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THURSDAY, MAY 26, 1870

THE NEW NATURAL HISTORY MUSEUM

WITHIN the last few days two members of Her Majesty's Government, the Chancellor of the Exchequer and the Premier himself, have declared, in their places in Parliament, that it is the wish and intention of the Ministry to carry into effect, without further delay, the long-talked-of project of erecting a special building to contain the Natural History Collections of the British Museum.

That this announcement will be received with great satisfaction by the large body of persons interested in the various branches of natural history in this country there can be no doubt, although there may be misgivings in some quarters lest the fullest advantage should not be taken of so grand an opportunity of making the very best museum of the kind in the world. These misgivings are in a great measure justified by the present condition of not only our own, but nearly all other European Zoological Museums, and more especially by the plans that have at various times been put forth in a semi-official manner, as representing the ideal of what such a museum should be.

Long and extensive experience has, or ought to have, taught us the best principle of construction as applied to libraries and picture galleries ; but the natural history sciences are in their infancy as compared with literature and art, and the best methods by which their treasures can be housed and exhibited have yet to be learned. The way in which this is done in the new Museum will exercise so great an influence upon the progress of these sciences, that it should not be determined upon without full consideration by those who are most conversant with their present state, and with the probable wants of a future generation of students.

Let the reader imagine what a public library would be if the books, instead of being shut up and arranged on the shelves for consultation when required, had every single page framed and glazed and hung on the wall, so that the humblest visitor as he passes along the galleries has only to open his eyes and revel in the wealth of literature of all ages and all countries, without so much as applying to a custodian or opening a case. There is something truly heroic in the conception of such a scheme ; but laying aside all questions of space and cost, what would be its real utility to those who are able to appreciate and make true use of its contents! All the inconveniences, all the impossibilities, I may say, of a library arranged upon such a plan would be found in a museum containing anything like an adequate number of objects for the purposes of really enlarging the boundaries of scientific zoology, in which every specimen contained in it were exposed to the gaze of all who choose to enter its walls.

We are only beginning to form any idea of the enormous numbers of specimens actually required to enable us to rest our generalisations relating to most zoological problems upon a firm basis, and of the importance of keeping these specimens in such a condition, and so placed, that they can be examined and compared with the greatest facility. Provision should, therefore, be made in the new Museum for the great bulk of the collection being thus treated. It would be quite a mistake to suppose that they would then be shut up and put away, and that the public have no further concern in them, and ought not to be expected to pay for their accommodation. They would be in exactly the same circumstances as the books in a well-arranged library, and ought to be equally accessible under suitable regulations; and there are thousands of people who will read with interest the conclusions that scientific men will draw from their study of them, who would never care to see, or if they did, never learn anything from, the specimens themselves.

At the same time, the other essential function of a Natural History Museum, the diffusion of knowledge among the general public, should be carefully provided for, and means should be taken by which these two objects may be carried on simultaneously, and, at all times, without interfering with each other, instead of continuing the present excessively inconvenient system of alternate closed and open days. This, and many other advantages, upon which I need not dwell at present, can be readily secured by the admirable plan, first suggested, I believe, by Mr. Sclater, of having all the glass-cases hermetically closed on the side towards the public galleries, and opening behind into the working-rooms in which the unexhibited portions of the same series are arranged in drawers or cabinets. In this way, any exhibited specimen, if required for examination or comparison, could be readily removed and replaced, without inconvenience to the visitors, and without letting in the dust which necessarily fills the air of the crowded public galleries. One of the principal objections to lighting the Museum with gas in the evening would also be obviated if this were carried out.

Another important requirement in the arrangement of a new Museum of Natural History is the abolition of the special department of palæontology. There might be a comparatively small *geological* series, consisting of characteristic fossils arranged stratigraphically, but the great bulk of extinct animals should be incorporated with the zoological series, so that they may be studied side by side with their existing representatives, not only by the sight-seeing public and specially-instructed visitors, but also by those who have charge of the collections. If the construction of the new museum tends to perpetuate the present artificial distinction between extinct and recent species of animals, it will hinder instead of promoting the progress of any general conception of the organic world as a whole, and will also impose unnecessary difficulties in working out the minute comparisons by which the affinities and gradations between the various units of which that world is composed are recognised.

