THURSDAY, MAY 11, 1871

THE PROPOSED COLLEGE OF PHYSICAL SCIENCE AT NEWCASTLE-UPON-TYNE

A FEW weeks ago* we gave some account of the initiation of a movement in the North of England, having for its object the establishment of a College of Physical Science in Newcastle-upon-Tyne. As the Executive Committee appointed at the public meeting had only then begun its work, the details entered upon were given as mere indications of the general form the institution might be expected to take. A letter from the Master of University College, Durham, which appeared in our columns more recently, added somewhat to our information, and a circular which has been issued, with commendable promptitude, by the Executive, is now before us, representing the views of the promoters as modified in committee.

We shall probably best further the intentions of the Committee, whom we are anxious to aid, and at the same time give our readers the most reliable information, if we reprint this document verbatim :—

"It is proposed to found at Newcastle-upon-Tyne, in connection with the University of Durham, a College for the teaching of Physical Science, especially as applied to Engineering, Mining, Manufactures, and Agriculture.

"The want of such an Institution has long been felt in the North of England, and it is believed that while it would be useful in all the above pursuits, it would be of especial value to all persons intended for the professions of Mining and Engineering.

"Such an Institution (which it appears desirable to limit at its commencement to purely scientific objects) would offer instruction in the following branches of scientific knowledge. 1. Pure and Applied Mathematics. 2. Chemistry. 3. Experimental Philosophy. 4. Geology, Mineralogy, and Biology. Professorships and Lectureships will be founded on these subjects. It is proposed that the course of study shall last for two years, that it shall consist partly in attending lectures and partly in the work of the laboratories, that there shall be examinations at the end of each year, conducted mainly by Examiners from the Universities, and that at the final examination the successful students shall receive the title of Bachelor or Associate of Science of the University of Durham, or, upon certain further conditions, the degree of B.A. It is hoped that classes of evening lectures for those who are unable to attend during the day may soon be formed.

"The Government of the Institution will be entrusted to a Council, of which one-third will be nominated by the University of Durham. The University has offered the sum of 1,000*l.* annually towards the establishment of Professorships and of ten Scholarships of 20*l.* each to assist students. It is believed that 2,000*l.* a-year is the lowest estimate at which it is possible to place the expenses of such a College, even at its commencement, and it is proposed to appeal to the public for a subscription to create a capital fund of at least 30,000*l.* If this amount be collected, the endowment from the University of Durham will be made a permanent one. When it is remembered that such an Institution will benefit a very large portion of the population of the Northern Counties, and be directly useful to nearly all branches of Manufacturing and Agricultural, as well as of Mining and Engineering pursuits, it is believed that no difficulty will be found in ultimately raising this sum, which, according to the experience of all similar institutions, will probably be increased by private donations both for Scholarships and Professorships. It is proposed to offer Subscribers the option either of paying their whole subscription at once or of extending it over a period of five or six years. Small as well as large subscriptions are invited towards the above-mentioned fund. Upwards of 100 000*l.* has been recently collected in a similar case, or is in the course of collection, in subscriptions ranging from 2,000*l.* to the very smallest sums."

The last paragraph pleases us most. Six years is perhaps long enough to look forward in arrangements of many sorts, but not in matters pertaining to finance. The adoption of a scheme such as that originally suggested, based on a preliminary terminable endowment, would have crippled the energies of the whole staff, by suggesting the possibility of the early demolition of the structure they were labouring to build. It can scarcely be known, until the trial is made, how much may have to be done in the way of *creating the demand* for scientific education in the locality. We do not for a moment doubt its existence to a considerable extent, but we cannot suppose that the present case will form any exception to the general rule, that educational facilities are only slowly and by degrees taken advantage of by the classes for whose benefit they have been primarily designed. If the proposed college *begins* to find an appreciative public, and to promise eventual success within the six years, we should regard it as a subject of congratulation, and a proof alike of energy and judgment in its management, rather than as a matter of course. Happily, for this reason, the guarantee principle is to be put upon its best basis—funded property. Instead of 1,000*l.* per annum for a term of six years, as at first proposed, the public is asked for 30,000*l.* in one sum. This, with the consequent permanent endowment from Durham University, which may be regarded as equal to another 30,000*l.* capitalised, will provide a substantial foundation to commence upon. Nor can we doubt that the amount required will be easily raised amongst the wealthy men of the North.

We may perhaps say one word more about the selection of subjects for professorships, as our former remarks are alluded to in the Rev. Mr. Waite's letter.

We adverted to the absence of any mention of Biology as a part of the scheme of education in the report of the speech of the Dean of Durham at the preliminary meeting. In the revised programme, above reprinted, biology is *not omitted*, but that is all that can be said. The subject is tacked on to geology and mineralogy, and the result is a complete anomaly. To teach mineralogy in any modern sense, a man must be more than an average chemist—hence no one who is not an expert in geology, mineralogy, chemistry, zoology, and botany, will have the requisite qualifications for the chair which it is now proposed to constitute. We trust that the Committee are prepared to pay pretty smartly for so handsome an instalment of omniscience. Our fear that biology of itself might be thought too large a subject for a single professorship, was at any rate groundless, but we doubt whether entire exclusion would be worse than the grant of a third of a chair.

The geological knowledge of first importance in a mining district is essentially "stratigraphical," in other words, that attained by practical field work. Just so much palæontology is necessary as will enable the student to recognise the more common characteristic fossils, and sufficient acquaintance with minerals to render him fami-

* See NATURE, vol. iii. p. 461.

liar with ordinary rock specimens. It would be better that Geology of this sort should be associated with a subject like mining, instead of being placed in the position it at present occupies.

Mineralogy, in any right sense, is only applied chemistry, and would be more in place as a recognised portion of the chemical curriculum in such an Institution than as a part of geology. Few geologists pretend to mineralogy beyond a sufficient knowledge of the general external characters of rocks for the recognition of the commoner varieties. Palæontology, on the other hand, as a subject of systematic study, is but a phase of biology, and cannot without violence be linked with subjects arising out of the laws which govern the inorganic world.

In thus enlarging upon our former remarks, we are actuated solely by a desire for the success of an undertaking which has our entire sympathy.

Just as we are going to press we learn that it has been determined to push forward the arrangements so as to enable the College to open its doors in October. This is a wise decision on many grounds. The first week in October has become the recognised time for the commencement of winter courses of lectures, and delay beyond that might easily entail the loss of a whole year. Of the 30,000*l.* required, upwards of 17,000*l.* has already been subscribed, without any systematic canvass, and we can scarcely doubt that the remainder will be forthcoming. On public grounds we would venture earnestly to second the appeal made by the Committee, and to express the hope that the liberality of the coal-owners, manufacturers, and merchants of the district will enable them to open the Institution free from pecuniary embarrassment, and clear of the manifold difficulties that beset an undertaking burdened at the outset with debt. We also hear at the same moment that the Committee has again debated the question of a biological professorship. That body seems to be undecided as to whether it would be less ridiculous to ignore biology entirely, or to include it with a number of quite distinct branches of science in a sort of miscellaneous professorship, and the prevailing view *now* seems to be that, on the whole, the former alternative is the least conspicuously absurd. Surely there is a third course open to the Committee. We trust wiser counsels will prevail, and that we may never have to record that in Newcastle—the home of Bewick and Selby, Fryer and Alder, Winch and Robertson, not to name a host of living biologists—in the focus of the Tyneside Naturalists' Field Club—a College of Natural Science has been established in which Natural History in its higher aspects is excluded as a subject of study.

STAVELEY'S BRITISH INSECTS

British Insects. A familiar Description of the Form, Structure, Habits, and Transformations of Insects. By E. F. Staveley, Author of "British Spiders." (London: L. Reeve and Co., 1871.)

To compose a work on so extensive and difficult a subject as "British Insects," which shall convey a large amount of useful and interesting information without being too much overloaded with bare facts,—which shall be accurate without being dry, and amusing without being flippant,—is no easy task, yet it is accomplished by the author of this work in a very creditable manner. The introductory chapters are condensed and clear, just giving enough information on the general structure and economy of insects to interest the uninitiated reader, and lead him on to the more detailed account of each order given in the succeeding chapters.

An excellent feature of the work is the clearness of the type, and the well-executed woodcuts which somewhat too sparingly illustrate the text, while sixteen coloured plates by Mr. Robinson contain admirably life-like portraits of nearly a hundred of our most conspicuous or most interesting insects. A few extracts will best illustrate the author's style. In the chapter on the larvæ of Lepidoptera it is remarked, that there is neither time nor place in which we may not find the traces of these creatures or the creatures themselves.

"If at one time of the year we tear a handful of moss from the trunk of a tree, out drop some little brown chrysalids; if at another we drag a tuft of grass up by the roots, there we find silken tubes, the homes of some small caterpillars. We find them in fungi, we find them in grain, we find them in teazle-heads, in fir-cones, in rose-buds, and in fruit; and the Hymenopterist, carefully watching the insect emerging from a gall, discovers that he has reared in it a moth! On the face of a lichen-covered rock we see a moving fragment, and lo! a little caterpillar, neatly encased like a caddis-worm in a tent of lichen, is moving and feeding, safe even from the bird's sharp eye. We open our drawers, and there, oh, sight of horror! What is that streak of white silk upon the best garment—the garment laid by, too good for common wear? We look farther; what is that dusty little roll? It is a great-coat on a microscopic scale. It matches our best garment ominously. It moves—a head peeps out—some little legs, and away it walks!—tell not the housekeeper!—away it walks in safety from the admiring Entomologist."

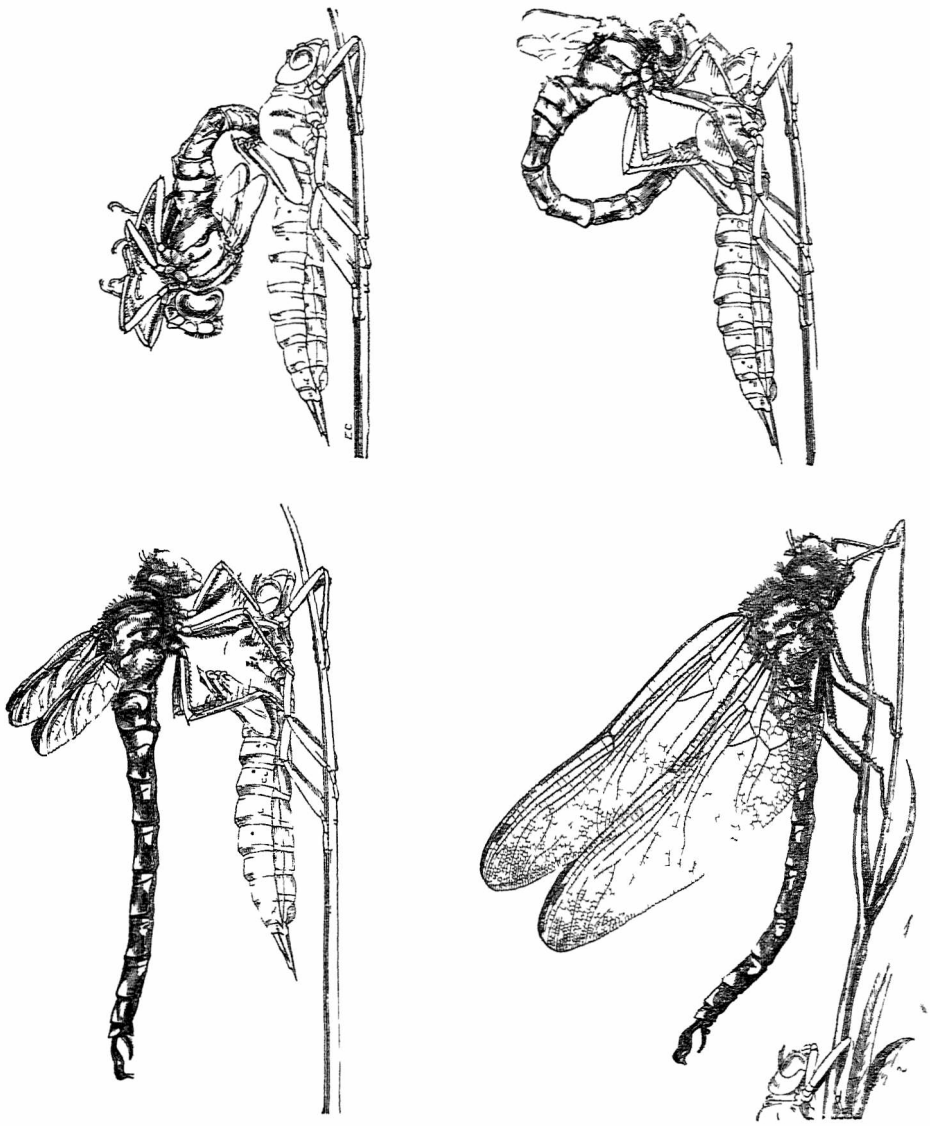
As an example of the woodcut illustrations we give the series showing the progressive stages in the transformations of the dragon-fly. The sluggish mud-coloured pupa ascends the stem of a grass or any other stalk of convenient size which rises above the surface of the water, after a time the skin cracks behind, between the wing cases, and the head and thorax of the enclosed fly are drawn out. The abdomen follows, the insect turning up and clinging to the pupa case, where it remains till the wings increase to the full size so rapidly that they can be seen to grow.

In the chapter on Diptera there are some good remarks on the many erroneous uses of the term "Fly."

"Being a 'popular name' the people have a right to mean what they choose by it, and they avail themselves of the right—some meaning by it one thing, some another, some every flying insect for which they know no other name. Thus the 'fly' of the former is usually the little hopping turnip beetle; the 'fly' of the hop-grower is an aphis; the 'fly' of the herdsman a gad; while to the citizen almost anything to be seen with wings (except pigeons and sparrows) is a fly. There are some, again, to whom flies are *flies*, one fly *the* fly, the common well-known little black house-fly. Here at last is something definite. No, not even now; for these will, at least, claim their young house-fly, and their full-grown house-fly, and expect you to believe that late in the year their house-fly takes to biting you, little dreaming that the little fly, and the big fly, and the fly which bites you, not only are different species but even belong to different genera; that the little fly never grows big, that the big fly never was little, and that their house-fly could not bite you if he would. What, then,

are we to understand by the name fly? It is clear that the popular sense has no sense at all, or too many senses, and yet the word cannot be spared from our vocabulary. In any Latin dictionary we shall find *Musca* (fly), and the entomologist pounces upon it and says it shall mean the *tribe of two-winged insects*. Linnæus so used it, and his genus *Musca*, now broken up into many new genera, represented the greater number of those insects which the entomologist now claims as flies."

In some parts of the work there is rather a tendency to jump at conclusions, and to give explanations of very doubtful value. It is attempted, for instance, to explain why the bee has four wings instead of two, by the fact that it is necessary for them to fold up and pack into a small compass to avoid injury and be out of the way during work, and this it is said is "the purpose of the division of the wing." This conveys the entirely erroneous



TRANSFORMATIONS OF THE DRAGON-FLY

impression that the wings of insects are normally two, and that the four are formed by the "division" of these two, an impression which we feel sure a person so well informed as the author could not have meant to convey. It also seems carrying hypothetical life-history a little too far to say of a bee emerging from the pupa that "into his mind rushed a full sense of his responsibilities," and on finding himself, say, a worker, "he, or rather she, became aware that the duties of house-builder, housekeeper, nurse, and even soldier and sentinel, devolved upon her;" and accordingly she forthwith "addressed herself to the task of repaying to futurity that debt which the cares of a former generation had laid upon her, and daily she toiled in its fulfilment." To make this exposition of the mental state of the newly-born bee complete, we should have been told whether it regulated its conduct in doubtful cases

according to the utilitarian or the intuitive theory of morality.

Such vagaries as the above are however rare, and we can conscientiously recommend this book as admirably adapted to lead its readers to observe for themselves the varied phenomena presented by insects, and thus to become true entomologists. ALFRED R. WALLACE

AMERICAN GEOLOGY

Preliminary Field Report of the United States Geological Survey of Colorado and New Mexico. Conducted under the authority of the Hon. J. D. Cox, Secretary of the Interior. By F. V. Hayden, United States Geologist. 8vo. pp. 155. (Washington: Government Printing Office, 1869.)

THIS preliminary field report makes us acquainted with a vast tract of territory hitherto scarcely known, save to the more adventurous squatters and to the various tribes of Indians who have gradually been driven farther and farther west by the wonderful growth of the United States populations, fed as they are annually by streams of English, Irish, Scotch, and German emigrants. Unfortunately for the Red-skins, they are not only hemmed in on the one side by the United States, and on the other by the equally vigorous growth of California and its vast mining and agricultural population; but their territory, only hitherto invaded by the Mormons and the "Pony-Dispatch," is now cut in twain by the great Pacific Railroad, which, in its course, has sent forth geological reconnaissances right and left, discovering timber here, coal there, building stone in this spot, mines in that, until there is no space left for them save in the happy hunting-grounds above, to which they are fast going, aided by revolvers, alcohol, and disease.

