mounted in cases with his own hand. He was a skilled taxidermist, a very fair painter of small landscape sketches in oil, and an excellent folk-lorist of his county. His homestead at Godalming, a room in which was occupied for some years by Inskip the painter, was the resort of every naturalist of note who passed through Surrey, desiring to avail himself of the most exact knowledge of the birds and reptiles. His earlier contemporaries have long since passed away, but there are many who still remember with gratitude his kindness of character, and the fulness and freeness with which he gave his knowledge to his many visitors. He reached his eightieth year, tended affectionately by his daughters in his old age. He died peacefully on the 21st September last, and was buried at Godalming.

North London Shells.—Mr. Cockerell (pp. 212–213, ante), at the end of his courteous, and, to say the least, praiseworthy critique of the first part of my article on "Variation in the Mollusca" (concerning which I shall have something to say later), makes a few interesting observations about my note on "Shells from North London Districts," which was printed on p. 164 of the July number. I did not scruple (nor shall I) to use what are, in my thinking, "somewhat objectionable terms," for the reason I gave in Part 1 of the Variation article, that "they have been added by workers in faunas, and consequently they must remain; and, more than that, they must at present be acknowledged." And, although I cannot see a utility in them sufficient to warrant their use, yet I shall still employ them in recording until they are pronounced against by a common veto, simply because they have so ingratiated themselves into the minds of faunal workers. I used the name, proposed by Mr. Cockerell, var. *pallida*, as distinctive of a pale ground-colour of hortensis, different in tint from Moquin's var. *albina*, and, as is done with the other colour-variations, as *olivacea*, *incarnata* and *lutea*, given the various band-formulæ gathered from the bandings on that ground-colour. I need hardly say that the bandings I recorded are exact, and that I shall be pleased to accompany Mr. Cockerell to the same spot, when he returns to England, where I believe many are still to be found in the same hedgerow. Mr. Cockerell, in conclusion, says, "It would be interesting if someone would collect a large number of the North London *Paludina fasciata* (*vivipara*, Auct.). Some of the forms approach *contecta* closely in shape, such being apparently the var. *inflata* of Locard." I may say that I have examined thousands of this species from the Bathing Pond, Leg of Mutton Pond, and

Red Arches Pond, on Hampstead Heath (the only North London localities known to me for this species) for forms which I could consider in shell as mesostates between vivipara and contecta, and which I wanted for dissecting purposes. I have not been fortunate enough to find any other than the type and Jeffrey's var. *unicolor*—none to correspond with Locard's var. *inflata* (though I know this has been recorded): "less elongated spire, ventricose shape, rounder whorls."—*Joseph W. Williams.*

N. B.—In "Shells from North London Districts" (p. 164 ante), 2nd column, line 19 from top, "Hendon" should be "Finchley."

Helix caperata.—The Rev. S. S. Pearce, in his interesting paper on this species in the July "Journal of Conchology," proposes to call the unnamed small variety var. minor. No name could be more appropriate, but for the circumstance that Picard has long ago used it for a different variety of the same species. It will therefore be necessary to give a new name to var. minor Pearce. Now that so much attention is given to band-variation in *Helix nemoralis*, one wishes that banded species of other sections, such as *H. caperata*, might receive a little notice. I am somewhat inclined to suppose that dryness tends to produce forms with the bands much split up, and yet distinct. I find this tendency in American examples of *H. nemoralis*, and it occurs to excess in *H. pisana*, which always frequents hot and dry localities. Here are a few band-formulæ of British Helices of this group, taken from specimens I have examined—it will be seen how complicated they are:—*H. caperata*, var. $_{12}34_{44}555$, var. 003445; *H. virgata*, var. 0034455, var. 00344455 (this last from near Clonmel, Ireland, collected by Rev. A. H. Delap); *H. pisana*, var. $_{1}2333_{444}55$, var. $12333_{4}4_{4}4455$. From Bordighera, in the south of Europe, I have seen *H. pisana* var. 0033444455 (collected by Colonel Wilmer). Some southern examples of *H. pisana*, however, have quite simple formulæ; Mr. J. H. Ponsonby gave me examples of vars. (123)00, 005_{34}, and $003_{4}0$.—*T. D. A. Cockerell, West Cliff, Colorado.*