The report refers to a line of country extending from British North America to New Mexico in a northerly and southerly direction, and from the Rocky Mountains to the Lower Missouri in an easterly and westerly one. Dr. Hayden explains the reason why he has been able in a very short time to cover so large a tract of territory—it is, that "there is great uniformity in the geology of the country, and when one has become familiar with the different geological formations over a small area, he can trace them with great rapidity over long distances" (p. 11).

First, we have the Rocky Mountain system forming the main ridges and the hills, composed of granite rocks. Resting on the flanks of these more elevated masses, the stratified deposits are exposed in succession, becoming less and less inclined as we recede from them and enter the plains.

The oldest stratified deposit met with is the Potsdam Sandstone, equivalent in geological position to our Upper Cambrian, or to the Primordial Zone of Barrande; this is followed by strata of Carboniferous age, but giving no promise of workable seams of coal. The Triassic series may be represented by certain red arenaceous deposits, sometimes containing gypsum and rocksalt; these pass upwards into undoubted Oolitic beds. Next follows a Cretaceous formation, some 4,000 feet in thickness, followed by a well-developed Tertiary series of vast geographical extent, and but very slightly inclined.

These Tertiary beds are rich in lignites, and evidence a long period of tranquil estuarine or lacustrine deposition in a region supporting dense forests of large trees, and a vegetation far exceeding in luxuriance anything now met with in these latitudes. Carnivores, Pachyderms, Proboscidea, &c., occur in great abundance. It is very interesting to know that in Tertiary times North America had its elephants, hippopotami, rhinoceroses, horses, lions, &c., and was, in the size and abundance of its Mammalia, in no way surpassed by the Continents of the Old World.

Two minor reports accompany Dr. F. V. Hayden's report, one on "Mines and Mining," by Mr. Persifor Frazer, jun., giving a most interesting account of the mining capabilities of the district; the other on the "Agriculture of Colorado," by Mr. Cyrus Thomas. There is every prospect of the Colorado territory becoming as rich an agricultural district as it has already proved to be a mining one. H. W.

OUR BOOK SHELF

Aunt Rachel's Letters about Water and Air. (London: Longmans and Co., 1871.)

IN the form of a series of familiar letters from an aunt to a nephew and niece, we have here an account, in simple familiar language, of some of the commoner physical phenomena of nature. Recollecting the books with a similar aim that have passed through our hands, we feel grateful to find one free from conspicuous blunders. To the little book before us we need not however apply such negative praise. It is in all respects to be commended as a book to put into the hands of the young. And we fancy that even many well-educated people who are not young in years, will find a record and explanation of facts with which they are not familiar. They may learn here all about the formation of ice, latent and specific heat, the air-pump, the barometer and thermometer, the winds, combustion, and many other phenomena of daily life. A few well-executed woodcuts illustrate the text; and we would like to hear that a large circulation has rewarded the efforts of "Aunt Rachel" to popularise the elements of science.

Handbuch der allgemeinen Himmelsbeschreibung vom Standpunkte der kosmischen Weltanschauung dargestellt. Von Hermann J. Klein. Pp. 351. (Braunschweig, 1871. London: William and Norgate.)

Theoretische Astronomie. Von Dr. W. Klinkerfues. Erste Abtheilung. Pp. 256. (Ditto, ditto.)

THE first of these works is the second edition of the first part of a general description of the universe, and is devoted to the solar system: another part will be given to the fixed stars. The aim of the author is to afford a complete account of his subject, including the latest researches, which shall be at the same time thoroughly scientific, while it will not be beyond the comprehension of those who are possessed of only an elementary knowledge of astronomy, or more properly perhaps uranography. The first forty-nine pages contain a description of the sun; the next five are given to the zodiac. Then follow the planets Mercury, Venus, &c., in order, and finally we have a full and very interesting account of comets and meteorites.

Turning to the chapter on the sun, we find, after a general introduction, methods for calculating the distance between the centre of the sun and that of the earth. After this we have an account of the "spots," accompanied with tables of their numbers in different years, and their connection with the movements of the magnetic needle. The labours of Herschel, Airy, Lockyer, Huggins, and others are largely quoted, and the author begs any ob-

server whose researches may have been omitted, to attribute the neglect to the disturbing influence of recent events. The earth and her satellite are treated at some length, and the questions of the moon's influence on the earth's atmosphere, the winds, weather, and magnets, are fully discussed. The chapter on meteorites is very interesting. We are told, on the authority of Miller and Haidinger, that the earliest mention of meteorites is probably in Iliad xv. 18—22, where the anvils spoken of by Jupiter are supposed to refer to these phenomena. Livy mentions a shower which some think may have been a star shower; and the famous black stone in the Kaaba, at Mecca, is said to be undoubtedly a meteorite of great antiquity. Numerous analyses of meteorites are given, and tables are added containing full details of all those which are recorded to have fallen from the earliest times. There are similar tables with regard to comets and star-showers; and finally we have two well-executed plates of the appearance of different sun-spots, and a chart of part of the moon's surface. We should like to see an English edition.

The Theoretical Astronomy of Dr. Klinkerfues, director of the Royal Observatory of Göttingen, is a reproduction of lectures delivered by him in that University. This is the first part of the work, and its object is to give an explanation of the means by which the courses and positions of heavenly bodies are determined. It is not adapted to the general reader, but will prove a useful companion to the mathematician who wishes to obtain an insight into astronomical methods of calculation. Several very good figures accompany the text.

G. T. A.

Kuklos; an Experimental Investigation into the Relationship of Certain Lines. By John Harris Part I. (Montreal, 1870)

IN a review of Prof. Bretschneider's History of Early Geometry we have mentioned some clever attempts to square a circle, made at a time when this problem engaged the attention of the first mathematicians. Then, however, as at present, there existed circle squarers of a different kind, who excel only in demonstrating their own ignorance. A fine specimen is preserved by Simplikios. Some persons had heard of square numbers which are at the same time cyclical, that is to say, the last figure in the square number is the same as that of the root, as 25 and 5. Nothing, of course, could be more evident to them than that a number which is both square and cyclos must be a measure for the circle. Mr. Harris ranks almost as high, only he does not give his conclusions in quite so short a form. His book is to consist of four parts in quarto, of which the first contains merely a preface, preliminary arguments, and on the last page an introduction. In the preface the author excuses the haste in which the publication has taken place, with the remark that if his researches are of value they cannot be brought early enough before the public,—if a failure "the communication itself would not be worth the additional labour bestowed on improving its form." This latter conclusion we willingly grant. It is only to be regretted that Mr. Harris has not had the same opinion of the time he spent in writing this communication and preparing the numerous and long figures which fill ten large plates.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his Correspondents. No notice is taken of anonymous communications.*]

Pangenesis

MR. GALTON—by acting upon the conclusion that the supposed gemmules supposed to be detached from the cells of the body at different periods of life in the case of the higher animals swarmed in the blood prior to their supposed collection and union to form the reproductive element—favoured the provisional hypothesis of Pangenesis, for he indicated a not improbable manner in which the very improbable phenomena involved in the hypothesis might actually occur.

But Mr. Darwin, in NATURE for April 27th, writes to explain that he maintains that the gemmules must be "thoroughly diffused"—I conclude, suspended in the fluids which circulate freely in every part of the very substance of all the tissues of the body. The supposed gemmules must be much more minute than the smallest particles that can be seen by the highest magnifying powers used in these days, and must be invisible to the eye when made to appear five thousand times larger than their real size. They must be capable of *diffusion*, and, as is suggested by Mr. Darwin, much as chemical substances are *diffused*.* But the terms of the hypothesis would imply that the gemmules are actual particles *suspended* and not *dissolved* in the fluids.

It is not very encouraging to those who work, to discover after having performed numerous and well-devised series of difficult, laborious, and troublesome experiments honestly to test the value of a hypothesis, that they have been investigating a shadow, and to be then informed that the results they have obtained have little or no bearing on the question at issue. The "experiments are extremely curious," says Mr. Darwin, and the experimenter "deserves the highest credit for his ingenuity and perseverance."

It would, of course, be possible to remove from one animal portions of tissue which, according to the hypothesis, *must* contain the supposed gemmules, if they exist, and graft the pieces of tissue upon another. If the experiment was successful, and the offspring exhibited any of the characters of the variety from which the graft was taken, the opponents of Pangenesis would admit the doctrine at once, but if the results were again of a negative kind, would Mr. Darwin consider that his hypothesis had "received its death blow?" It would certainly be as easy to defend it as it is at this time. Nor do I believe it possible to obtain a series of experimental results which would lead the supporters of Pangenesis to abandon the hypothesis. A firm belief in hypothetical gemmules, which cannot be rendered evident to the senses, is not likely to be shaken.

Depend upon it, neither the well-devised experiments of Mr. Galton, nor any other experiments that may be devised, will overthrow this doctrine. The provisional hypothesis of pangenesis is perfectly safe, and will withstand every attack that may be made. It cannot be successfully assailed. Like many favoured hypotheses of these days, it can neither be proved to be true nor positively shown to be false, and it is open to anyone to ground his belief in the truth of this and other doctrines upon the fact that they have not been and cannot be disproved. For undoubtedly gemmules *may* be formed in the manner supposed; if formed, they *may* be detached; if detached, they *may* pass through the tissues; they *may* then collect together, and *may* form reproductive elements. Each one of the countless millions of sperm elements produced in such profusion during so many years of life *may*, indeed, be formed by the union of millions of gemmules which, after meandering through the various textures of the body, marshal themselves in order in one particular locality. From the vast company thus supposed to have collected, we *may* conceive, by the light of imagination, the formation of regiments composed of multitudes of individual gemmules of the same kind; and further, it is not difficult to imagine that each individual gemmule of every regiment *may* move away and unite with thousands and tens of thousands of others, to form at length that marvellous compound and complex speck of matter less than the $\frac{1}{50000}$ of an inch in diameter, which constitutes the active material of each small reproductive particle. This is one way in which the properties of the spermatozöon may be accounted for. Nor is it beyond the power of the imagination to picture the orderly arrangement and rearrangement of such vast hosts of potential molecules as is supposed. No confusion, no jostling of one another, no struggling would be seen, for each molecule takes its appointed place, in obedience to its own properties, knowing of course the position it is to occupy in the complex ranks at each different period of its life's progress, and, never ambitious of discharging a higher function than that which it is destined to fulfil, performs the important office of transmitting certain peculiarities, important or trivial, useful or useless, from the existing to a new being.

* In NATURE for May 1st, Mr Francis Galton very properly remarks that the term Mr. Darwin should have employed is "dispersion" not "diffusion," and there are other critical remarks which appear to me equally just.

We may be led from the consideration of the broad facts nature to conceptions of the most abstract kind, without being conscious of the slightest gap between the facts of Science and the creations of the Imagination. In these days the utmost skill is often displayed in hiding and ignoring or denying the hiatus by which the arguments deduced from the results of observation and experiment are separated from those which are based upon the fictions of the fancy. But, unhappily, the gulf cannot be filled up, or bridged over. It may be obscured by mists and clouds, but, though it be lost for a time, it is sure to be rediscovered and its limits studied by the curious and unphilosophical.

Nowadays analogical argument is employed very freely without any attempt to show, in the first place, that there is any real analogy between the facts upon which the reasoning is based. In order to convince people that a hypothetical gemmule may move long distances through all sorts of tissues, it is only necessary to show that actual matter, millions of times as large, does burrow a short distance through certain textures. Mr. Darwin remarks that it cannot be objected "that the gemmules could not pass through tissues or cell-walls, for the contents of each pollen grain have to pass through the coats both of the pollen tube and embryonic sack."

He might have advanced in his support the fact of fungi traversing tissues, of entozoa of various kinds burrowing long distances through the textures of the living body, and many well-known instances of a similar kind. But such facts do not strengthen the hypothesis of Pangenesis in the slightest degree. They were known before it was advanced, and the objection controverted has not been raised in the form indicated. We *know* that a thing infinitely larger than the hypothetical gemmule does pass through tissues, but do the gemmules really exist, and do they pass through? Certainly, if they exist, they *may* pass, but, as I have indicated, there are other matters invalidating the hypothesis besides the question of the gemmules traversing the tissues. Pangenetic gemmules might pass everywhere. They might leave the body, collect in the atmosphere and coalesce, and the compound particle formed might easily wriggle itself back again into the organism through the chinks between the cuticular cells. Such gemmules might move anywhere, up and down and in and out through any cell wall. They might pervade solids and fluids and gases. The pangenetic gemmule cannot be seen or tested, neither can its presence or absence be proved in any way. The phenomena adduced by Mr. Darwin in support of his hypothesis can be demonstrated; but the pangenetic gemmules are of the imagination alone, and the analogy between the actual facts and the supposed facts is surely but an analogy of the imagination. The facts alluded to no more support the pangenetic hypothesis than does the demonstration of living germs in the air support the hypothesis of life in the blue sky. It is possible to supply many arguments stronger than those adduced in support of the hypothesis, nay, perhaps, stronger than any Mr. Darwin himself has yet advanced in favour of Pangenesis; but yet other considerations appear to me greatly to preponderate against the acceptance of the doctrine. Mr. Darwin admits that "from presenting so many vulnerable points" the life of his hypothesis "is always in jeopardy;" but is it not this very jeopardy which lends interest and enchantment to many a hypothesis, and sustains it in the estimation of those who delight in conjectural information and scientific speculation?

LIONEL S. BEALE

MR. DARWIN, in his letter to NATURE of April the 27th, says: "The fundamental laws of growth, reproduction, inheritance, &c., are so closely similar throughout the whole organic kingdom that the means by which the gemmules (assuming for the moment their existence) are diffused through the body, would probably be the same in all beings, therefore the means can hardly be diffusion through the blood." Now, if in the vegetable kingdom pangenetic gemmules are able freely to be "diffused" from cell to cell by endosmosis, we should expect that in the case of grafts, where certainly such diffusion goes on between the cells of the stock and the scion, a bud borne upon the graft would certainly be affected by the gemmules arising in the root and stem of the stock. Yet we all know that the pips from a pear grafted on a quince stock will not give rise to a hybrid between a pear and a quince, neither will the stone of a peach which has been grafted on a plum stock grow into a tree whose stock bears plums, while the extremities of its branches bear peaches.

A. C. RANYARD

Noises at Sea off Greytown

IN NATURE, vol. ii. p. 25, Mr. Dennehy gave an interesting account of a peculiar vibration, accompanied by sound, which is perceivable at night on board *all* (?) *iron* steamers which anchor off Greytown, Central America; and in subsequent pages I have read with great interest various speculations as to its origin, which is ascribed (1, the probable solution) to troops of Sciænoids (with reservation) by Mr. Kingsley (p. 46); (2) to musical fish or shells, by Messrs. Evans and Lindsay (pp. 46 and 356); and (3) to gas-escape from vegetable mud and sand, by Mr. Malet (p. 47); whilst Mr. Dennehy himself suggests the possibility of some galvanic agency.

I remarked upon this vibratory phenomenon in a communication published in the *Field* newspaper of October 26th, 1867, signed "Ubique," after having heard it myself when on board the Royal Mail steamer *Danube* (Capt. Reeks) during the nights of the 12th, 13th, 14th, and 15th of May, 1867; the new moon occurring on the 4th of the same month. As my statement serves to confirm Mr. Dennehy's report, I may be forgiven for giving it in full.

After giving an account of the sudden appearance of a huge white shark in the deep sea when a man fell overboard, I proceeded to state as follows:—"On embarking on board the *Danube* steamer, lying at anchor in the roadstead off Greytown on the 12th May, 1867, I was informed that the ship was haunted by most curious noises at night since she had arrived, and that the superstitious black sailors were much frightened at what they thought must be a ghost. The captain and officers could make nothing of it, and it afforded a great matter for discussion. On inquiry I found out that other *iron* ships had been similarly affected. Curiously enough this noise was only heard at night, and at certain hours. Some attributed it to fish, suckers, turtle, &c., others to the change of tide or current; but no satisfactory conclusion could be arrived at. When night came on there was no mistake about the noise; it was quite loud enough to awaken me, and could be heard distinctly all over the ship. It was not dissimilar to the high monotone of an Æolian harp, and the noise was evidently caused by the vibration of the plates of the iron hull, which could be sensibly perceived to vibrate. What caused this peculiar vibration? Not the change of current and tide, because, if so, it would be heard by day. Like everything else that we cannot explain, I suppose we must put it down to electricity, magnetism, &c. If this should meet the eye of any of the officers of the above-mentioned steamer, or others who have noticed this phenomenon, I should be glad to hear whether this effect still continues, or if any satisfactory conclusion has yet been arrived at. I may add that from the hold of the vessel the grunts of the toad-fish could be distinctly heard. I hope that the above notice may lead to some answers from your various correspondents."

This brief notice drew forth a rejoinder from a correspondent (November 23, 1867) who had noticed a somewhat similar sound.

"The singular sound noticed by 'Ubique,' I have also heard without knowing its origin. One moonlight night in 1854, on board a steamer anchored near the Tavoy river (Tenasserim) we were struck by an extraordinary noise which appeared to proceed from the shore about a quarter of a mile off, or from the water in that direction. It was something like the sound of a stocking loom, but shriller, and lasted perhaps five or six seconds, producing a sensible concussion on the ear like the piercing scream of the cicada; and this gave an impression as if the vessel itself were trembling, or reverberating from the sound. One or two Burmans on board said simply, the noise was produced by 'fishes,' but of what kind they did not describe. It was repeated two or three times. I never heard it before or after the occasion referred to, nor have I ever met with any allusion to this singular phenomenon until I perused 'Ubique's' communication in the *Field* of the 26th ult. The steamer in my case, I should add, was a wooden one."

Mr. Evans, in his letter, speaks of the rapid silting up of Greytown harbour this still continues, and the passage over the bar, which is continually shifting, is often a matter of great difficulty, and indeed often so dangerous that the Royal Mail Company will not undertake to allow their own boats to land, and passengers have to land in the local canoes at their own risk. The Nicaraguan Government, however, propose to carry out Mr. Shepherd's plan of diverting the waters of the San Juan river from the Colorado mouth to the Greytown channel, hoping thereby to scour the harbour clear.

Mr. F. J. Evans also refers to the vast amount of animal life, and mentions the quantities of sharks and *alligators* which abound in and about Greytown Harbour. I can fully corroborate this, although I believe that what Mr. Evans terms *alligators* are really *crocodiles* (*Molinia Americana*), I should be glad to have certain information on this point: when not actually visible, their proximity is made evident by a powerful odour of musk. The most notable, however, of the denizens of these waters, besides the turtle, is the Atlantic manatee, which Columbus mistook for a mermaid, and which Agassiz terms the modern representative of the Dinotherium. The Mosquito Indians on the Indian, Rama, and Blewfields rivers are great adepts at harpooning this paradoxical mammal, and its flesh salted is a staple article of food all along these coasts, being not unlike to ship's pork.

Southsea, April 28 S. P. OLIVER

P.S.—When at anchor off Greytown, also in the *Danube* steamer, during the night of February 15, 1867, (moon eleven days old) there was no vibration or noise perceived, but then there was a tremendous swell breaking with high surf on the bar, and the vessel rolling heavily. It would be interesting to overhaul the logs of the Royal Mail Company's vessels which have been at Greytown, in order to discover the periods of these vibrations, but I am afraid that no observations have been recorded in their books.

Mechanical Equivalence of Heat

YOU will see from the proceedings of the Literary and Philosophical Society at Manchester, that, since the discussion there, Dr. Joule has definitely abandoned the reasonings in his famous paper on the mechanical force of electro-magnetism, steam, and horses. I have now had time to test the facts and experiments of this new theory, and find it, as I hope soon to show in detail, as untenable as his former one. Indeed, I am sure that the mechanical equivalence of heat must soon be generally abandoned as inconsistent with facts. You will see that the April number of the "Review of Popular Science," has definitely pronounced a decision in my favour; and I am sure you will soon be convinced yourself that your own first reviewer of my article in the *Quarterly Journal of Science* was more reasonable than your second. H. HIGHTON

Aurora by Daylight

AN additional well-authenticated instance of this very rare but indisputable phenomenon, may, perhaps, be thought worthy of insertion.

In the Transactions of the Royal Irish Academy for 1788 (embodied in "Memoirs of Science and the Arts," 1798), is "An Account of an Aurora Borealis seen in full Sunshine, by the Rev. Henry Ussher, D.D.," which opens in the ensuing manner:—

"The following phenomenon being very uncommon, if not entirely new, I think it worth communicating to the Academy, principally with a view to learn whether any other person has observed a similar one at any time:—

"'On Saturday night, May 24, 1788, there was a very bright aurora borealis, the coruscating rays of which united, as usual, in the pole of the dipping needle. I have always observed that an aurora borealis renders the stars remarkably unsteady in the telescope. The next morning, about eleven, finding the stars flutter much, I examined the state of the sky, and saw whitish rays ascending from every part of the horizon, all tending to the pole of the dipping needle, where at their union they formed a small thin and white canopy, similar to the luminous one exhibited by an aurora at night. These rays coruscated or shivered from the horizon to their point of union. These effects were distinctly seen by three different people, and their point of union marked separately by each of them.'"

T. W. WEBB

The Coronal Rifts

THE enclosed extract of a letter from Captain Tupman, who observed the Eclipse of December last through the finder of Prof. Harkness's telescope at Syracuse, may interest some of your readers:—

"It is a singluar feature in all the photographs that the 'rifts' are so wide and distinct. They are actinic rifts. As seen in the telescope simply the corona had no such rifts. I watched it during the whole 105 seconds; such a feature would, of course, have struck me instantly. I actually pointed Prof. Harkness's spectroscope *in* the rifts as being bright parts of the corona!"

A. C. RANYARD

The Name "Britain"

As "C. L. N. F." has in your last well answered the letter of "A. R. H.," I have now only to reply to Mr. Hyde Clarke's letter, in which he says I should find it difficult in my derivation of "Britannia" and "tin" "to explain on the same basis the conformable names" of the countries and rivers which he mentions, inasmuch as "these names are not explainable in Phœnician, because they were given long before the Phœnicians entered on the stage of history."

His paper read before the Anthropological Institute I have not seen, but as "the learned" Bochart and other authors have considered the name "Britain" to have been derived from the tin which the Phœnicians exported from Cornwall more than 3,000 years ago (Num. xxxi. 22), and as no one will venture to say that "tin" was not then the name of this metal in the most ancient Cornish as well as in the Phœnician language, from which it proceeded, I do not think I can fairly be called upon to go into the "difficult" task suggested by Mr. Clarke.

The original name of our island I have imagined to be *Bretin* ("Tin Mount"), that being at first exclusively the name of the *mount* from which the Cornish *tin* was exported by the Phœnicians, and it is highly probable that the same name was afterwards given by these ancient traders to the entire island, of which the mount was only a part, for it was Britain that gave them nearly all their *tin*, and its most beautiful natural object known to them was St. Michael's *Mount*.

There being other islands close to Britain, the Romans gave the name *Britanniæ* indiscriminately to them all. When they spoke of Britain as dissociated from its contiguous islands, they called it either *Britannia* or *Insula Britannica*, which is synonymous with νῆσος Βρεττανικη. This word, Βρεττανικη, used at first adjectively by the Greeks, had in the time of Diodorus Siculus become a substantive, so that he uses it as such when describing the daily insulated port or mount called sometimes *Iktin* (Tin Port), and sometimes *Bretin* (Tin Mount), adjacent to Βρεττανικη, to which *port* or *mount* at low water the tin was carried from the mainland for sale and exportation. The following is the passage:—*εἰς την νησον προκειμενην μεν της Βρεττανικης ὀνομαζομενην δε Ἰκτιν.*

Plymouth, May 6 RICHARD EDMONDS

*** We cannot print any more letters on this subject.—ED.

The Sensation of Colour

PROF. CLERK MAXWELL in his valuable paper on Colour in NATURE (vol. iv. p. 13) commits himself to the opinion that there must be three distinct sets of retinal nerves, one for each of the three primary sensations of colour. It is obvious that demonstrative proof or disproof of this is unattainable: we can only reason analogically. The analogy of the ear is in favour of such an opinion, so far as it goes; for there appears to be proof, or probability almost amounting to proof, that sounds of different pitch are conveyed to the brain by different nerves. But the ear resembles the other organs of sense less than they resemble each other; and there is surely no reason for thinking that there are distinct nerves of smell for every distinct kind of smell, or distinct nerves of taste for every distinct kind of taste. Nor I believe is there the slightest proof of nerves for the sensation of heat distinct from those of touch.

JOSEPH JOHN MURPHY

Old Forge, Dunmurry, Co. Antrim, May 8

P.S.—I am not now at home. I intend to write in reply to Mr. Laughton's important letter on the Prevalence of West Winds, when I am at home and have the file of NATURE and other authorities to refer to.

The Cave-Lion in the Peat of Holderness

WHILST engaged in the task of rearranging this Museum, I have been impressed with the value of two specimens in the Palæontological collection.

One is labelled "No. 7, *Felis*—metatarsal inner (Right side),"

the other one is "*Felis* — 14. Femur Right side." There is no record in the catalogue by whom they were presented, nor of any of the circumstances of their *gisement*. The specimens, in fact, have no history whatever, and I can only say that I found them in close juxtaposition with a large series of red-deer bones from Holderness, with which they perfectly agree in their mineralogical condition. I have no doubt that they are *bonâ fide* from the Holderness Peat.

Their identification as bones of *F. leo* (variety *spelæa*) is also certain.

Hull Royal Institution C. CARTER BLAKE

Eozoön Canadense

SINCE reading some of the communications on the Eozoön, which have appeared from time to time in NATURE, I have felt constrained briefly to give the results of my examination of the "Eozoic" limestone in Eastern Massachusetts. I am the more disposed to do this, hoping that a new line of investigation will be suggested to observers in other localities.

Last autumn I visited for the first time the quarries of "Eozoön" limestone in Chelmsford, under the guidance of my friend Mr. Burbank, of Lowell, Massachusetts, who has furnished many microscopists with specimens for sections. Having been long engaged in the study of the foliated series of rocks, and having years ago discovered indubitable evidence that portions of the included limestone are of vaporous origin, I was prepared to recognise the same feature in the Chelmsford "Eozoic" rock. I was accordingly not surprised on examination to find, what the advocates of the organic nature of the Eozoön seem never to have suspected, that the limestone in question is not a "sedimentary rock;" that it occupies, or rather occupied, (for it has been for the most part removed) pockets or oven-shaped cavities, which were once plainly overarched by gneiss; that it is foliated, there being a regular succession of leaf-like layers from the walls toward the centres of the cavities, witness to which is borne by a like succession of different minerals; that in some places it ramifies the surrounding rock in a vein-like way, while in others it exactly conforms with the most abrupt irregularities of surface; that in one locality, which I have repeatedly examined, it conforms with the uneven portions of a mass of syenite, with which it is so associated as to reveal its more recent origin; and that, therefore, it is not of nummulitic derivation, but was deposited in a vein-like form, the materials having been probably forced up into the cavities from below while in a vaporous state.

Such, in few words, is the result of my examination—a result which tends to show that the "Eozoön" of Eastern Massachusets is not organic, and that thus it belongs to the department of Mineralogy, and not to that of Palæontology. Waving additional particulars for the present, I may simply add that I propose in due time to give a detailed exposition of the relations of this famous "Eozoic" rock.

Cambridge, Mass., April 15 JOHN B. PERRY

THICKNESS OF THE EARTH'S CRUST

I SEE that at p. 296 of your journal for February last, which has recently reached Calcutta, you print a lecture by Mr. David Forbes "On the Nature of the Earth's Interior," in which reference is made to the Mr. W. Hopkins's method of determining whether the thickness of the earth's crust is great or small when compared with the whole radius, and to M. Delaunay's objection to it.

The lecturer refers to me as having approved of Mr. Hopkins's method, which I always have done and do still, and then makes the following apparently crushing remarks to annihilate Mr. Hopkins and all who approve of his method and of the result to which it leads, viz., that the crust is very thick. He says:—"M. Delaunay, an authority equally eminent as a mathematician and an astronomer, was induced to undertake the reconsideration of the problem; a labour (!) which has resulted in altogether reversing the above decision and demonstrating the complete fallacy of the premises upon which so much elaborate reasoning had been expended."

As the lecturer had condescended to mention my name in connection with the subject, I wonder why he has taken no notice of my letter in reply to M. Delaunay, which was printed in your journal for July 1870, six months before the lecture was delivered, and which also appeared about the same time in the *Philosophical Magazine* and the *Geological Magazine*. In this I showed that M. Delaunay had evidently misconceived the problem, and that Mr. Hopkins's method is altogether unaffected by his remarks.

So much has been said about profound mathematical calculations in connection with Mr. Hopkins's investigation, that I conceive many have shrunk from attempting to understand the question at issue, from a feeling that they would not be able to comprehend it were they to attempt to do so. But this is quite a mistake. Anyone with an ordinary degree of knowledge of popular astronomy and of mechanical action is quite competent to form a good opinion on the point in dispute. What Mr. Hopkins did may be divided into two parts. He first conceived an idea, which was to be the basis of his calculation; and then he made his calculation. It is the *calculation* that calls for the "profound mathematics." But it is not this that is the matter of dispute. It is the *idea*, on which the calculation is based, which M. Delaunay calls in question.

I think I can make the matter sufficiently plain to your readers to enable them to form their own opinion.

Everyone having a knowledge of popular astronomy is aware that the earth revolves round an axis, which is fixed in the earth's solid crust, but shifts very slowly in space, producing what has been known ever since the days of Hipparchus by the name Precession. On this fact as his ground-work Mr. Hopkins reasoned as follows; and so got to his *idea*, which formed the basis of his calculation. Suppose the earth has a solid crust, the interior being filled up with fluid. If the axis remained steady in space and the crust revolved round it uniformly, no doubt, although the crust and fluid may have moved differently at one time, yet in the lapse of ages friction and viscosity in the fluid would cause the fluid at last to revolve with the crust just as if the whole were one solid mass. This being the case, suppose a slight horizontal push is given to the two poles, in opposite directions, so as slightly to shift the axis in space; what would happen? The revolving crust, by this new and additional motion, would slip over the surface of the revolving fluid, through a small space proportionate to the push given to the poles. The fluid could not possibly acquire in an instant this new motion, however small it might be, because the fluid is not rigidly connected with the crust. Suppose a second, and a third, and a succession of slight horizontal pushes to be given to the poles in a continually altering direction, the effect will be that the revolving crust will be continually slipping over the revolving fluid which has not time to acquire these new motions given instantaneously to the solid crust. These successive slight pushes given to the poles, and so to the solid crust, represent the unceasing action upon the crust of the force which causes the motion of precession in the earth's axis, and arises from the attraction of the sun and moon on the protuberant parts of the earth about the equator.

Mr. Hopkins having reasoned thus far, went a step farther, and so came to his fundamental idea. He saw that the thinner the crust the smaller would be the mass which the disturbing force producing precession would have to move, and therefore the greater would be the motion caused, that is, the precession. Here, then, he discerned a connecting link between the amount of precession of the earth's axis and the thickness of the earth's crust. This was the *idea* I have alluded to.

Starting from this idea he entered upon a profound calculation and obtained a formula, which gives the thickness in terms of the amount of precession. This amount is a matter of observation; and the thickness can therefore be deduced by the formula from the observed pre-

cession. It is, as I have already said, not this calculation which is called in question by M. Delaunay, but the fundamental idea.

M. Delaunay says the fluid will have precisely the same motion as the crust; and that, because the new motion of the crust is so slow. But it is clear that its slowness has nothing to do with the matter. The fact is that the fluid and the crust not being connected together by any solid connection, no motion, whether small (*i.e.* slow) or not, can be suddenly communicated from the crust to the fluid mass. If the crust moved uniformly, as I have already said, and around a steady axis, the fluid might, after a lapse of ages, by friction and viscosity, acquire the motion of the crust. But if the crust is continually shifting from this steady position, however slowly, the fluid cannot suddenly acquire the new motion, and the crust slips over it; and the thicker or thinner the crust, the greater or less is the solid mass to be shifted, and the less or the greater the precession produced. If the internal mass obeys at once the shifting motions of the crust, that mass cannot be fluid, but must be solid, and have a solid connection with the crust; in which case the whole question is yielded.

Mr. David Forbes speaks of the "labour" M. Delaunay has gone through in giving vent to his opinion. If the thing *done* is to be measured at all by the thing *said*, his labour must have been infinite; for what he has said is an impossibility. He has evidently altogether mistaken the problem. Mr. Hopkins's method stands unimpaired by his criticisms. Indeed Mr. Hopkins was not a man to advance a theory which could be apparently set aside by such slender means. JOHN H. PRATT

A THEORY OF A NERVOUS ATMOSPHERE

UNDER the above title, Dr. Richardson, in a lecture published in the *Medical Times and Gazette* of last week, suggests a new theory in respect to nervous function. We propose in a few sentences to state simply the meaning of this theory.

The earlier physiological writers on the functions of the nervous system were under the impression that the brain, spinal cord, and other nervous centres acted after the manner of glands, and produced or secreted, as they said, a liquid. They called this assumed secreted liquid the nervous fluid, and they considered that it charges the nervous system, some also supposing that it makes even a circulation through tubular nervous channels or canals. It was not an uncommon notion that the nervous fluid conveys nourishment to the organs of the body; but the most common, and indeed generally accepted, hypothesis was, that it acts as a means of communication between all parts of the nervous system, and is the communicating medium of the impressions and motions derived from the outer world. Attempts were made to measure the rate of motion through this fluid, how long it took to convey an impression by it from brain to muscle.