Slug Notes.—It is curious that apparently no genuine Arion is native to North America, unless it is *A. subfuscus* in Greenland. The Massachusetts *A. fuscus*, as I learn from Mr. W. G. Binney, is *A. hortensis*, and introduced—notwithstanding that Bourguignat has described it as a new species. Mr. Binney also informs me that "*Arion*" *foliolatus*, Gould, is not an arion at all. *Arion distinctus*, Mabille, introduced into the British fauna from Ireland, appears, from the researches of Messrs. Simroth and Ashford, to be only a young form of *A. ater*, the stripes notwithstanding. This is interesting, as pointing to the probability that the oldest type of Arion was striped. *Arion celticus*, Pollonera, described from N.W. France, should be looked for in S.W. England and S. Ireland, though it seems likely enough to be only a form of Bourguignati. While on the subject of slugs, I may correct an error I made in a former note. *L. cærulans* and *L. montenegrinus* belong to Frauenfeldia, and not to Lehmannia, as I had it.—*T. D. A. Cockerell, West Cliff, Custer Co., Colorado.*

The Rudimentary Intelligence of Infusoria.—Mr. Deane appears to contend that "instinct" is an outcome of intelligence. Is not rather intelligence a higher development of instinct? The various faculties of the paramæcium, which is taken as an illustration, may surely be the result of the law of the survival of the fittest, since those faculties tend to the well-being of their possessor, and those individuals of a colony who possessed them in even a slight degree whilst their fellows did not possess them at all, or had them developed to a greater degree than their cotemporaries, would presumably be in a better position to avoid danger and to procure food, with the necessary result of a greater chance to perpetuate their kind. Of the offspring, many might doubtless fail to inherit the advantageous peculiarities, and in turn would be handicapped as compared with those who did inherit them. The greater the degree in which the faculties were developed, the greater the advantage the fortunate individuals would possess over others. It does not seem to be necessarily a question of intelligence or instinct at all; a mere mechanical advantage would have the same result if transmitted.—*H.*

The Hearing of Ants.—In reply to the note by Sir John Lubbock, in the October issue of Science-Gossip, I may say that whilst experimenting with the glass-bell, I held the glass in my hand, and not, as he seems to think, on the table. Thus proving that the ants in this case could not be startled by the vibration in the wood upon which they were creeping. I have, as I said in my paper, tried this experiment over and over again, always with a like result. I attach some importance to the experiment with the blue-bottle fly, and ere long I hope to record more experiments of a varied and interesting nature tending to substantiate my case.—*Jos. Bowman.*

A Few Shells from Clifton, Bristol.—Mr. R. O. Millward has recently sent me to name for him from this locality a small packet of shells. The packet included *Hyalina cellaria*, *Limnæa peregra*, *Planorbis umbilicatus*, (= *P. complanatus* and *P. marginatus*), *P. contortus*, *P. spirorbis*, *Testacella Maugei* and *Sphærium corneum*, which may be interesting enough to place on record.—*J. W. Williams.*

Limnæa stagnalis and L. peregra devoured by Dytiscus marginalis.—During last summer I kept several dytisci and fed them upon *L. stagnalis* and *L. peregra*. One dytiscus killed and devoured seven *L. stagnalis* in the course of one afternoon. The beetles also ate *L. peregra*, but seemingly with not so much gusto as they did stagnalis, for, on placing equal quantities of these two species into the aquarium, they fixed the latter species first. They were conchologists, too, in this respect, for they evidently knew *L. stagnalis* from *L. peregra*. And this is of importance to note, since from this observation (and others I tried with like results), it is legitimate to conclude that, in any given locality, the number of *L. stagnalis* and *L. peregra* will decrease as the number of dytisci increase, the former species decreasing more rapidly than the latter. I may be permitted to say that it is one of the faults of our shell-specialism that we do not sufficiently attend to the relation of other groups to our own group of study, and hence chorological matters are but indifferently understood. I may be permitted to draw the attention of shell-faunists to this point, and to ask that the subject of snail-enemies may have a fuller attention given to it than has hitherto obtained. One genus of leeches, the glossiphonia, to which I believe scarcely any attention has been paid in England for the last twenty years, must act as a very great factor in decreasing the number of aquatic and palustral molluscs in a locality where they abound, and I would suggest that conchologists pay some attention to the number of these snail-eaters present in localities of which they are making a faunal report.—*J. W. Williams.*