The discovery of frictional electricity, the special discovery of the electric shock by Cuneus, of Leyden, in 1746, and the after discovery by Galvani of the inductive action of the prime conductor of the electrical machine on the muscles of frogs, threw quickly into the shade the speculations of the earlier neuro-physiologists. It was assumed at once that there exists a true animal electricity, that there is production of electrical action within the bodies of all living animals, that there is conduction, and, in short, every mechanism and method for the carrying on, if we may so say, of electrical life. The discovery of the electrical organs of the torpedo, the dissection of the animal, the descriptions of its nerves by John Hunter, and the experiments made by a very earnest investigator, Mr. Walsh, aided greatly to establish the hypothesis which Galvani and his followers advanced, and which Volta, with the whole force of his experimental argument, failed to demolish.

Of late years the old hypothesis of the nervous fluid has been lost altogether, while the electrical hypothesis infinitely varied from its original and simple character, and infinitely varying with every new step of electrical discovery, has in a certain sense retained its popular hold. It is true the hypothesis has rested on so much laboured obscurity that nobody has succeeded in making out of it a demonstration like the demonstration of the circulation of the blood, and no one has made it so simple that every scholar can read it when it is written, and every medical practitioner practise by it and act upon it as a known principle. It is true that since the time when Volta gave his undeniable proofs against the truth of the first inferences of Galvani, the best and most thoughtful philosophers have felt doubts as to the electrical character of living action, and have looked on Galvani's construction of life as a beautiful crumbling ruin rather than as a temple befitting the worship of the gods of nature; and, lastly, it is true that whoever takes up to read the tomes or volumes of the most eminent writers on the subject of animal electricity is prone to lay them down again as he would the handles of a battery that master his will without appealing to his reason. All this is quite true; but still the electrical hypothesis has, as we before said, held its place; no attempt has been made to replace it; it has maintained around it a spell of fascination.

The theory that has been suggested by Dr. Richardson is in some sense a return to the old view respecting nervous action, and in some sense also is an extension to the nervous system of the physical idea of communication of motion by molecular disturbance. In a few words, the author of the theory supposes that the blood, as it circulates in the vessels on which the structures of the body are constructed, yields a diffusible vapour or atmosphere which charges the nervous system surrounding the molecules of nervous matter and pervading the whole nervous organism. He attempts to formulate the physical qualities of this vapour; it is probably an organic vapour containing carbon, hydrogen, and nitrogen; it is insoluble in blood, it is condensible by cold, diffusible by heat; it is retained after death longer in cold-blooded animals than in warm-blooded, and longer in warm-blooded animals that have died in cold than in those that have died in heat; it possesses conducting power, and as a physical substance is susceptible of variation of pressure; it connects the nervous system in all its parts together; it is the medium of communication during life between the outer and the inner existence; by the organs of the senses the impressions and motions derived from the outer world are vibrated into or through the nervous atmosphere to the brain; in the living and healthy animal the nervous ether, if we may so designate it, is in correct tension, in the feeble it is diminished, in the dead it is absent or inactive; in the waking times of the living it is most active; it may be used up faster than it is produced during exercise; it is renewed during sleep.

On the supposition of the existence of a nervous ether or atmosphere as thus suggested, the author of the theory accounts for various phenomena connected with the partial or complete destruction of conscious, and even of organic life. The action of narcotic vapours is an illustration in point. It is assumed that these vapours—vapours of chloroform or alcohol, for example—taken into the blood and carried to the nervous system, become diffused through the nervous atmosphere, and by their presence interfere with its physical qualities and thus obscure function. "The foreign vapour that has been introduced benumbs; in other words, it interferes with the physical conduction of impressions through what should be the cloudless atmosphere between the outer and the inner existence."

Carrying out in a different way the same line of thought, the author of the theory to which we have

specially called attention, accounts for the diffusion of some poisons through the body and for that rapid action of certain poisonous substances which so many experimenters have endeavoured, but not successfully, to explain; further, he suggests that in some instances poisonous products of decomposition generated within the body itself, in disease, may be diffused through the nervous ether, and that the sudden collapse of nervous function, which is often seen in acute disease, may be due to this cause. Finally, there may be conditions of disease in which there is unnatural tension of the nervous atmosphere. followed by disturbance of muscular motion, convulsion, or cerebral pressure, leading to apoplectic insensibility.

We have sketched out thus briefly the leading points of this theory of a nervous atmosphere or ether produced, during life, within and by the living organism, as a theory calculated to give rise to much discussion and device of new experiment.

ASTRONOMICAL OBSERVATION

THE statistics of modern astronomical observation would, we suspect, be very curious, if it were possible to get at them. A report showing the gradual increase in the number of telescopes manufactured during the last fifty years would be very interesting; and so would be a table comprising at once the advance in their dimensions and the diminution in their cost. The result would, we believe, be such as at first sight to cause great surprise among those unacquainted with the subject, or those whose recollection does not go back to days when five inches was as extraordinary an aperture for an object-glass, as double that size is now. But the value of these, as of other tabular statistics, would suffer material abatement, if they were applied to establish any other conclusions than those to which they directly lead. For instance they would probably be fallacious, if considered as inferring a proportionate increase in the number of important observations. In order to bring out such a result, we require, so to speak, another factor, and a very essential one—a corresponding increase in the number of competent observers. This, we fear, may not have been commensurate with the advance of optical means: at least, except upon the supposition of some such deficiency, it is difficult to understand what becomes of the multitude of really good object-glasses which are annually produced, not only in England, but in Germany and America. A large proportion of these, we are led to think, must be purchased to be looked at, and not looked through: or handled as mere toys for the amusement of people who do not know what to do with themselves in an idle evening. This was not so much the case in the early days of telescope-manufacture. The greatest master of figuring specula in his own time was also the greatest proficient in using them: it is needless to add the name of Sir William Herschel. And so the finest reflectors in Germany were placed at the same period in the hands of the leader of all accurate selenographical investigation, J. H. Schröter. These were "the right men in the right place." Even then, it may be said, many noble reflectors went, no one knows where, the greater part of them long before this time useless from tarnish, or, still more mortifying to think upon, ruined by unskilful repolishing. Still, admitting this, the disappearance of powerful instruments does not seem to have been so remarkable in those days as it is now, and the quantity of really valuable observations appears to have been greater in the end of the last and the early part of the present century, in proportion to the means of observing.

This is not a very encouraging view of the present state of this branch of astronomy. But, if well founded, as we believe it to be, we might expect that there would be some assignable reasons for it; and, in fact, several are sufficiently obvious. One certainly is, that the process of discovery is not, generally speaking, renewable. What has been once detected is usually placed on record, in bar of all future claims. So it has been in the science of music; a man might arise among us with the fervid genius of Handel, but he could not write the Hallelujah Chorus over again; and doubtless the spirit of Mendelssohn must have been cramped by the impossibility of employing many of the noblest and most impressive subjects which had been anticipated by his predecessors. And so it has been in the researches of geography. The enterprising explorer has now to go much farther in pursuit of "fresh woods and pastures new," and every Alpine season is so rapidly narrowing the number of summits untrodden by the foot of man, that the excitement of a first ascent will soon have to be sought in remoter regions. Thus in astronomy, though it cannot be said that there are no worlds left to conquer, yet all the larger and more conspicuous features of the heavenly bodies have been long ago so fully noted and recorded, that what remains for exploration is chiefly of that delicate character which, without being the less interesting from its minuteness, is less accessible, for that reason, to the possessors of ordinary instruments. And on this account many a student who might well have risen from the ranks in the earlier days of scientific campaigning, is now compelled to remain in comparative obscurity—a mere spectator, when he might well have taken his place among the discoverers of fifty years ago.

Another reason why tools have multiplied without a corresponding increase of good work, may be this, that looking upon the observer and his instrument as a complex apparatus, the improvement of the intelligent has not kept pace with that of the material part. In fact, it is impossible that it should. The eye is but what it was when David learned humility from considering God's heavens, the work of His fingers, the moon and the stars which He hath ordained; the intellect, though more developed and cultivated, is not more strong and piercing than it was in the days of Hipparchus; man does much more with his brain, but he has no more brain to do it with, than his uncivilised ancestors; and observers may, and will be, collectively multiplied without being individually improved. Every man that has eyes does not know how to use them; or, not failing in this respect, he may lack other requisites: he may not know what to look for, or where to find it; or he may be deficient in his handling of the faithful pencil or the expressive pen. And so it comes to pass that the capacities of instruments may be much in advance of the abilities of those who use them.

Besides all this, there is a physical obstacle of an entirely different character, which must not be forgotten; the unimprovable constitution of our own atmosphere. This will ever be a sore subject for the zealous observer, especially among ourselves. If even Secchi finds fault with the glorious Roman heavens, what have we not to regret in our own murky, and fuzzy, and restless skies? Who that has read the most graphic as well as instructive writings of Sir J. Herschel is likely to forget his complaints of "twitching, twirling, wrinkling, and horrible moulding?" and who that has had much actual experience of observatory work will not endorse all this with a very lively fellow-feeling? The nights may easily be numbered, during a long season, in which the defects of the atmosphere do not overlie those of the instrument, and when the observer has not rather to wish that he could see all that his telescope could show him, than to long for greater power or light, to be expended in making atmospheric disturbances yet more conspicuous and prejudicial. The only way to obviate this grievous hindrance is to get above it; and no man has yet done this except Professor Piazzi Smyth in

his most successful "Experiment"; it was said, indeed, that the French observers were about to follow his example, and to plant their instruments on the Pic du Midi de Bigorre; but we have never heard whether the idea has been carried into execution. And, however striking may be the advantage of such a plan, it must ever be confined to a favoured few.

We have dwelt at some length on a view of the present state of astronomical observation, which, though rather unfavourable, we believe to be substantially true. But it is not to be inferred that this is its sole aspect. There are, as usual, two sides to the shield; and much is to be said that is of an opposite tendency. If, for instance, we have asserted that for some time past observers have not multiplied in proportion to the means of observation, this is but a relative statement; the absolute fact is that at no former period has there been so numerous, or so zealous, or on the whole so competent a band of astronomical students. And of this we have a very pleasing evidence in the recent formation of an astronomical society expressly devoted to physical observation, to which we cordially wish success. If again it is probable that not many of the great discoveries are left within the reach of ordinary instruments, it should not be forgotten that many telescopes of very superior character are now housed in private observatories; and that for them investigations are still reserved, whose delicacy is no bar to their importance, and which may be undertaken with a hope of success no longer chargeable with extravagance. Great cabinets may be unlocked by little keys. Minute researches may give the clue to discoveries of the broadest extent and deepest interest. The changes of the lunar surface, the internal motion of starry clusters; the parallax and fixity of nebulæ; the planetary attendants on the brighter stars, these are mere specimens of the magnificent arcana, whose solution may not be denied to human energy and perseverance. We may remember, too, that if the telescope and the micrometer should be found unequal to the task, we have yet a new and most powerful method of investigation, the results of which are equally important and surprising—spectrum-analysis. The revelations of this beautiful invention may be said to be only beginning, and no man can foresee their end. What has already been done would have appeared as improbable as the reveries of Kepler, had it been predicted fifty years ago; and who shall say what may be the result of fifty years more of patient and energetic application? And what might not Kepler have said and done, had such an instrument of research been placed in his hands? We may suppose how his fervid imagination would have exulted in the prospects, and with what confident joy he would have repeated the memorable words which characterise one of his lofty aspirations, "Plus ultra est."

NOTES

It is stated that the Astronomer Royal is to have the honour of a K.C.B. conferred upon him in recognition of his services in respect to the International Exhibition. We trust this rumour is not strictly correct; for unless it is to be generally understood that services are to be rewarded in the inverse ratio of their value, it is simply grotesque and unbecoming of the Government to ignore all the Astronomer Royal's services to Science, and all his unpaid services to the State in connection with subjects more important to the nation than all the exhibitions which ever have been or ever will be.

In a Congregation to be held at Oxford on Tuesday, May 23, three forms of statute will be promulgated on the subject of the Second or Final Examination. It is proposed to have one Pass School of a mixed character and six Honour Schools. In the Pass School the examination is to be divided into three groups, as follows:—Group A.—1. One Latin and one Greek author, one at least of which shall be a philosopher or an historian. 2. The outline of Greek and Roman history, with a special period of one or the other, and English composition. Group B.—1. Either English History and a period or subject of English Literature, or a period of Modern European History with Political and Descriptive Geography, together (in each case) with English composition. 2. A Modern Language, either French or German, including composition in the language and a period of its literature. 3. The Elements of Political Economy. 4. A branch of Legal study. Group C.—1. The Elements of Geometry, including Geometrical Trigonometry. 2. The Elements of Mechanics, solid and fluid, treated mathematically. 3. The Elements of Chymistry, with an elementary practical examination. 4. The Elements of Physics, not necessarily treated mathematically. Every candidate is to select two subjects from one of these groups, and one of another of them, and must pass in all three; but may present himself for each of the three subjects in separate Terms. The six Honour Schools are to be:—1, Literæ Humaniores; 2, Mathematics; 3, Natural Science; 4, Jurisprudence; 5, Modern History; and 6, Theology. The examination in the Honour School of Literæ Humaniores is to include Philology, Ancient History, and Philosophy:—1, In Philology, the Greek and Latin languages; 2, in Ancient History, the histories of ancient Greece and Rome; 3, in Philosophy, Logic, the History of Philosophy, and the outlines of Moral and Political Philosophy, each candidate being required to offer at the least two treatises by ancient authors. Candidates shall be permitted to offer in addition, as special subjects, one or more authors or portions of authors, or departments, or periods falling within or usually studied in connection with any of the stated subjects of this school. For the purpose of this provision philology shall be taken to include textual criticism, the minute critical study of authors or portions of authors, the history of ancient literature, and comparative philology as illustrating the Greek and Latin languages, and ancient history shall be taken to include classical archæology and art, and the law of Greece and Rome.

It is with very great pleasure that we print the following intelligence of the safety of Dr. Livingstone:—Despatches were received last week at the Foreign Office from Dr. Kirk, the Acting British Consul at Zanzibar, containing information of the safety of Dr. Livingstone in October last. The doctor was then at Manakoso, helpless, without means, and with few followers. Dr. Kirk had sent him supplies to meet his immediate necessities, which, it was hoped, would shortly reach him.

At the annual meeting of Convocation of the University of London, held on Tuesday last, Dr. E. A. Parkes was chosen by a very large majority at the head of the list of three graduates, to be submited to Her Majesty for selection therefrom of a member of the Senate in the place of the late Dr. W. A. Miller. At the same meeting a resolution proposed by Dr. Francis T. Bond, that it is expedient to retain Greek in the Matriculation Examination only as an optional subject, was rejected by a small majority.

The example set by Clifton College in the formation of a botanic garden in connection with the Natural History Society is, we understand, about to be followed at Marlborough, a plot of ground having been granted by the authorities for that purpose. Such a garden will be a valuable adjunct to the herbarium, if such plants are selected as are typical of the principal natural orders, especially of those which are sparingly represented in the British flora.

The following appointments have been made in consequence of the death of Prof. Miquel:—Dr. N. W. P. Rauwenhoff to be Professor of Botany and Director of the Botanic Garden at Utrecht. Dr. W. F. R. Suringar to be Professor of Botany and Director of the Botanic Garden at Leyden.

THE *Botanische Zeitung* records the death on March 23 of Dr. Schultz-Schultzenstein, of Berlin, well known as a copious writer on vegetable morphology and physiology.

MR. F. M. BALFOUR, late of Harrow, and Mr. P. H. Carpenter, of the Royal School of Mines and University College, London, have been elected to foundation Scholarships at Trinity College, Cambridge, for proficiency in Natural Science.

WE regret to have to record the death of Mr. James Yates, at his residence at Highgate, on the 7th inst. He was a prominent member of the Royal and Geological Societies, and of late years had been best known as one of the most active advocates of the introduction of the Metric System of Weights and Measures.

THE following gentlemen have been placed in the first class of the annual examination in Natural Sciences in St. John's College, Cambridge (order alphabetical) :—Edmunds, Garrod, Read, Sollas, Yule.

THE annual *conversazione* of the members of the Society of Arts will be held on Thursday, June 1, at the South Kensington Museum.

M. ELISEE RECLUS, a very active contributor to the *Revue des Deux Mondes*, has been appointed director of the National Library in Paris, to fill the room of M. Taschereau, who has left for Versailles.

PROF. WYVILLE THOMSON delivered, on the 2nd inst., his inaugural lecture to the students of the Natural History class in the University of Edinburgh. In the course of his observations he paid a glowing tribute to the services of his predecessor, Dr. Allman, whose valuable researches in zoology will continue to be prosecuted in spite of his retirement from the chair.

WE regret to learn from *Harper's Weekly* that at the great fire which recently destroyed the printing office of Weed, Parsons, and Co. in Albany, the edition printed of the Twenty-fourth Report of the New York State Cabinet of Natural History was entirely destroyed. Fortunately a nearly complete copy of the revised proof was saved; so that no serious difficulty will be experienced beyond considerable delay, although the loss to the State in the destruction of fifteen thousand impressions of plates, &c., will be considerable.

THE continuation of the exhaustive work of Bronn on the classes and orders of the animal kingdom contains an elaborate memoir upon the anatomy of birds, and several numbers are devoted to the peculiarities of the muscular structure alone.

AT the meeting of the Boston Society of Natural History for March 1, the principal communication was one by Mr. George Sceva, in which attention was called to the fact of the shortness of the upper jaws in the skulls of the Hindoos, and the frequent absence of the third molar. This generalisation was based upon the examination of a number of crania; and it was found that about fifteen per cent. of the whole exhibit this peculiarity, while in an extensive series of skulls of European races only about one per cent. showed the same feature.

AT the annual meeting of the Chicago Academy of Sciences, held on April 11, various communications upon a variety of subjects of interest were presented. The most important paper read was one by Colonel Foster, upon the subject of Artesian Wells, in which an account was given of the principal borings that have been attempted in the West, with a statement of their geological relationships, and the depth to which they were carried.

THE Rugby School Natural History Society has just published its Fourth Report for 1870. Rugby having to so great an extent taken the lead among our public schools in its cultivation of Natural Science, we looked for this Report with special interest, and have not been disappointed in its value. There is an interesting paper by the President, the Rev. F. E. Kitchener, on the Times of Flowering of Plants, containing just that record of facts and minute observations which it is one of the special functions of local natural history societies to collect. It is illustrated by two plates, in which are delineated curves representing the average forwardness of flowering in the spring and early summer months of 1867, 68, 69, and 70, contrasted with other curves representing the rainfall and temperature. Other illustrated papers are by the Rev. T. N. Hutchinson on Sun-spots, and Mr. C. H. Hinton on the Mechanism of a Crane's Leg. We learn that the society now possesses a museum of its own, and has just acquired cases for its botanical and entomological collections. We are glad to see that the officers, in their report, lay great stress on the importance of completing the local collections.

IN the Proceedings of the Cotteswold Naturalists' Field Club for 1870, the President, Sir W. V. Guise, Bart., calls attention, in his Annual Address, to the unusual interest and importance of two papers which occupy nearly the whole of the volume—The Gravels of the Severn, Avon, and Evenlode, and their extension over the Cotteswold Hills, by Mr. W. C. Lucy; and On the Correlation of the Jurassic Rocks in the department of the Côte-d'Or, France, with the Oolitic formations in the counties of Gloucester and Wilts, by Dr. Thomas Wright. The terms in which these papers are referred to by the president are thoroughly well deserved, and the Club is doing great service to science in their publication. Mr. Lucy's paper is the result of four years' labour, and is copiously illustrated by numerous sections, and a large coloured map showing the surface geology of the country between Evesham, Chipping Norton, Gloucester, and Cirencester. The work is most creditable to the club, and renders this volume of its Transactions indispensable to anyone studying the geology of the western counties.

THE Proceedings and Transactions of the Nova Scotian Institute of Natural Science for 1869-70 lies on our table, and we may take this opportunity of acknowledging the great service rendered by this society in the elucidation of the natural history of our American colonies. Among the papers in the present number we may mention especially the continuance of Dr. Bernard Gilpin's series on the Mammalia of Nova Scotia, a monograph by Dr. Lawson of the Ranunculaceæ of Canada and adjacent parts of British America: a paper by the President, Mr. J. M. Jones, on the Laridæ of the Nova Scotian coast; and a record of Meteorological Observations for 1869, by Mr. Henry Poole.

THE Botanical Exchange Club has just issued its Report for the current year, signed by its indefatigable curator Dr. J. Boswell-Syme. It is chiefly occupied by observations on certain critical sub-species or varieties gathered by the members, no absolutely distinct indigenous species having been added to the British flora during the year. We are glad to see a considerable increase in the number of members of this useful society.

WE have received the Report of Observations made by the members of the Observing Astronomical Society for 1869-70. A considerable proportion of these observations has already been reported in our columns. In addition, the Report includes Hints and Suggestions on the Observation of Lunar Objects by Mr. W. R. Birt, and three drawings of the Bands of Jupiter on Oct. 6, and Nov. 1 and 24, 1869. We are glad to see that the number of members has increased to fifty, and congratulate the society on the good work it is doing.

IN a recent number of the "Proceedings of the Asiatic Society of Bengal," we have a report of the Address of the President, the Hon. Mr. Justice Phear, a considerable portion of which is devoted to a statement of the importance of a systematic series of barometrical observations in India. Mr. Phear points out that

in India we possess almost unrivalled opportunities for examining and analysing the atmospheric column in all its parts, and that India proper, the Bay of Bengal and Burma, constitute a region which, for the purposes of one branch at least of meteorological science, demands to be taken and treated as a whole. The actual state of the case, on the other hand, is that for administrative purposes, British India is divided into eight principal districts or provinces, viz., Bengal, Madras, Bombay, N.W. Provinces, Oude, Panjab, Central Provinces, and Burma; and in each of these, except Burma, is a separate local system of observation, with its own independent head, and very little communication with one another.

ON the 2nd May, two days before the full moon, a complete lunar halo was observed at Clifton by Mr. George F. Burder, and described fully in the *Times* of the 4th. Mr. Burder saw the two halos, the large one and the small one, the larger being very difficult to be seen. A paraselenic circle, having the zenith for its centre, was also observed, and mock moons, or *paraselenæ*, four in number, were seen at the intersection of the halo with the paraselenic circle. This appearance, as usual, was followed by very bad weather. It is produced, as demonstrated by the French natural philosophers of the eighteenth century, by floating particles of ice; and the light from the moon being considerable, the phenomenon was observed in all its glory.

MR. T. LOGIN'S reports on the experimental cultivation of cotton at Camp Bahalgurh in the Valley of the Jumna, are exceedingly satisfactory. Although the crops were damaged by floods and by late frosts, the yield of clean cotton has been at the rate of 307½ lbs. per acre, or from four to five times the average yield in India. Mr. Login attributes this result in great measure to his practice of irrigating the fields in the afternoon or night, rather than in the mid-day, believing that the combined action of light and heat on stagnant water makes it under almost all circumstances injurious to plants.

OF the many fresh-water fish characteristic of the continent of North America, comparatively few, with the exception of members of the salmon and trout family, are of sufficient economical value to make it expedient to introduce them into regions where, they do not naturally occur. This transfer has been made to a very disastrous extent in the case of the pike (*Esox*), which although multiplying rapidly, is at the same time the determined foe of all other kinds of fish, and soon almost exterminates them from the waters which it inhabits. For this reason, some States have passed laws prohibiting, under severe penalties, except by direct permission of the Commissioners of the Fisheries, any transfer of the species in question to new localities. There is, however, one fish that is of great value, and which can be introduced without as much doubt of the propriety of the act as exists in regard to the pike. We refer to the black bass (*Grystes salmoides*). This inhabits, in one variety or another, the basin of the great lakes of the Mississippi Valley, and the upper waters of the streams of the south Atlantic coast as far north as the James River. Within a few years it has been transferred with success to streams previously uninhabited by it—to the Potomac, for one, where it is now extremely abundant. During the past summer some public-spirited gentlemen of Philadelphia collected among themselves a fund to stock the Delaware with this noble fish, and obtained about seven hundred, principally in the vicinity of Harper's Ferry. These were carried alive in large tanks to the Delaware, and deposited in that stream at Easton, about two hundred of the number dying by the way. The same party of gentlemen propose to use a surplus fund in their hands in experimenting upon the restocking of the river with shad and salmon.

THE white sugarcane of Cuba has been tried in Columbia and found more productive than the local variety called Cinta.

*REPORT ON THE DESERT OF THE TIH**

THE following report has been sent to the Vice-Chancellor of Cambridge by Mr. C. F. Tyrwhitt Drake, who received a grant from the University for the purpose of investigating the natural history of the Tîh. He spent several months in the district, accompanied by Mr. E. H. Palmer (late of the Sinai Survey), who was travelling on behalf of the Palestine Exploration Fund:—

I have now the honour to lay before you a report of my work during last winter in the "Badiet et Tîh," or Wilderness of the Wandering. As this desert had been only partially, and even then superficially examined, I shall give, firstly, a short account of the route we took and of the general physical features of the country; and, secondly, the various traditions of beasts and birds which are current amongst the Arabs. Many of these are curious, from their similarity to Western tales; and others, though seemingly foolish in themselves, are not without interest, as illustrating the beliefs and folk-lore of the Bedawîn. These stories are not so numerous as I found them to be in former journeys amongst Arabs inhabiting more fertile tracts, for the Desert of the Tîh is in truth "a great and terrible wilderness." The last winter, too, was one of unusual drought even in those parched regions, and the scattered tribes of Arabs who live there experienced great difficulty in finding pasture for the herds of camels and goats which exist in considerable numbers in some districts.

The supply of water is very scanty and variable, as springs are extremely rare, and most of the water is obtained from "Themaîl," or pits dug in the gravelly beds of wadies, and similar situations into which the water filtrates. The water thus obtained is very bad, being impregnated either with mineral salts or lime, to say nothing of the quantity of earthy and animal matter held in suspension by its being constantly stirred up for the daily use of the Arabs and their flocks, who naturally collect in the neighbourhood of any place where water is to be had. This want of water was the greatest drawback to the satisfactory exploration of the country: want of food may be contended with, obstructive Bedawîn may be quieted, and trackless mountains crossed, but the absence of water renders a country impracticable, especially to those who travel as lightly laden as we did, dispensing with the usual suite of dragoman and servants. Picturesque and desirable as a large retinue and guard of wild Arabs may appear to some persons, had we indulged in these impedimenta, I feel convinced that we should never have got through the country by any but the ordinary route. In these districts fertility is slowly but steadily being driven northwards, for various traces of cultivation and dwellings show that the rainfall must formerly have been plentiful and regular, for surely as tillage and the consequent vegetation decreases, so will the rain-supply diminish till the land has become an irreclaimable waste.

The manner in which gardens may be made and will afterwards sustain themselves, is well shown in those which still flourish at Sinai, notwithstanding the neglect of the present degraded inmates of the convent.

Even in those parts of the Tîh near El Aujeh and Wady el Abyadh which, from internal evidence, must at one time, and that within our era, have supported a large settled population, so desolate is the general aspect, that, to a casual observer, the country would seem to be and always to have been an utter waste. That they were so always is, however, at once negatived by the existence of several ruined cities surrounded by the remains of extensive gardens and vineyards; of these, the walls alone remain to tell their tale. The vineyards are clearly to be traced on the low hills and rising grounds by the regular heaps and "swathes" of black flints, with which the chief part of the district is covered, and which still retain the name of "Teleilat el 'Aneb" or grape-mounds. These facts are of great importance as showing that the objections to fixing certain localities—mentioned in Scripture as abounding in pasturage—in what is now completely desert, may be set aside as worthless. I consider too, that the southern limit of the Promised Land, at the time of the Israelitish invasion, must be placed as far south as Wady El Abyadh. This would remove many difficulties hitherto met with in the satisfactory identification of Kadesh. Though I have not space to enter fully into the question here, I may say that there is strong evidence in favour of fixing that much-disputed locality at Aîn Gadîs (first dis-

* A map to illustrate this paper is printed in the "Quarterly Journal o the Palestine Exploration Fund" for January.

covered by Mr. Rowlands, though he seems to confuse it with Ain El Gudeirat). Many facts support this supposition, for instance, the suitability as a strategic position for a camp of long duration. There is abundance of water there even at the present day, and springs are found at Ain Muweilah to the north and Biyar Maayín to the south. The probability is great that a large host like the Israelites, encumbered with their families and herds, would take the easy route by the open country to the west of the Azazimeh mountains in preference to the barren and rugged passes south-west of the Dead Sea.

The desert of the Tíh consists of a succession of limestone plateaux intersected by several wadies, of which the most important are W. El Arísh, which is joined near Nakhl by W. Rowag, W. Garaiyeh, with its tributaries Mayin, Jerur, Muweileh, W. El Ain, which runs into W. El Abyadh, W. Rehaibeh and W. Seba, which drain into the Mediterranean. W. Ghamr and W. Jeráfeh—the names of which have been interchanged by former travellers—fall into the northern slope of the Arabeh, and so run into the Dead Sea, as also do Wadies Murreh, Maderah, and Figreh, which debouch into the Ghor es Sáfi.

The southernmost limit is Jebel el Ráhah and Jebel el Tíh on he S.W., and Jebel el 'Ejmeh on the S. and S.E., which together form a cliff running from Suez to Akabah, and projecting into the peninsula of Sinai much in the same way as that peninsula projects into the Red Sea. The height of this cliff at its most elevated point—on Jebel el 'Ejmeh—is about 4,200 feet above the sea, and from its summit the ground descends north-westwards.

To the N.E. of the Tíh rises a third steppe or promontory, its northern portion corresponding to the "Negeb" or south-country of Scripture, its southern part bearing the name of Jebel Magráh, sometimes also called "the mountains of the Azázimeh," from the tribe of Arabs which inhabits it. To the S.E. of this mountainous region we came upon the only bed of sandstone which occurs throughout the whole country. It belongs to the same formation (New Red sandstone) as that at Petra and the lower strata of the Dead Sea basin.

Having carefully considered the best means of thoroughly examining the Tíh plateau, Mr. Palmer and myself determined to proceed along the base of Jebel el Tíh, and leaving to the west the Nagbs Emreíkheh and er Rákineh—the passes on the ordinary routes for travellers proceeding northwards from Mount Sinai—to cross Jebel el 'Ejmeh wherever it might prove practicable, and thus proceed through a hitherto untraversed district to Nakhl, where we had established a depôt of provisions, and where we should have to make arrangements with a different tribe of Arabs for carrying our baggage northwards.

This plan was carried out, and we entered the Tíh by the Nagb el Mirád on January 12, 1870. From the summit of the cliff—for Jebel el 'Ejmeh has no pretensions to be called a mountain—a magnificent view is obtained of the Sinaitic peninsula. The range itself is composed of mountain limestone, so worn and broken by the action of frost and weather that the hills are covered with fine detritus, which, after rain, would produce some herbage, but when we were there only a few dried-up, stunted bushes were to be seen, which here as elsewhere in the desert supply good and abundant fuel.

From Jebel el 'Ejmeh the steep, bleak, waterworn hills gradually slope down and fall away into the great plains, or rather, low plateaux, which stretch across to the Mediterranean. The sameness of outline and dreariness of this country is something terrible: the few shrubs that exist are grey or brown, and seemingly withered and dead; no animal life enlivens the scene—at times perhaps a stray vulture or raven may be seen sailing far away in the blue sky, a frightened lizard will start from beneath one's feet, or a small flight of locusts be disturbed from their scanty meal on some "retem bush." Water on the road there was absolutely none; a supply for four days had to be carried from El Biyár, a well strongly impregnated with Epsom salts, and lying a few miles to the south of Nagb el Mirád.

Under these conditions we can scarcely expect to meet with many signs of life. Judging from the numerous cairns and other primeval remains, this district must at one time have been populous. Wearily did I tramp day after day, gun in hand, but I was seldom rewarded with any thing more than a stray beetle or lizard, and now and then some small desert bird, and on very rare occasions a hare or snake.

As from former experience we had found that it was impossible to work a country thoroughly when mounted, we only employed enough camels to carry our baggage. The camel-drivers acted as guides, and, to a certain extent, as attendants, for we took no servants whatever. This added to our already heavy work, yet it enabled us to get on much more satisfactorily with the various Arab tribes than we could otherwise have done.

From the Nagb el Mírád our course lay down Wady Rouág, which takes its rise in the highest part of Jebel el 'Ejmeh, about eighteen miles east of the head of Wady el Arísh, with which it holds a nearly parallel course till it joins it at a short distance to the north-east of Nakhl. The district between Wady el Arísh and Wady Rowág is drained by W. Ghabiyeh, which falls into the latter about twenty-five miles from the Nagb el Mirâd; after this junction the country becomes open and comparatively level. Here the ground is almost as hard as a macadamised road, and is covered with a layer of small, black, polished flints, which glisten in the sun as though they were wet. This polish must be attributed to the dust and grit kept in motion by the almost incessant winds, which are frequently very violent. Many of the monuments in Egypt bear witness to the destructive action of the grit. In this desert sand is almost unknown. There are only two or three sandy tracts, and these may be traversed in a few hours at most. The largest sandy district we had to cross was the Rumeilet Hámed, to the north of Khalasah (the ancient Elusa) where the prevailing north-west winds have formed extensive dunes. This sand, however, seems to have been entirely brought from the coast.

On arriving at Nakhl we found a small fort with wells and cisterns. In this dreary spot, encompassed by glaring white hills, a few miserable soldiers are maintained by the Egyptian Government for the protection of the Hajj caravan, the place being halfway between Suez and Akabah. Here we were obliged to dismiss the Towarah Arabs, and taking up our provisions which we had sent on from Suez, we entered into an agreement with the Teyáhah, who, after considerable discussion and futile attempts to extort a large "ghafr" or black mail, engaged to take us anywhere we wished through their country.