THE MEANING OF CYGNEA IN ANODONTA CYGNEA.—On p. 189, Mr. F. P. Perks asks why the specific names of Cygnea was given to this mussel? There is no superstition connected with it, as suggested, as with the barnacle and the goose. I believe Linné gave it this name because he considered it the favourite food of swans.—*J. W. Williams.*

THE DARTS OF HELICIDÆ.—In my note on page 213, concerning crystalline stylets printed under this heading, I state that in no morphological text-book does a mention occur of any crystalline stylet being found in the Mollusca except in the Unionacea. As I have been written to concerning this statement, and in order to avoid any further misapprehension, I should like to say that I only referred to English inland forms when I used the word "Mollusca," to the exclusion of marine species.—*J. W. Williams.*

DISCOVERY OF PUPA CINEREA IN LANCASHIRE. —(Peculiar to the basin of the Mediterranean, J. M. Taylor).—The appearance of this stranger to the British fauna was again verified for the fourth time on the 30th of October last by Mr. J. Jones of Church, who brought a beautiful specimen to the monthly meeting of the Accrington Naturalists' Society on the second day of November. The four takes have been obtained at intervals extending over a period of twelve years, and though doubts have been expressed by some of our leading conchologists concerning this northern habitat, and whose unwillingness to include a spurious species deserve the highest praise, nevertheless facts must drive doubt away. The best vindication of its occurrence was at a field-day excursion of the society about four years ago, when the take was witnessed by several of the members, and by them considered a small reversed form of *Clausilia laminata;* but subsequently a couple of the shells coming into my possession about eighteen months ago they were sent to J. M. Taylor, of Leeds, who pronounced the species *Pupa cinerea*, but was somewhat unwilling to give it a place in the British list, as no live ones could be obtained setting the matter beyond doubt. But convinced in my own mind of the accuracy of the find, I determined to visit the locality myself, and did so last year, and also in August of the present year, the result in both cases being unsuccessful. But hearing of the whereabouts of the late Mr. W. Cooper's collection, which was sold to a gentleman in Church parish, I resolved upon gaining access to that collection; and as Mr. Cooper and Mr. Jones took it at the same time in the first instance, and as this test was an important matter, I was fortunately rewarded in finding nine beautiful mounted specimens. Mr. Jones again found it in the same spot, which is situated in a well-wooded, out-of-the-way-place, where foreign wood or plants or any kind of foreign importations are not likely to have ever occurred. There appears, therefore, no probability of its introduction, and we do not hesitate to call it a British species.—*Robert Wrigglesworth.*

NOTES AND QUERIES.

REGULATION AND DISTRIBUTION OF THE ELECTRIC CURRENT FOR LIGHTING PURPOSES.—Before the current produced by the generator can be used to do the required work, it is necessary to see to its regulation and distribution. The due regulation of the current is of as much importance as the adoption of suitable generators and receivers, i.e. the apparatus which produces, receives, and consumes the current, such as lamps, motors, or decomposition cells. To work with unregulated currents is far from economical, and often causes considerable loss, as may be shown by the following example: Suppose the currents of a machine to have a strength corresponding to the number of lamps which they are supposed to feed. Now suppose that all of a sudden, either by chance or purpose, a number of lamps are put out, at once the resistance in the circuit is considerably diminished. The current being inversely proportional to the resistance, it follows that the decrease of resistance causes increase of current, which will not only alter the remaining lamps, but might injure the insulation of the machine, or melt off portions of metal. To prevent cases like this occurring, the generator may be constructed so as to allow to pass only currents of such strength as are wanted, or regulators constructed for the purpose may be used. Finally, the receivers, i.e. the lamps, may be so arranged as to allow only the required current to pass. The fluctuations of current are especially unpleasant in machines where the dynamo-electric principle is thoroughly adopted, i.e. where the coils of armatures and coils of magnets together form only one circuit. Every increase of resistance in the circuit here will cause diminution of current, as a matter of course; in the dynamo-electric machine, when the current is weakened, the electro-magnets are also weakened. Let us suppose, for the sake of illustration, that the current has to feed an arc lamp, and suddenly a piece of one of the carbons springs off, thereby increasing the resistance. The current will decrease, and the machine will furnish a weaker current just at that particular moment when a stronger current is required to maintain the lamp burning. Although the lamp might not go out, a change in the intensity of the light will certainly be produced. As we have already seen, it was for this reason that Wheatstone placed the electro-magnets in shunt, so that the circuit of the magnets should be separated from that of the armature and receiver. Brush makes the outer circuit independent of the intensity of the magnetic field by providing the electro-magnets with coils of much thinner wire in addition to the ordinary coils, the ends of which are connected with the collecting brushes. Marcel Duprez obtains current regulation along with the distribution, and aims at securing (1) that each portion of the apparatus shall receive the necessary current, and shall act independently of the others; (2) that the necessary regulation shall be executed by the machine itself; (3) that this regulation shall be of such a kind that the machine produces only such current as is required for the apparatus inserted in the circuit.—From "Electricity in the Service of Man."