Of the various tribes which inhabit the Desert of the Tíh, the most numerous and powerful are the Teyáhah, of whom there are two divisions, the Sagairát and the Benaiyat, and truly they were, as their name implies, "birds of prey." They possess large herds of camels whose numbers are frequently increased by the product of the raids which they make on their hereditary foes the 'Anazeh, whose territory lies around Palmyra and to the east of the Haurân, and is about twenty days' journey from the Tíh. These forays are sometimes carried out on a large scale; on the last occasion the Teyáhah numbered 1,000 guns. At times the plunder amounts to many hundred camels, but at others the owners come down in force and the aggressors are compelled to retire. Bloodshed in these freebooting expeditions and even actual warfare is avoided as much as possible, for it results in a blood feud which is always much dreaded by a Bedawi, since it binds the relatives of anyone who has perished either by murder or manslaughter—the Arabs do not distinguish between them—to avenge his death. The blood feud or vendetta thus exercises a most salutary influence, for without it the value of human life would be totally disregarded in these wild regions which lie beyond the pale of the law.

The Terabín, the tribe next in importance, occupy the country east of the Teyáhah, their territory extending from Jebel Bisher and Bir Abu Suweirah on the Sinai road some forty miles south-east of Suez, as far as Gaza to the north.

The Haiwátt live in the mountains to the west and north-west of Akabah, and are not numerous.

The Azázimeh occupy the mountainous region which I have before mentioned as bearing their name: this tribe is not large, and they are exceedingly poor; their only food consists of the milk and cheese obtained from their camels and goats and such roots as they can dig up. On very rare occasions they may have the luck to shoot some wild animal which, whether it be ibex or hyæna, is equally acceptable to their not over squeamish stomachs. They are obliged to live in very small and scattered communities, from the fact that—with the exception of one or two brackish and unpalateable springs, their only water supply is derived from the rains collected in hollows of rocks in the ravines and wady beds, and even these are few and far between. This water was usually putrid and full of most uninviting animalculæ: however, as no other was to be had, we were obliged to drink it.

From Nakhl we went in a north-easterly direction to Wády Garaiyeh, thence to Jebel 'Araif, which we ascended; though it is little more than 2,000 ft. high; the view is very extensive. We then proceeded to cross Wady Mayín, W. Lussán, and W. Jerúr, and afterwards reached Ain Muweileh (the supposed

site of Hagar's well). Here are very numerous primeval stone remains, the most remarkable being piles of stones placed in rows at the edges of the cliffs which face the East. Cannot they be the remains of the old Baal worship followed by the Amorites, whose name is still preserved in the country to the north of W. Muwéileh, at Dheigat el 'Amerín (the ravine of the Amorites), Ras 'Amir, and Sheikh el 'Amiri? At various places on our route, especially at 'Uggábeh—between Nakhl and W. Garayíeh—on S. el 'Ejmell, S. 'Araif in Wady Lussán, we found very large numbers of cairns, stone circles with graves, and open spaces, which, to judge from the burnt earth within them, seem to have been designed for sacrificial purposes; also enclosures, girt by rude stone walls; and, in W. el Biyàr, circular dwellings, some of which are still standing, quite perfect. In W. Rowág nearly every hill is topped by a cairn; there are three on the summit of Jebel Araif, and we noticed that they frequently occurred as far north as Bir Seba and El Milh (Molada).

At Muwéileh and near a neighbouring spring, Ain Guseimeh, are several caves. At the former place there is one cut in the face of the cliff, and entered by a staircase, ascending from a smaller cave below; this has been at one time the dwelling of a Christian hermit, as we noticed crosses rudely painted in red and traces of frescoes. At this place, too, we found, with the exception of one place in W. Lussán, the first signs of regular cultivation in former times. Stones are laid in lines across the wady-beds to check and, at the same time, distribute the drainage, and to prevent the soil being washed down by a sudden *seil* or flood.

Our next point was *El Birein*, so called from the *two wells* in the wady; here are traces of considerable ruins, a *fiskiyeh*, or reservoir, and aqueduct, the latter ruined, and the former nearly so. In the wady are some old *butmeh* or terebinth trees, remarkable as being the first trees, with the exception of two "seyáls" or acacias, that we had seen since leaving Sinai. About six miles N.W. of El Birein lie the ruins of El 'Aujeh, confounded by Dr. Robinson with 'Abdeh, which I shall presently mention, situated on a low spur running into W. Hanein. This valley, however, on account of a superstition attaching to its real name, has always been called by the Arabs, when speaking to travellers, W. Hafir. Some five or six square miles of the wady are covered with ruined walls of gardens and fields; the sides of the watercourse are built up with large stones, and dams still exist across it, though all the valley is now barren and neglected. Ten miles to the east of El 'Aujeh we discovered the ruins of a fortress called "El Meshrifeh," perched on a projecting spur, and defended on two sides by steep cliffs, which overlook a broad plain formed by the sweep of Wady el Abyadh as it debouches from Jebel Magrah; the south face of the cliff is fortified by escarpments and towers of massive masonry, and on the summit are ruins of several houses, and of a small church; on the third side a thick wall runs across the level crest of the spur. Beneath the towers and in connection with them are numerous rock-hewn chambers; also traces of a more ancient and, indeed, primeval wall, and pieces of masonry of a date far anterior to the rest of the buildings.

On the plain above mentioned and three miles and a half to the S.E. of El Meshrifeh we found the ruins of a considerable town called S'baita. This name seems to have been heard of by former travellers, who confounded the site with Rehaibeh; but I believe we were the first Europeans to visit the ruins. Here, as in many other cases, we experienced considerable difficulty, owing to the apprehensions of our Bedawin, who did their best to dissuade us from going there. I succeeded, however, in taking sketches and photographs of the chief points of interest. The town contains three churches, which, like those at El Aujeh el Meshrifeh and S'adi, must, I think, be referred to the 5th century. There are also two reservoirs, and a tower with a rudely ornamented gateway. With the exception of a fragment or two at El Aujeh, this was the only instance of sculpture we saw, and not a single inscription was anywhere to be found.

The structure of the buildings at S'baita is worth noticing: the upper stories of the houses are supported on wide, low-spanned arches two feet wide with intervals of three feet between them, and upon these is placed the flooring of the upper rooms, which consists of narrow slabs of stone. Numerous ruined towers and walled gardens and enclosures, extending to a distance of several miles from the town, attest its former importance. The vineyards, too, marked by the "Teleilát el 'Aneb," which I mentioned before, extend over large tracts in this neighbourhood.

From S'baita we went to Rehaibeh, examining *en route* the ruins of S'adi,* which do not seem to have been visited or even heard of by former travellers. At Rehaibeh the ruins are of much greater extent than at S'adi, but so confused that it is impossible to trace the plan of any single building. There are numerous wells, cisterns, and other remains of cultivation in the neighbourhood. From Rehaibeh we went to Khalasah and Bir Seba: the ruins at the former place have nearly disappeared, as the inhabitants of Gaza find it cheaper to send camels for the already squared stones than to quarry them near their town. Owing to the drought we found Bir Seba barren and deserted, though our Arabs assured us that in good seasons the grass is knee-deep, and furnishes ample pasturage for countless flocks and herds. Our unlooked-for appearance in out-of-the-way districts was usually considered by the natives to be in some manner connected with the exceptional drought, and on several occasions we were either implored to bring rain or cursed for the want of it, since the Arabs firmly believe that every *Nasráni* holds the weather under his control.

From Bir Seba we went to Jerusalem, and, after a short stay there, returned to Hebron, where we engaged three of the Jehalin Arabs, with their camels, to convey our baggage to Petra. Taking a new route, we passed Tell Arad and El Milh, and struck into the unexplored mountains of the 'Azázimeh, where we discovered the ruins of the El 'Abdeh (Eboda), which are of considerable extent, and similarly placed to those of El Meshrifeh, most of the dwellings here, as there, being half excavated and half built. Of the buildings now standing, the greater part are of Christian times. The natives are perfect savages, and detained us for two hours from visiting the ruins by collecting in a gang to the number of thirteen on the top of a pass, singing their war-song, throwing down stones, and occasionally firing off one of their old match-locks in bravado, and swearing by God and the Prophet that no one should come up. As the pass was very narrow, almost precipitous, we judged it best to propitiate them, a task accomplished, after much discussion, at the cost of eight shillings. They then escorted us to the ruins, where we took such measurements and photographs as we required. From 'Abdeh we went through the 'Azázimeh mountain, a region so awfully desolate as to defy description, struck the 'Arabah at the junction of W. Jerafeh with W. Ghamz, and crossed thence to Petra. Here the Liyathineh fully maintained their character for brutality and insolence. Infidels in all but the name of Moslims, they are descended from the tribe of Khaiberi Jews, who bear such a bad character in Arabia. To add to our discomfort, we were snowed up for two days in a tent only just large enough for us both to lie down in. During a stay of six days, however, Petra was thoroughly examined by us and accurately mapped. We then bent our steps northwards, and at El Barid, about seven miles from Petra, discovered a colony of dwellings and temples cut in the rock, and some rudely chipped Nabathæan inscriptions. The walls and ceilings of the rock-chambers were decorated with frescoes, some coarse others well executed. We next travelled down the 'Arabah to the Dead Sea, and having examined the Lisan, went up into Moab. Here we stopped about three weeks and wandered over the country in search of inscriptions, as Mr. Palmer had specially come to ascertain if another Moabite stone was in existence. At last, however, we both came to the conclusion that *above ground* there are none. From Moab we crossed the Jordan, near Jericho, and returned to Jerusalem.

(*To be continued.*)

SCIENTIFIC SERIALS

THE fifth part of the nineteenth volume of the *Palæontographica* recently published, is devoted to the description by Prof. Schenk, of fossil plants from the north German Wealden formation. The plants here described and figured upon 8 plates are all cryptogamous, and with the exception of a single *Chara*, and four *Equiseta* belong to the group of ferns, of which 21 species are noticed; but it must be remarked that Prof. Schenk has considerably lessened the apparent number of species by reducing a great many of the names given by former authors to the rank of synonyms. At the same time he describes and figures seven forms as new species, one as the type of a new genus, *Marsilidium*, belonging to the Rhizocarpeæ, and he also establishes the new genus *Matonidium* for *Laccopteris Göpperti*, Schimper. The other new species belong to the genera *Sphenopteris*, *Alethopteris*, *Laccopteris*, *Olean-*

* S'adi is two-and-a-half miles E.S.E. of Rehaibeh.

dridium, *Dictyophyllum* and *Protopteris*, the last being doubtfully represented by a portion of a tree-like stem.

THE second part of Tome xx. of the *Mémoires de la Société de Physique et d'Histoire Naturelle de Genève* (1870) contains an exceedingly important zoological paper, namely, a supplement to Prof. Claparède's descriptive account of the Chætopod Annelides of the Gulf of Naples. This not only includes descriptions of many new forms discovered by M. Claparède during the winter of 1868-69, but furnishes him with an opportunity of effecting a combination between his own observations and those of Prof. Ehlers, whose valuable work on the Chætophorous Annelides appeared almost simultaneously with Prof. Claparède's former publication. The memoir is illustrated with fourteen beautiful plates. This part also contains descriptions by Dr. J. E. Duby of some minor little-known exotic mosses, accompanied by four plates.

THE first and second numbers of the *Bollettino del R. Comitato Geologico d' Italia*, published together for the months of January and February of the present year, contain some interesting papers, among which, perhaps, the most important is that on the temperature of the rocks in the Mont Cenis tunnel, communicated by the engineer, M. F. Giordano. The highest temperature observed was 29·50° C. (=85·10° F.) at a distance of 6,450 metres (about 21,000 feet) from the southern opening, at the same time that the temperature of the rock at 400 metres (about 1,300 feet) from the opening was only 11° C. (= 38·2° F.). M. Giordano also publishes notes on the geological constitution of the Roman Campagna, illustrated with three long sections. These numbers also contain a translation into Italian of G. von Rath's memoir on the environs of the lake of Bolsena, an extract from a paper by Prof. T. Taramelli on the Eocene formation of Feiuli, and some short bibliographical notices.

THE editor of the *Geological Magazine*, in his April number (No. 82), has resumed his series of notices of eminent living geologists with a sketch of the scientific life of Mr. Thomas Davidson, illustrated with a good portrait. That Mr. Davidson's labours on the Brachiopoda fully entitle him to such an honour no one will be inclined to deny, but one is somewhat startled at learning what is the real result of his activity, chiefly in this field of research, and being told that his published writings occupy about 2,220 pages, and are illustrated with 244 plates, all or nearly of them drawn by his own hand! Mr. H. B. Woodward describes a curious example of the inversion of strata belonging to the carboniferous series at Vobster, in Somersetshire, to the north of the Mendip Hills, where coal is worked beneath mountain limestone. This phenomenon has been ascribed to a folding over of the main ridge of the Mendips, but the author adduces what seem to be good reasons in opposition to this view, and endeavours to account for it by local disturbance associated with faults. He illustrates his views by means of a diagram section.—Mr. G. H. Kinahan communicates a paper on Æolian drift or blowing sands in Ireland, in which he explains these peculiar deposits as being the products of the action of glaciers during the glacial period.—M. De Rance describes the pre-glacial geography of nor hern Cheshire. The number also contains a reprint of Mr. David Forbes' lecture on the nature of the earth's interior, and the usual reviews and short communications.

THE *Transactions of the Linnean Society*, vol. xxvii. part 3, has just been issued, containing three papers, each illustrated with 4to. plates:—Observations on the Lichens collected by Dr. Robert Brown in West Greenland in 1867, by Dr. W. Lauder Lindsay; On the Vertebrate Skeleton, by Mr. St. George Mivart; and Descriptions of some British Spiders new to science, by the Rev. O. P. Cambridge. Mr. Mivart's article is devoted to a discussion of the following questions:—1. What is the best way to seek *a priori* a general view of the axial skeleton? 2. What is the essential nature of ribs, transverse processes, and sternum? 3. What is the essential nature of branchial arches, and in what relation do they stand to the ribs? 4. What is the essential nature, as compared with branchial arches, of the hyoidean arch, mandible, and more anterior structures? 5. What relations exist between the "chevron" bones and other parts of the vertebrate skeleton? The appendicular skeleton, as distinct from the axial skeleton, consisting of the anterior and posterior limbs, is also discussed.

THE *Proceedings of the Natural History Society of Dublin* for the sessions 1867-68, 1868-69, vol. v. parts iii. and iv., was published on May 3, 1871. Among the more important papers we notice:—Prof. W. King "On some Palliobranchiate Shells from the Irish Atlantic;" Prof. Macalister "On the Myology of the Otter," "On the pyloric appendages of the common Trout," "On the Flora of Kinross-shire," and "On the arrangement of Pronator Muscles in the limbs of Vertebrate Animals.—Dr. D. Moore "On the Botanical Congress of Paris of 1867," and "On Addenda to British and Irish Muscology." Dr A. W Foot "On some points observed in the dissection of an Aylesbury Duck." Rev. E. O'Meara "On some new Arran Diatomaceæ" (Plate 13). W. Archer "On a peculiar cyst-like structure enclosing examples of *Staurastrum cuspidatum*," &c., and "On some Freshwater Rhizopoda" (Plates 8, 9, 10). Prof. E. P. Wright "On *Tubipora musica*" (Plate 11). Notes of a tour in the spring and summer of 1868 to Sicily and Portugal (Plate 12). These Parts conclude vol. v., and have title page, index, and appendices.

SOCIETIES AND ACADEMIES

LONDON

Royal Institution of Great Britain, May 8.—Sir Henry Holland, Bart., M.D., president, in the chair.—The following Vice-presidents were nominated for the ensuing year:—Duke of Northumberland, Lord Lindsay, W. Spottiswoode, the Treasurer, Sir Frederick Pollock. William S. Burton, Arthur Samuel Hobson, Richard Liebreich, Abraham De Mattos Mocatta, and Edward Stanhope Pearson, were elected members. John Tyndall, F.R.S., was re-elected Professor of Natural Philosophy.