Cuckoo and Magpie.—We have in our garden here, now, a most curious spectacle: a young cuckoo being reared by a pied wagtail. The poor little bird can scarcely satisfy the adopted one with food, though it supplies a fly about every minute. Is not this strange. I thought the hedge-sparrow was generally selected as a foster-parent?—*J. A. Smith.*

Fasciation.—A curious case of "fasciation" came under my notice recently in a garden ten miles from here. A common vegetable marrow threw out a branch about fifteen feet long, forked about three feet from the growing end. This branch widened as it grew, measuring from three to four inches across near the fork, each limb being as wide as the branch a little below the fork. Near the fork were growing eight marrows, all large enough to cut, their stalks all starting from a line running nearly straight across the branch. Near the end of the larger limb of the fork was another row of marrows, all about one and a half inch long, but their growth, as well as that of the rest of the branch, which bore many small leaves, appeared to be arrested by the rapid development of the marrows lower down. A well fasciated branch of willow was brought to me last autumn; the twigs are parallel for some eighteen inches, then diverge for five or six inches more.

Packing Ripe Fruit.—Can any correspondent give a scientific reason for the practice of packing ripe fruit (plums, apples, etc.) in fresh stinging-nettle leaves? The practice seems to prevail both in this neighbourhood and in East Kent, but I never heard of it till lately. I have seen baskets of fruit for market covered with nettles, and I know if fruit for a country show—apples—gathered a few days beforehand, and laid in nettle leaves, often changed, the reason given in both cases being that the nettles restored the bloom destroyed by handling, or increased its quantity. The plan seems so curious that further information would, I think, be interesting. The apples were undoubtedly improved by the process, but I cannot see the connection between cause and effect.—*M. E. Pope.*

Do Ants Hear?—I see some little discussion has been taking place in your magazine about the hearing of ants. Mr. Whatmore thinks they do not hear, and Mr. Bowman believes that they do hear. I do not think there exists any question at all, for if I may be allowed a word, I may say that auditory organs have been demonstrated in all the Insecta except the Thysanoptera. Indeed, the sense of hearing is so keen in insects, that there are as many as two hundred auditory organs in some species situated on the dorsal aspect of the abdomen, antennæ, palpi, legs, and even on the wing-membrane. Each organ is generally known as a chordotonal organ. Their essential structure is the presence of a nerve ending in a ganglion, which in its turn ends in end-organs which are connected directly or indirectly to the hypodermis of the integument. Each end-organ consists of an "endstift" or terminal rod enclosed in a scolopophore or sheath. If Mr. Whatmore is still in doubt, he will be satisfied by turning up to pp. 502–503 of the recent edition of Rolleston's "Forms of Animal Life," (Clarendon Press, 1888).—*J. W. Williams.*

The Metamorphosis of the May Fly. — I picked up a common May fly (*Ephemera danica*) from off a grass stalk at Olney, and placed it beneath a tumbler, when to my astonishment, it commenced to pull its wings out of their skins as though they had been kid gloves. Caterpillars increase in bulk by this process, but it is strange to observe an insect already perfect, so behaving. I am told that there is an allusion to this feat in the Water Babies.—*A. H. Swinton, 1 Tudor Villas, Gery Street, Bedford.*

Aphis Fluid.—W. E. G., Bristol, will find it stated on page 88, vol. 2, Kirby and Spence's Entomology (ed. 1817) that the aphis fluid "issues in limpid drops from the abdomen of these insects, not only by the ordinary passage, but also by two setiform tubes placed one on each side just above it." Again, in an extract from Stuart's "Elements of Natural History" quoted in Wood's "Linnæan Genera of Insects" (ed. 1821), the fluid is stated to exude "partly from the horns on their abdomen, and partly from two orifices at the same place." In the Micrographic Dict. (ed. 1883), page 62, it is stated, that "Kaltenbach considers the abdominal tubes to be merely produced stigmata, and states that the saccharine fluid is emitted through the anus," and that "this is also the opinion of De Geer, Kyber, and others"—*F. Wain Sampson.*

Land Shells near Norwich.—It may be of interest to Norwich conchologists and others to know that I have recently found *Helix aculeata* and *H. pygmæa* in this locality, *H. aculeata* in plenty in a lane adjoining the western suburbs of the city, and *H. pygmæa* at Hellesdon, near Norwich, and a few other places close by. I do not think that these species have hitherto been recorded as living in this district.—*Arthur Mayfield.*

Two Replies.—In reply to W. P. H's query, appearing under the heading "Animalcula," in the "Notes and Queries" column of October's issue of this journal, I confess me much guilty, but, at the same time, may I venture to suggest that people who live in glass houses should not throw stones? "Medica" is, I believe, the fem. gend. of "Medicus," and, I also believe, in Latin as well as in English, the pronoun in a general way agrees with the noun. In reply to "Notes on Leprosy," I would call to the writer's remembrance the fact that such a thing has been known in the columns of this journal as one disputant calling another "an antiquated old fossil," "a variety monger;" and, fearing lest this latter title be applied to me by the writer who seeks to cut down my nomenclature of the disease of leprosy from six species to two, I make my bow, and retire. Yet, I must say, that I think the note on swelling appears, at first sight, to give a wrong impression. It seem to insinuate that swelling is not a symptom of leprosy properly so-called. Whether this be intended or not, of course I cannot say.—*Medica.*

THE LIFE OF A SHOOTING STAR.—A small body, perhaps as large as a paving-stone or larger, more often perhaps not as large as a marble, is moving round the sun. Just as a mighty planet revolves in an ellipse, so this small object will move round and round in an ellipse, with the sun in the focus. There are, at the present moment, inconceivable myriads of such meteors moving in this manner. They are too small and too distant for our telescopes, and we can never see them except under extraordinary circumstances. At the time we see the meteor it is usually moving with enormous velocity, so that it often traverses a distance of more than twenty miles in a second of time. Such a velocity is almost impossible near the earth's surface: the resistance of the air would prevent it. Aloft, in the emptiness of space, there is no air to resist the meteor. It may have been moving round and round the sun for thousands, perhaps for millions of years, without let or hindrance; but the supreme moment arrives, and the meteor perishes in a streak of splendour. In the course of its wanderings the body comes near the earth, and within a few hundred miles of its surface, of course, begins to encounter the upper surface of the atmosphere with which the earth is enclosed. To a body moving with the appalling velocity of a meteor, a plunge into the atmosphere is usually fatal. Even though the upper layers of air are excessively attenuated, yet they suddenly check the velocity, almost as a rifle bullet would be checked when fired into water. As the meteor rushes through the atmosphere the friction of the air warms its surface; gradually it becomes red-hot, then white-hot, and is finally driven off into vapour with a brilliant light, while we on the earth, one or two hundred miles below, exclaim: "Oh, look! there is a shooting star." —*From "The Story of the Heavens"* for November.