Zoological Society, April 29 (Anniversary Meeting).—Viscount Walden, president, in the chair. After some preliminary business, the report of the Council was read by Mr. P. L. Sclater, F.R.S., the secretary. It stated that the number of Fellows of the Society on the 1st of January last was 3,021, showing a net addition of fifty-five ordinary members to the roll during the year 1870. Twelve new corresponding members had likewise been elected during the year 1870. The total income of the society during the year 1870 was stated to have been 23,257*l.*, being 488*l.* more than that of the preceding year. The total ordinary expenditure had been 21,364*l.*, in which sum had been included every item necessary to keep the society's establishment in its present state of efficiency. Besides this the sum of 3,043*l.* had been devoted to extraordinary expenditure, in the shape of new buildings and works in the gardens. Of these works the most important was the new elephant-house, on completing which the sum of 2,324*l.* had been expended. This, when added to the sums spent upon the same building in former years, had raised the total cost of that building to 6,356*l.*, in which, however, the yards, ponds, fences, terrace walk in front, and the necessary arrangement of the adjoining grounds were included. Other works carried on in the society's gardens during the past year had been the completion of the new first-class refreshment-room, and the extension of the system of heating the buildings by hot-water apparatus. The total number of visitors to the society's gardens during the year 1870 had been 573,004, showing an increase of 156 over the corresponding number in 1869. The greatest daily number of admissions in 1870 (28,457) was on Whit Monday, the 5th of June; the least number (28) on the 3rd of March; the average daily number of admissions throughout the year had been 1,570. The number of animals contained in the society's menagerie on the 31st of December, 1870, was stated to have been 2,118, showing an increase of 105 when compared with the corresponding number at the same date in the previous year. Among the additions made to the collection during the year 1870 had been a considerable number of special interest, either on account of their scientific novelty or from not having been previously brought to England in a living state. Full particulars concerning these were given, as also a list of the species that had bred in the society's gardens during the year. The report then proceeded to give a long list of donors and their several donations to the menagerie, after which, in conclusion, the council contrasted the present state of the society's affairs with that which had existed ten years ago. In 1860, they observed, the total number of Fellows was 1,716; it was now 3,021; in 1860 the number of visitors to the society's gardens had been 394.906; in 1870 it had been 573,004. The total income of the society in 1860 was 16,864*l.*; in 1870 it had amounted to 23,257*l.* In 1860 the reserve fund was 3,000*l.* Reduced Three per Cents.; it had now been augmented to 7,000*l.* of the same stock. Moreover, during the past ten years, sums amounting altogether to upwards

of 46,000*l.* had been devoted to the permanent improvement of the society's garden establishment, the expenditure of which had enabled the council to renew nearly the whole of the more important buildings on an improved and enlarged scale. These facts, it was believed, could not be otherwise than gratifying to the Fellows of the society. The society then proceeded to ballot for the council and officers for the ensuing year, when Lord Calthorpe, Mr. Francis Galton, F.R.S., Captain the Count Gleichen, R.N., Mr. John Gould, F.R.S., and Dr. Hamilton were elected into the council, in the place of Professor Huxley, F.R.S., Mr. J. Travers Smith, Lord Walsingham, Mr. G. R. Waterhouse, and the Bishop of Winchester, who retired therefrom, and Viscount Walden was re-elected president; Mr. Robert Drummond, treasurer; and Mr. P. L. Sclater, F.R.S., secretary.

Zoological Society, May 2.—Viscount Walden, President, in the chair. A letter was read from W. H. Hudson, addressed to the secretary, containing observations on the habits of the various swallows met with in and around Buenos Ayres.—Mr. P. L. Sclater exhibited and made remarks on the shell of a river-tortoise of the genus *Pelomedusa*, obtained by Mr. Chapman on the Upper Zambesi.—Prof. Flower exhibited and made remarks on the mounted skeleton of the young hippoptoamus, recently born in the Society's Gardens.—The Viscount Walden read a paper on the Birds of the island of Celebes, in which the materials hitherto available for the elaboration of its avi-fauna were brought together and discussed. Out of the generic forms met with in Celebes, thirty-eight appeared to be Indian, and twenty-three Australian in character. To these were added a strong element of individuality, shown by the presence of sixty-five species, and nine genera unknown elsewhere. The avi-fauna of Celebes, so far as was certainly known, was composed of 193 species; but the author observed that a considerable portion of the centre of the island remained unexplored, which gave a prospect of future discoveries.—A communication was read from Mr. W. Harper Pease, of Honolulu, Sandwich Islands, containing a catalogue of all the known land-shells inhabiting Polynesia, together with remarks on their synonomy, distribution, and variation, and descriptions of some new genera and species.—A communication was read from Dr. John Anderson, Curator of the Indian Museum, Calcutta, containing the description of a new generic form of newt from Western Yunan, proposed to be called *Tulototriton verrucosus*.—A second communication from Dr. J. Anderson contained some drawings of and notes on the original specimens of *Testudo phayrei*, Blyth, in the Indian Museum. Having examined the skull in the British Museum upon which *Scaphia falconeri*, Gray, had been based, and re-examined the smaller example of *Testudo phayrei* at Calcutta, Dr. Anderson had come to the conclusion that Mr. Theobald's account of its history was strictly accurate.—A communication was read from Dr. J. E. Gray, F.R.S., entitled Notes on the species of *Bradypidæ* in the British Museum.

Geological Society, April 26.—Prof. Morris, vice-president, in the chair.—Mr. Robert Russell, of the Geological Survey of England and Wales, was elected a Fellow of the Society. The following communications were read:—1. "On a new species of Coral from the Red Crag of Waldringfield," by Prof. P. Martin Duncan, F.R.S. Prof. Duncan described, under the name of *Solenastræa Prestwichi*, a small compound coral obtained by Mr. A. Bell from Waldringfield, and stated that it was particularly interesting as belonging to a reef-forming type of corals which has persisted at least from the Eocene period to the present day. The single specimen consisted of several small crowded corallites, having calices from $\frac{1}{10}$ to $\frac{3}{20}$ inch in diameter, united by a cellular epithecal cœnenchyma. It was much rolled and worn before its deposition in the Red Crag, and hence the author regarded it as a derivative fossil in that formation, and he stated that it probably belonged to the rich reef-building coral-fauna which succeeded that of the Nummulitic period. Mr. Etheridge remarked that the origin of this interesting fossil seemed uncertain. It appeared, however, to be derived from some other source, and not to have originally belonged to the Red Crag. In England the genus was hitherto unknown in beds newer than those of Brockenhurst. The presence of this single specimen showed how much we had still to learn with regard to the crag formation. It was to be hoped that the coral might eventually be found attached to some organism from which its age might be determined. Prof. T. Rupert Jones remarked that he would be glad to hear of more corals being discovered in the so-called Coralline Crag. He inquired whether cœnenchymatous corals were necessarily reef-corals, observing that this coral was referred to the Miocene on account of its presumed reef-forming character. He added that some of the Foraminifera of the White Crag had the aspect of existing Western Mediterranean forms, and thus supported some of Prof. Duncan's remarks. Mr. Gwyn Jeffreys observed that the distinction between the Coralline and Red Crag seemed to be every day diminishing. The appearance of the fossil seemed to betoken its derivative character. Like other speakers, he complimented Mr. Alfred Bell on his great intelligence in the collection of crag fossils. Prof. Duncan, in reply, maintained that the differences between deep-sea and reef-building corals were well established, and around modern reefs in the deeper sea the forms were quite distinct, and the deep-sea corals never presented the cœnenchyma distinctive of the reef-building form. This, he suggested, might be connected with the difference in the amount of sea-water with which it was brought in contact, which in the surf was much greater than in the almost motionless depths of the sea.—2. "Notes on the Minerals of Strontian, Argyleshire," by Robert H. Scott, M.A., F.R.S. The paper stated that the existing lists of minerals to be found at Strontian were incorrect. The discovery of apophyllite, talc, and zircon seemed to be hardly sufficiently confirmed. On the other hand, Mr. Scott named several species which he had himself observed *in situ*, and which are not noticed in any of the books, viz., two felspars, orthoclase, and an anorthic felspar in the granite; two varieties of pyroxenic minerals in the granite and syenites, neither of which have as yet been analysed; natrolite in the trap-dykes, muscovite or margarodite in very large plates, lepidomelane and schorl. Specimens of these minerals and of the others found at the mines were exhibited; but it was stated that, owing to the fact that the old workings at the mines in Glen Strontian had been allowed to fall in, it was now no longer possible to ascertain much about the association of the species. The one is galena, containing very little silver. The gangue is remarkable for the absence of fluor and the comparative rarity of blende and heavy spar. Harmotome is found principally at a mine called Bell's Grove, both in the opaque variety and in the clear one called morvenite. Brewsterite occurs at the mine called Middle Shap, and at the mine Whitesmith strontianite is found with brewsterite, but without harmotome. Calcite is alse very common. Within the last few years a new mine has been opened called Corrantee, which is in the gneiss, whereas the other mines lie on the junction of the granite and gneiss. At this mine several fine specimens of calcite have occurred, many of them coated with twin crystals of harmotome, similar to those from Andreasberg, whereas the crystals found at the old mine are not so clearly macled. Associated with these were found a number of small hexagonal prisms, perfectly clear, and exhibiting a very obtuse dihedral termination. They gave the blowpipe reaction of harmotome; and on analysis by Dr. J. E. Reynolds, proved to be that mineral. Descloiseaux has already described a quadrifacial termination to harmotome, with an angle of 178° 20′. Mr. Scott submitted that possibly the crystals which he exhibited might bear faces which had a close relation to those described by Descloiseaux. He concluded by stating that Strontian promised as rich a harvest to the mineralogist as any locality is these islands. Mr. W. W. Smyth mentioned the wonderful collection of minerals from Strontian which had been brought to the Great Exhibition of 1861, which gave a most striking idea of the mineral riches of the locality. The occurrence of such a series of different substances in one locality in the granite was almost unparalleled, though in the Andreasberg mines, in clay slate, they were to some extent rivalled. The features, however, differed in the two places, more silver and a greater number of zeolites being present in the Hartz mines. Mr. D. Forbes observed that harmotome occurred also at the Kongsberg silver-mines in Norway, at a distance from granite. He thought it remarkable that these crystals of peculiar form occurred in the same spot and in connection with crystals of the same substance, but of the ordinary form. Mr. Davis remarked that celestine was also to be placed on the list of the minerals from Strontian. Harmotome had been found in the same form of double crystals at Bodenwies in Bavaria. Mr. Scott stated, in reply to a question from the chairman, that the mineral had not been as yet optically examined, but that if he could procure more of it he should be happy to place it at the disposal of any gentleman who would examine it As regarded the idea that harmotome usually occurred near the surface, he could give no information about the old mines, as they had been allowed to fall in; but most certainly the new specimens from Corrantee came from surface-workings. He was very glad to learn from Mr. Davis that celestine had

been found at the locality; and he felt sure that careful search would double or treble the number of species known to occur there. With reference to what had fallen from Prof. Smyth, he could fully corroborate his observations as to the difference between the forms of calcite associated with harmotome at Andreasberg, in the Hartz, and at Strontian. It was remarkable that the general facies of the crystals of calcite occurring at Corrantee, where the lode was entirely in the gneiss, differed from that usually observed in the old mines in Glen Strontian, which were partly in the granite and partly in the gneiss. 3. "On the probable origin of Deposits of 'Loess' in North China and Eastern Asia." By Mr. T. W. Kingsmill, of Shanghai. Communicated by Prof. Huxley, F.R.S., V.P.G.S. The author stated that the Baron von Richthofen had lately applied the term "Loess" to a light clay deposit covering immense tracts in the north of China. The author regarded this formation as in great measure corresponding to the Kunkur of India, and thought that it probably extended far into the elevated plains of Central Asia. Richthofen considered that this deposit had been produced by subaërial action upon a surface of dry land; the author argued that it is of marine origin, having been deposited when the region which it covers was depressed at least 6,000 feet, a depression the occurrence of which since the commencement of the Tertiary period he considered to be proved by the mode of deposition of the Upper Nanking sandstones and conglomerates, the bold escarpments of the hills on either side of the Yangtsze, and other peculiarities of the country. Prof. Ramsay remarked that the author had not proved that the loess he described was really stratified. He could not agree with his views of the inland escarpments he mentioned having been old coast lines. It was only accidentally that sea cliffs had any connection with the line of strike of the strata, whereas inland cliffs always followed the strike. He thought the phenomena were rather in accordance with a long exposure of the land to subaërial influences than with the loess, having been of marine origin. Even in England, in those parts which had long been free from marine action, beds of brick earth had been formed. He also instanced the plains of Picardy as exhibiting a vast extent of such subaërial beds. Prof. T. Rupert Jones said that though the area treated of by Mr. Kingsmill was too large to have its geology explained merely by reference to rain-wash and valley deposits, whatever his low-level loess might be, the higher accumulations of loamy deposits, stated to be 1,000 feet thick at an elevation of 3,000 feet, and regarded by Mr. Kingsmill as the quiet water sediments of a great gulf with the miocene conglomerates and sandstones of Nanking and elsewhere for its marginal equivalents, appeared to require different explanation. All loess need not be of sea origin; in oscillations of land marine deposits must be carried up to great heights: and, referring to Mr. H. M. Jenkins's determination of the marine origin of the loess of Belgium, Prof. Jones thought it highly probable that some at least of that in China may have been similarly formed. Mr. Hughes said that the author appeared to have grouped together all the superficial deposits of a vast area without explaining very clearly the grounds upon which he identified those deposits at distant points. He did not prove that what he called the shore deposit was marine, or that it was of the same age as the loam which he described, and which Mr. Hughes thought, from the description, was far more likely to be subaërial. Mr. Evans and Mr. Etheridge suggested the probability of much of the so-called loess might be derived from higher loamy beds, possibly derived from the decomposition of limestone rocks containing sand and clay, and redeposited by the action of rain. The following specimens were exhibited:—Minerals from Strontian; exhibited by Mr. Scott, in illustration of his paper. Corals; exhibited by Prof. Duncan, in illustration of his paper.

Royal Geographical Society, April 25.—Major-General Sir Henry C. Rawlinson, K.C.B., vice-president, in the chair. The following new Fellows were elected:—Mr. G. E. Bell; Staff-Commander Charles Burney, R.N.; Messrs. Walter J. Ellis; J. C. W. P. Graham; Simon Little; Henry Syme. A letter was read from Mr. R. B. Shaw to Sir Roderick Murchison, on that portion of his recent journey to Yarkand (with Mr. Forsyth) in which, detached from the rest of the party, he explored the rugged country between the western extremity of the Thibetan Plateau and the Valley of the Upper Shayok. He described the plateau (17,000 feet high) as ending abruptly on the west in a great limestone range, which, like the masonry *revêtement* of an embankment, has protected the level table-land from the wearing influence of the rains from clouds sweeping up the Shayok Valley. Standing on the edge of the plateau, the whole country westward appeared as an irregular mass of snowy peaks and narrow precipitous valleys. In attempting to descend one of the valleys towards the Karakoram road, the party suffered fearfully in struggling for three days through the broken ice of a torrent at the bottom of a stupendous chasm, from which, in some places, the light of day was nearly excluded.—A second communication was read "On the Journey of the Mirza across the Pamir Steppe to Yarkand and Kashgar," by Major Montgomerie. This was a detailed report of the journey of an Afghan gentleman, instructed by the officers of the Trigonometrical Survey to traverse the Mahomedan countries across the Hindoo Koosh and Pamir Steppe, eastward to the plains of Eastern Turkestan. The journey was successful in its main object; and we have now, for the first time, a scientific account of those little-known regions, with the means of fixing the geographical position of all the important places. The Mirza proceeded from Fyzabad eastward, along one of the head-waters of the Oxus, arising in Lake Pamir-Kul (13,300 feet), and thence to Tash Kurgan, Yanghissar and Kashgar. Crossing the elevated region of the Pamir, he suffered fearfully from the cold, although well clad, even to the lining of his boots, in warm woollen clothing. Sir Henry Rawlinson explained to the meeting that the Mirza's route was the same as that followed by Marco Polo and Benedict Goez, and in later times by Mahomed Amin. He also stated that the vexed problem of the longitude of Yarkand (placed by the Schlagintweits about 200 miles too far to the west) had been solved by the recent lunar observations of Mr. Shaw, the computation of which had been completed that day, at the Geographical Society, by Mr. W. Ellis of the Greenwich Observatory. These observations placed Yarkand in E. long. 77° 14′ 45″. Colonel Walker, of the Great Trigonometrical Survey of India, and Sir A. Scott Waugh also addressed the meeting, chiefly on the subject of the employment of native observers in the geographical exploration of the regions beyond the British boundaries.

Chemical Society, May 4.—Dr. Warren De La Rue, F.R.S., vice-president, in the chair. The following gentlemen were elected Fellows:—Messrs. R. S. Best, C. S. Cross, W. H. Darling, G. H. Ogston, I. Schweitzer, and W. A. Smith. Dr. Völcker delivered a lecture "On the Productive Powers of Soils in Relation to the Loss of Plant Food by Drainage." The lecturer began by showing the futility of the belief that a soil-analysis could reveal whether a land was productive or not. To those who only imperfectly know the teachings of modern agricultural science, it appears very simple to remedy a deficient soil by finding out through analysis the wanting constituents, and then to supply them. But this is not so. Not only is it difficult exactly to analyse a soil, but many other conditions besides the composition of a land have to be observed. The state of combination in which the mineral constituents of a land are found, the physical condition of the soil, the presence or absence of some matter injurious to the growth of plants, all these are so many important points upon which soil-analysis throws no light whatever. The lecturer equally opposes the views of those who advocate that in a system of rational farming there should be kept up a debtor and creditor account as regards the constituents which are removed from the soil in the crops grown upon it, and the quantity of fertilising matter restored to it in the shape of manure. The fertility of the soil cannot be maintained, much less increased, if only as much fertilising constituents would be applied to the land as one removes from it in the crops. Dr. Völcker then discussed the relative values of various mineral salts as manures, quoting in support of his views the results of the classical field experiments of Lawes and Gilbert; and this then led the lecturer to speak of the examination of land-drainage waters. Lawes and Gilbert, throughout a long series of experiments on the growth of wheat, have experienced a great loss of nitrogen; the amount of nitrogen supplied in the manures was greater than that recovered in the increased produce. It appeared to Dr. Völcker that the nitrogen lost might have passed into the drains. Careful collection of such drainage waters, and their analysis, proved Dr. Völcker's supposition to be correct. It became clear that, in whatever form the nitrogen is applied to the soil, a large proportion of it is carried off chiefly in the form of nitrates. At all times of the year, but especially during the active period of growth of the crops, nitrates are found in the watery liquid which circulates in the land, whereas ammonia salts are never met with in any appreciably large quantities. It may therefore be assumed tha

it is chiefly, if not solely, from the nitrates that the crops build up their nitrogenous organic constituents. Dr. Völcker's analyses of drainage waters further showed that potash and phosphoric acid, which certainly are the most important mineral constituents for the plant, are almost entirely retained in the soil, whilst the less important, as lime or magnesia, or sulphuric acid, pass with greater readiness out of the land.

Entomological Society, May 1.—Prof. Westwood, M.A., F.L.S., in the chair. Mr. Higgins exhibited fine collections of exotic Lepidoptera, Coleoptera, &c., from Natal and Borneo, and a number of photographic coloured figures of larvæ from Natal. —Mr. Meek exhibited *Nyssia lapponaria*, Duponchel, captured in Perthshire by Mr. Warrington, and new to Britain.—Mr. Champion exhibited *Scydmænus rufus*, captured by him in Richmond Park, a beetle new to Britain.—The Rev. R. P. Murray exhibited a collection of Swiss insects, including a singular variety of *Lycæna Eurydice*.—Mr. Bicknell exhibited an extraordinary specimen of *Conepteryx rhamni*, captured by Mr. Cowan at Beckenham in March 1870; this individual had the central margin of both fore wings, and of the right hind wing, broadly suffused with deep crimson; it was considered that the colour was accidental, and probably owing to the wings having come in contact with some chemical substance. Mr. Bicknell exhibited varieties of other British Lepidoptera.—Mr. Stainton exhibited drawings of Micro-Lepidoptera from New Grenada collected by Baron von Noloken.—Mr. M'Lachlan exhibited the tusk of a female Indian elephant lent to him by Dr. Sclater. The root of this tusk was much eroded and blackened, and on the diseased part were long rows of eggs, apparently those of some insect. The elephant had been shot in Malabar by Mr. G. S. Roden, of the 1st Royal, and both its tusks were in the same condition. Furthermore, it appeared from the notes of a writer in the *Field* that this circumstance was not uncommon, but always occurred in the female elephant. None of the members could give any information respecting the parasite, but it was generally considered that the parasite had not caused the decay, but rather that it had taken advantage of a previously morbid condition.—Mr. Lewis exhibited an earthern jar, like an ordinary tobacco jar, of Chinese manufacture. It had an enormously thick porous bottom, and it was stated that the inhabitants of Pekin use these jars for the purpose of confining large beetles, which they keep for fighting. The beetles are allowed no food but water, and become extremely ferocious. Prof. Westwood reminded the meeting that the Chinese were already known to keep mantides for fighting purposes.—M. Müller read notes on a gall on the common brake (*Pteris aquilina*) found by Mr. Rothway, and he remarked that Schenck had noticed the same gall in Germany, and referred it to *Diastrophus rubi*.—Prof. Westwood read descriptions of new species of *Lucanidæ*.—Mr. Bates read a description of a remarkable longicorn beetle from Matabili land, in the interior of South Africa, sent to him by Mr. T. Baines. This insect he proposed to call *Bolbotritus Bainesii*. It was especially remarkable for the enormously swollen third joint of the antennæ, the other joints being much shortened. Mr. Bates also read a description of a new species of *Mallaspis* from Chiriqui, which he named *M. præcellens*.—Mr. Kirby communicated synonymic notes on European *Lepidoptera*.—Attention was called to paragraphs going the round of the London daily papers respecting a so-called storm of insects said to have occurred on two occasions recently at Bath. These records were characrised by the usual newspaper inaccuracy and vagueness on scientific matters. Prof. Westwood thought they probably referred to *Branchypus stagnalis*, a large fresh-water entromostracon.

Linnean Society, May 4.—Mr. G. Bentham, president, in the chair. Dr. Oswald Heer, of Zurich, was elected a foreign member in the place of the late Prof. Unger. The following papers were read:—"The phenomena of Protective Mimicry, and its bearing on the theory of Natural Selection, as illustrated by the Lepidoptera of the British Islands," by Raphael Meldola, F.C.S. "On the Ascalaphidæ," by R. McLachlan.

Society of Biblical Archæology, May 2.—Dr. S. Birch, F.S.A., president, in the chair. The following new members were balloted for, and duly elected:—Louis Blacker, Rev. D. S. Heath, M.A., F.R.S.L., and Mrs. L. Blacker. The President read a paper "On a Hieroglyphic Tablet of Alexander II. (Ægus) son of Alexander the Great, recently discovered at Cairo." This tablet was dedicated to the goddess Buto, and is dated in the seventh year of Alexander (311 B.C.). It records the restoration to the priests of Buto of the district formerly given to them by Khabash, an Egyptian monarch, contemporaneous with the later years of Darius and Xerxes, which last monarch is mentioned in disparaging terms, probably to flatter Ptolemy, the Macedonian ruler of Egypt, who is styled on it, "The Satrap of Alexander." Dr. Birch also contributed a second paper, based upon communications received from Lieut. Prideaux, containing the interpretation by himself and the Baron de Moltzan, of three bronze tablets, with inscriptions in the Himyaritic character, recording adorations by Hanbaz, an Himyaritic monarch, to the deities Ath-tor and Wud on the conquest of the town of Kuderamelek.—A third paper was further read by Prof. Goldschmidt (of Copenhagen) on the derivation of the name Αἴγυπτος, from Ukh-hap-t, *i.e.*, "the land of the good stream-sending spirit." Some discussion followed the reading of these papers, Messrs. W. R. A. Boyle, S. M. Drach, Rev. T. Gorman, Rev. I. Mills, Sir Charles Nicholson, &c., took part.

CAMBRIDGE

Philosophical Society, May 1.—Mr. G. Hale, M.A., and Mr. C. Smith, B.A., Sidney College, and Mr. A. G. Greenhill, B.A., St. John's College, were elected Fellows. The following paper was read:—"On the Measurement of an arc of the Meridian in Lapland," by Mr. I. Todhunter, F.R.S. The object of this memoir was to draw attention to the numerous errors which have been made, even by distinguished astronomers, in their accounts of the two measurements of an arc of the meridian in Lapland. A comparison of the original authorities on the subject at once detects these errors, and supplies the necessary corrections.

EDINBURGH

Royal Physical Society, April 26.—Mr. C. W. Peach president, in the chair. After the appointment of committees for carrying on special investigations during the summer, Dr. M'Bain communicated a paper by Dr. John Kennedy Elis, "Remarks on a Japanese Skull."—Dr. Robert Brown read "Notes on the Breeding Places and Food of some Scottish Sea Birds," by Captain M'Donald, Fishery Cruiser *Vigilant*.—Mr. Peach exhibited a fine mass of gulf weed covered with small cirripedes, which he received on Monday last from Captain N. Leslie, of the ship *Lady Milton*, now lying at West Hartlepool, picked up on the homeward voyage; and then read the following extract from the captain's letter:—"I picked up a lot of gulf weed in 32 N. and 7 70 W., on the 9th of March. I send a sample; it looked very beautiful when fresh, so many little barnacles, and all full of life when in a bucket of water. I am now sorry that none of it was bottled, if only for curiosity; it might lead you to something of a knowledge of seasons, as I never saw so many barnacles on a voyage as I have this time, either on seaweed or wreck, and, strange to say, there are none on the ship's bottom. Last year we saw none on the seaweeds, &c., when the quarters of the ship were nearly covered with them, and this although we had not so much fine weather as this."—Mr. Peach stated that the cirripede most abundant in the parcel thus sent was covered with bars and spines, much like *Oxynaselis celata* of Darwin's monograph, but it differed in so many respects that it might prove to be a new species.—Mr. Andrew Taylor read "Notes on the Geology of Inchkeith."

NEW ZEALAND

Wellington Philosophical Society, January 28.—Hon. W. B. D. Mantell, F.G.S., president, in the chair. From the report of the Council it appears that out of fifty-nine communications made to the Society during the past year forty-four will appear in the forthcoming volume of the Transactions. The number of members has increased from 85 to 103, and the accounts show a balance in hand of 60*l.* 10*s.* 7*d.* The chief item of expenditure has been a grant of 50*l.* in aid of the Botanic Gardens, for the purpose of having the collection of native plants completed by the addition of those found in other parts of the colony, and also in providing labels for the principal trees and shrubs along the paths, giving the scientific and native names. The office bearers chosen for the ensuing year are W, T. L. Travers, F.L.S., President; J. C. Crawford, F.G.S.. and W. L. Buller, F.L.S., Vice-Presidents, with J. Hector, M.D., F.R.S,, and Messrs, J. Kebbell, W. Lyon, F.G.S., R. Hart, and W. Skey, as members of the Council. F. M. Ollivier, Esq., Hon. Secretary and Treasurer. Messrs. J. Prendergast, G. Allan, W. Colenso, F.Z.S., and Dr. Knox, were elected new

members.—Dr. Hector called attention to a live katipo or poisonous native spider, with nest and young ones, on the table, and read a short notice by Mr. Duigan, of Wanganui, of an extraordinary flight of beetles that passed over that district in December last.—A paper was then read by Mr. Travers from Mr. Shand, of the Chatham Islands, describing the different kinds of Mokihi or flax stalk canoes that the natives used in former times, a model of one of which is in the Museum.—Dr. Hector gave an interesting account of the reports he had received from more than thirty stations respecting the magnificent meteor that passed over New Zealand on the 1st instant, at 8.30 P.M., which, he stated, had a general course from about a point west of north through the zenith of Picton, over which place it passed at less than thirty miles altitude above the surface of the earth, travelling with an apparent velocity of 12 miles per second. Its form was that of a ball intensely luminous, of a reddish hue, with a long very brilliant tapering tail, the light of which resembled burning magnesium wire, but giving off red sparks. It completely eclipsed the light of the moon which was shining brightly. The area over which it had been seen has a length of 700 miles, and width of 300, from lat. 36° S., long. 122° E., to lat. 46° S., long. 175° E. The apparent diameter of the head was 10′, and the length of the tail tapering about 1° Some of the observations appear to indicate that its course must have descended towards the earth's surface, but this depends on mere estimates of angular altitude, which cannot be depended on. The prolonged detonation which followed the passage of the meteor does not appear to have been heard at all the stations, but chiefly at those in the vicinity of Cook Strait, where the path of the meteor intersected New Zealand, all the observers in the North Island having seen it to the west, and those in the South Island to the east. When nearest to Wellington it must have been at a distance in a direct line of fifty-five miles, which agrees with the time, five minutes, which elapsed before the report was heard. This shows that the report did not proceed from the final bursting of the meteor, but proceeded from it at the time it was nearest to the observer. Indeed, from the length of the path in which the meteor was seen, its sudden disappearance, as if by bursting, must have been an optical illusion in the case of all the northerly observers. Mr. Marchant stated that he had witnessed another meteor, almost equal in brilliancy to the above, on the previous evening (27th inst.), passing from east to west. Mr. Floyd of the Telegraph Department, stated that this meteor was reported at several stations in the North Island, and appeared to have passed over Napier on the east, to Patea on the west coast. Its colour was blue.—After some further discussion two important papers on the electromotive and conductive power of mineral sulphides, were read by Mr. Skey, in which he claims to have made some discoveries.

PARIS

Academie des Sciences, April 21.—Eighteen members present. The sitting was not devoid of interest, although the communications were far from numerous. M. Egger, professor of Greek at the Sorbonne and member of the Academie des Belles Lettres, availed himself of the privilege granted to the members of different academies. He read a very long dissertation on a papyrus found in 1866, which gave a great deal of information on the state of ancient Egyptian civilisation. It related chiefly to the prices of different articles used in those times. The bursting of the shells and the thunder of French artillery was distinctly heard. It was an impressive scene to see these learned men discussing a civilisation which was swept from the earth so many centuries ago at a time when their own country was threatened by ruin not less awful and perhaps more disgraceful. The *Comptes Rendus* of the 7th April had gone through the press as usual. Its most important article was a communication from Prof. Simon Newcomb on the new method invented by him for discussing the inequalities of the moon's motion. The extract, four pages in length, is an abstract from the original communication, which was left by the American astronomer in the hands of the Committee instructed to report upon it. These *Comptes Rendus* are printed by Gauthier-Villars, printer to the Academy, at a great expense, and with the greatest difficulty. The continuation of the publication is highly creditable to that firm, of which the head, M. Gauthier-Villars, is a former pupil of the Polytechnic School. To show how difficult the business must be to manage, we must say, moreover, that the publisher of the *Connaissance des Temps* for 1872 is stopped merely because it is impossible to find working men for the printing of the last four sheets, which are ready to go through the press. If things continue for some time, French navigators sailing for distant Pacific Ocean expeditions will be obliged to resort to the Nautical Almanack.

DIARY

THURSDAY, MAY 11.

ROYAL SOCIETY, at 8.30.—An Experimental Inquiry into the Constitution of Blood, and the Nutrition of Muscular Tissue: Dr. Marcet, F.R.S.—On Non-Spontaneous Generation. On the Influence of Heat on Protoplasmic Life. On the Preparation of Nitrogen: Prof. Crace-Calvert, F.R.S.

SOCIETY OF ANTIQUARIES, at 8.30.—Sepulchral Remains at Rouen: The Abbé Cochet, Hon. F.S.A.—Letter to Mr. John Stanhope, from Sir Geo. Buck: Earl Stanhope, President S.A.—Sir James Tyrrell cleared (A.D. 1483): Rev. W. H. Sewell.

MATHEMATICAL SOCIETY, at 8.—On the Singularities of the Envelope of a non-Unicursal Series of Curves: Prof. Henrici.—On the Resultant of a large number of Vibrations of Irregular Phase, as applied to the Explanation of the Coronas: Hon. J. W. Strutt.—A Question in the Mathematical Theory of Vibrating Strings: W. Spottiswoode, F.R.S.—On the Problem of Finding the Circle which cuts Three given Circles at given angles (communicated by Prof. Cayley, F.R.S.): J. Griffiths, M.A.

ROYAL INSTITUTION, at 3.—On Sound: Prof. Tyndall.

LONDON INSTITUTION, at 7.30.—On Economic Botany: Prof. Bentley.

FRIDAY, MAY 12.

ASTRONOMICAL SOCIETY, at 8.

QUEKETT MICROSCOPICAL CLUB, at 8.

ROYAL INSTITUTION, at 9.—On the Defence of the United Kingdom: Col. Jervo's, R.E.

SATURDAY, MAY 13.

ROYAL SCHOOL OF MINES, at 8.—Geology: Dr. Cobbold.

ROYAL INSTITUTION, at 3.—On the Instruments Used in Modern Astronomy: J. N. Lockyer, F.R.S.

MONDAY, MAY 15.

LONDON INSTITUTION, at 4.—On Astronomy: R. A. Proctor, F.R.A.S.

ANTHROPOLOGICAL INSTITUTE, at 8.—On Dreams, Sympathy, Presentiment, and on Divination and Analogous Phenomena among the Natives of Natal: Dr. H. Callaway.—Notes on a Cairn at Khangaum, and on a Kist in Argyleshire: Dr. A. Campbell.

TUESDAY, MAY 16.

STATISTICAL SOCIETY, at 7.45.—On the Influence of a High Bank Rate of Discount on Monetary Crises: R. H. Patterson.

ZOOLOGICAL SOCIETY, at 9.—A Description of the Madreporaria dredged up during the Expedition of H.M.S. *Porcupine* in 1869-70: Dr. P. Martin Duncan.—On Speke's Antelope and the allied species of the genus *Tragelaphus*: Sir V. Brooke, Bart.—On a new Humming-bird, discovered by Mr. Whiteley, in Peru: Mr. J. Gould.

ROYAL INSTITUTION, at 3.—On Force and Energy: Charles Brooke, F.R.S.

WEDNESDAY, MAY 17.

SOCIETY OF ARTS, at 8.—On the Utilisation of Prison Labour: Captain E. F. Du Cane, R.E.

ROYAL SOCIETY OF LITERATURE, at 8.30.—On Shakespeare's Birthday: C. M. Ingleby, LL.D.

THURSDAY, MAY 18.

ROYAL SOCIETY, at 8.30.

SOCIETY OF ANTIQUARIES, at 8.30.

CHEMICAL SOCIETY, at 8.

ROYAL INSTITUTION, at 3.—On Sound: Prof. Tyndall.

CONTENTS

ERRATUM.—In vol. IV. p. 20, 2nd column, line 7, for "N. Hartog" read "M. Hartog."