COMMERCIAL BOTANY.—It would be impossible to form any correct idea of what has been attained in the knowledge of plants, useful or otherwise, without referring to the results of the principal expeditions which have left our shores for different parts of the world during the present century; such, for instance, as Ross's Antarctic Expedition, which resulted in "The Botany of the Antarctic Voyage of H.M. Ships 'Erebus' and 'Terror,' in the years 1839 to 1843," by Dr. (now Sir) J. D. Hooker; or Captain Kellet's voyage of the 'Herald,' after which appeared "The Botany of H.M.S. 'Herald' during the years 1845 to 1851," by Berthold Seeman; or, in still later times, Captain Nares' 'Challenger' Expedition from 1873 to 1876, the botany of which occupies two large volumes, principally the work of Mr. W. B. Hemsley, F.R.S. Not that these expeditions have resulted directly in the introduction of any one useful plant either for general culture or commerce, but they have been instrumental in imparting a knowledge of the resources of the several countries visited, and in this way have awakened an interest in them. Important, indeed, as these expeditions have been in elucidating the botany of the world, still more so has been the formation of the several museums in the principal centres of the United Kingdom, for the especial purpose of developing the economic resources of the vegetable, animal and mineral kingdoms, such as the Food Collection, first at South Kensington in 1857 and later at Bethnal Green, the Industrial Museum at Edinburgh, and the Museums of Economic Botany at Kew, founded in 1847. These, together with the Royal Botanic Society of London, founded in 1839, and the Pharmaceutical Society of Great Britain, founded in 1841, must always be considered the centres from which knowledge on these points has flowed, and continues to flow. Nor must we forget the several International Exhibitions since 1851, where the vegetable resources of the globe, especially of our colonies, have been prominently brought to the notice of millions of people. Then, in connection with these museums and exhibitions is the literature which emanates from them, such as the handbooks and guides, in which, though published mostly for a few pence, a mass of valuable information is given. We cannot leave this part of the subject without a word of high commendation on the handbooks and catalogues issued by the several colonies at the Colonial and Indian Exhibition of 1886, which should be in the library of every one interested in Economic Botany.—*From Cassell's "New Popular Educator"* for November.

TOADS CHANGING COLOUR.—Is it a recognised fact that toads will change colour after the fashion of the chameleon? During the past season I have had three toads in a cucumber frame, two spotted in the ordinary manner and one a deep brown. The two former died. On clearing out the frame to prepare it for wintering plants in, I removed the third for safety, and placed it under an inverted flower-pot on the grass. It was there perhaps half an hour. On lifting the pot to replace the toad in the frame, I found it had changed from brown to a dirty yellowish-green with the usual dark spots. It soon recovered its former brown colour when in the frame.—*H.*

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.

R. COUPAR.—For list of Dr. Masters' works, address him at the "Gardener's Chronicle" office, 41 Wellington Street, Covent Garden, London.

A. P.—From your sketch we judge the lizard to be a species of Iguana. That is, a genus of lizards remarkable for their herbivorous habits. The green lizard is insectivorous, or rather omnivorous as regards its animal diet.

J. B.—The "moving bodies" at the ends of Closterium are due to the flows of colourless protoplasm. The protoplasm appears to flow up over the interior of the cell-wall on all sides from the centre to the extremity, then to turn round past the vacuole, and return over the surface of the green endochrome parallel to the upward course. Some microscopists, however, believe these vacuoles are contractile vesicles, connected with the flow of the currents.

J. W. D. M.—Will Mr. E. D. Marquand kindly send us his present address to forward to this gentleman?

F. T. Maidwell.—The specimens are thin nodules of silicate of lime. There are appearances of casts of foraminifera in them. They certainly deserve further investigation.

W. G.—The "Fellowship" of the Royal Astronomical Society is not obtained by examination. A candidate is recommended for the Fellowship by three Fellows, one from personal knowledge, and all from that of his work and writings. Apply to the secretary of the society for the necessary forms and other information.

J. W. D. K.—The zoophytes are *Coryne pusilla.*

A correspondent, whose name and address are not given, sends us a specimen asking what mammal it is the *skull* of. It is the carapace of one of the spider-crabs (*Hyas araneus*).

S. P. Hawes.—The "Notes" shall appear in due course. Send on all you have.

S. Mottet (Paris).—We shall be very pleased to publish your paper, notwithstanding the increasing demands upon our space. Please send it at once.

EXCHANGES.

Wanted, parasites, mounted or unmounted, latter preferred. Good exchange in miscellaneous slides.—George T. Reed, 87 Lordship Road, Stoke Newington, London, N.

Uncleaned gathering of *Meridion circulare*, either in fluid, for mounting in situ, or dried, for boiling in acid; also dried material of *Melosira varians* for exchange.—G. H. Bryan, Thornlea, Chaucer Road, Cambridge.

Wanted, a good section-cutter for vegetable sections. Trial must be allowed. Offered, natural history books, &c.—F. C. King, 82 Fishergate, Preston.

Send any good rock section for a slide of *Nitella batrachosperma* (new to Britain), or offers, to—F. C. King, 82 Fishergate, Preston.

Micro-mounts and material, mosses and dried plants, all correctly named, in exchange for illustrated or rare books, and photographs.—J. H. Lewis, F.L.S., 145 Windsor Street, Liverpool.

Wanted, Nos. 217, 219, 220, 223, 224, and 227, of Science-Gossip. Offered, micro material and slides, fossils, &c.—A. G. Hammond, 10 St. John's Hill, New Wandsworth, S.W.

Wanted, foreign reptiles and small rodents, alive; also fossil and preserved fishes.—W. Hannan Watson, 219 St. Vincent Street, Glasgow.

Wanted, pure gatherings of amphipleura, toxonidea, *Tabellaria fenestrata*, denticula, okedenia, and colletonema, in exchange for pure diatom deposits, either raw or prepared, micro material, or slides.—S. L., care of W. West, 15 Horton Lane, Bradford.

Science-Gossip, 1875-8, bound blue cloth, gilt letters; "Life of an Insect," 2 vols.; "Insects" vol. of Naturalists' Library, col. plates; "Alphabet of Insects" (Rennie): Kirby and Spence's "Entomology," calf gilt; "British Moths and Butterflies," 1*s*. ed.; thirty odd numbers of Science-Gossip. Exchange Wanzer oil-lamp and cooker, or anything useful.—R. J. Warner, 80 Netherwood Road, Kensington, W.

"Illustrations of the Linnæan Orders of Insects," by W. Wood, F.R.S., 2 vols., 35 col. plates; "Half Hours with the Microscope" (new); "The Microscope, How Made and Used" (new); "Transactions of the Linnæan Society;" three numbers each of "Botany" and "Zoology," and photographic literature. Exchange for anything useful.—R. J. Warner, 80 Netherwood Road, Kensington, W.

Wanted, Jackson's or Wale's stand, or good ¼ or ⅙ objectives (if out of order not objected to), in exchange for mathematical, scientific, and engineering books; several hundred to choose from.—Taylor, 26 Marchmont Street, London, W.C.

A fine collection of Scotch graptolites, also *Bulimus decollatus*, offered in exchange for tropical shells. Lists requested.—Miss F. M. Hele, Fairlight, Elmgrove Road, Cotham, Bristol.

Wanted, diatoms in situ and pediculi (the latter in dilute alcohol or carbolic acid), in exchange for American diatoms, recent and fossil, and miscellaneous objects for mounting.—M. A. Booth, Longmeadow, Mass., U.S.A.

Wanted, a set of dissecting instruments in good condition. Good exchange given.—H. W. Parritt, 103 Camden Street, London, N.W.

Wanted, Devonian, gault, or greensand fossils. I will send four good specimens from carboniferous, including *Lingulella squamiformis* (rare), for any one good specimen from any of the above.—P. J. Roberts, 4 Shepherd Street, Bacup.

British marine, land and freshwater shells, fossils, drift from the Cornish coast, containing minute shells, corals, echinii spines, *Echinus sphæra* and *miliaris*, very small, for micro purposes; *Pyroxene andesite* from the interior of Mexico, which, when cut, polished and mounted, makes lovely slides for the microscope. Also, what offers for chips of rare Devonian corals and sponges, to work up for micro purposes? Wanted, *Acme lineata*, *Isocardia cor*, *Pecten nivea*, *Trochus granulatus*, *Buccinopsis Dalei*, *Buccinum Humphreysianum*, *Lima loscombii*, *L. subauriculata*, *Avicula hirundo*, and glass-top boxes.—A. J. R. Sclater, M.C.S., 23 Bank Street, Teignmouth, South Devon.

What offers for some back numbers of "Grevillea?"—Rev. C. H. Waddell, Whitewell, Belfast.

Wanted, good works on natural history subjects, chiefly microscopic, in exchange for foreign insects.—M., Ferndale, Brondesbury Road, N.W.

Lancashire specimens of *Bulimus Goodallii* offered for foreign land and freshwater shells not in collection.—W. Hy. Heathcote, M.C.S., Frenchwood Street, Preston.

Wanted, foreign stamps and shells in exchange for choice microscopic slides and British marine shells.—Suter, 5 High-week Road, Tottenham, London.

A good old violin, very sweet tone, with Vieuillame bow, in case, in exchange for objective or micro apparatus to value.—Chas. H. H. Walker, 12 Church Street, Liverpool.

Offered, *N. fluviatilis*, *B. tentaculata*, *P. vortex*, *P. contortus*, *L. auricularia*, *L. glutinosa*, *S. elegans*, *S. Putris*, *H. hispida*, *H. caperata*, *H. erictorum*, *L. palustris*, *Z. cellarius*, *P. fontalis*, *P. hypnorum*. Wanted, eggs of nightjar, quail, and Kentish plover.—E. Banks, 11 Grey Street, Hull.

Duplicates.—*Pal. contecta*, *Pl. glaber*, *dilatatus*, *albus*, *Lim. palustris*, *truncatula*, *Succ. putris*, *Z. glaber*, *nitidulus*, *H. sericea*, *concinna*, *C. tridens*, *Car. minimum*, &c. Wanted, *Venus chione* and *casina*.—F. C. Long, 8 Cog Lane, Burnley, Lancs.

Wanted, *Scalaria communis*, *F. gracilis*, *Bela turricula*, *Cap. Hungaricus*, *T. aureus*. Offered, two silver coins—Geo. III. threepenny piece (1763); Geo. IV. fourpenny piece (1824), and two copper coins.—W. J. Jones, jun., 27 Mayton Street, Holloway, London.

Duplicates of rare British birds' eggs, and Science-Gossip for 1886-89; also odd numbers and vols. of "Entomologist." Desiderata, rare eggs or British shells.—T. H. Hedworth, Dunston, Gateshead.

Offered, fine specimens of *Otina otis*. Wanted, any of the vertigoes, *H. lamellata*, and other shells not in collection.—Mrs. Falloon, Long Ashton Vicarage, Bristol.

Well-preserved snakes from Demerara, in spirits (names unknown), offered for scarce British birds' eggs, side blown. Description on application.—L. Montague, Crediton.

What offers or exchanges for the following: a French microscope (compound), eye-piece with a pair of brass forceps to fit, in neat mahogany box, Mantell's "Geology" (complete in two parts, bound), "Half-Hours with the Microscope," by E. Lankester, M.D. (illustrated by Tuffen West), "Zoology," by Andrew Wilson, Ph.D., containing chapters on amœba, hydra, sea anemone, freshwater mussel, lobster, and frog.—J. W. B. Rodgers, 52 and 54 London Road, Highfields, Sheffield.

BOOKS, ETC., RECEIVED.

"The World's Great Explorers: Life of John Davis, the Navigator," by C. R. Markham, C.B., F.R.S. (London: Geo. Philip & Son).—"Introductory Lessons on Quantitative Analysis," by John Mills and Barker North (London: Chapman & Hall).—"Elements of Physiology," by J. E. Boch (London: Chapman & Hall).—"Solutions to the Questions on Machine Construction set at the May Examinations of Science and Art Department," 1881-6," by H. Adams (London: Chapman & Hall).—"Birds of Oxfordshire," by O. V. Aplin (Oxford: Clarendon Press).—"Introduction to Chemical Science," by R. P. Williams and B. P. Lascelles (London: Ginn & Co.).—"Potential, and its Application to the Explanation of Electrical Phenomena," by Dr. Tumlirg, translated by T. Robertson (London: Rivingtons).—"Modern Methods of Making and Selling Carriages," by J. Phipson.—"Notes on the Pinks of W. Europe," by F. N. Williams, F.L.S. (London: West, Newman & Co.).—"Idylls of the Field," by F. A. Knight (London: Elliot Stock).—"Science and Scientists," Nos. II. and III.—"Some Wayside Problems," and "Who Painted the Flowers?" (London: Catholic Truth Society), &c.

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

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