It would probably be premature at the present time to enter into any further discussion of details, since the subject has so often seemed nearly as far advanced as now, and has as often receded again into the far-off distance. But after the declaration of last Friday evening it should be in a fairer way of being realised than ever before it, and it behoves the working naturalists of the country to lend their aid in furthering the excellent intentions of the Government by making known their well-considered opinions upon this most important question.

W. H. FLOWER

ON THE EXTRACT OF MEAT

AN article of food has lately been introduced which has found its way into every grocer's and chemist's shop in the country, and for which there is in all parts of the world a vast demand. This substance is variously called the Extract of Meat, the Juice of Flesh, Liebig's Extract, and in Latin, *Extractum Carnis Liebigii*. The name of Baron Liebig, the great chemist, is more especially connected with this compound, as he has undoubtedly the merit of having first called attention to it as a valuable article of diet. In his "Familiar Letters on Chemistry," he devotes a letter to vegetable and animal food, and gives an account of their various chemical components. He shows with regard to all animal flesh, that besides fibrine, albumen, gelatine, and fat, it contains certain other constituents which may be separated from these by a simple process of infusion, straining, and evaporation. The substance thus obtained is the extract of flesh. This compound was known to chemists previous to the researches of Liebig, and he especially mentions those sagacious and experienced physicians, Parmentier and Proust, who had long ago endeavoured to introduce a general use of the extract of meat. They, however, regarded it as a remedy for disease and exhaustion, and recommended it as a resource for the diseased and wounded soldier on the field of battle or in camp. "In the supplies of a body of troops," says Parmentier, "extract of meat would to the severely wounded soldier be a means of invigoration, which with a little wine would instantly restore his powers, exhausted by great loss of blood, and enable him to bear being transported to the nearest field hospital." "We cannot," says Proust, "imagine a more fortunate application. What more invigorating remedy, what more powerfully acting panacea than a genuine extract of meat dissolved in a glass of noble wine? Ought we then to have nothing in our field hospitals for the unfortunate soldier whose fate condemns him to suffer for our benefit the horrors of a long death-struggle amidst snow and the mud of swamps?" That which these sagacious physicians recommended for dying soldiers is now a common article of daily consumption in the households of Europe. That which was amply demonstrated to be of use to the dying soldier, was found no less adapted to restore the vital powers of the poor in our hospitals, and that which proved of benefit to the exhausted nervous powers of the poor was soon found to be of value to the exhausted nervous powers of the rich. The doctor, from prescribing it to the poor in hospitals, learned to prescribe it to his patients among the rich. The result of the action of this substance on exhausted nervous systems and debilitated frames is no delusion, it is no influence of imagination, no simple belief in doses without power, but a real experience which is accumulating from day to day, and making demands on the manufacturers of this all-potent juice, which their utmost industry cannot meet.

Let us now inquire how this is. To the unlearned there is a ready reply: the extract of flesh is all the nutritive power of flesh concentrated, and if one pound of juice is got from thirty pounds of flesh it must be thirty times as nutritious. But it is not so, and it will be surprising to those who believe in this doctrine to hear that the extract of meat contains little or nothing of what may be said to be nutritious at all. The substances which go to form nourishment for the body, which are contained in meat, are fibrine, albumen, and fat, but these are not present in the extract of meat.

One hundred parts of beef contain the following constituents :—

1. Fibrine	4
2. Albumen	4
3. Gelatine	7
4. Fat	30
5. Mineral matters	5
6. Water	50
	100

Let us contrast with this the composition of a hundred parts of Liebig's Extract of Meat :—

1. Creatine, Creatinine, Inosic Acid, Osmazome, &c.	51
2. Gelatine	8
3. Albumen	3
4. Mineral matters	21
5. Water	17
	100

The difference will be seen at a glance. The water has diminished by half, the albumen is less, and there is four times the quantity of mineral matter, and a set of bodies is introduced which occupy half the bulk of the compound, which are not noticed in the composition of beef at all. If, then, the Extract of Meat differs from beef and from all other nutritious articles of diet, it is not in containing nutritious matters, but in containing the chemical compounds just mentioned in large quantities, and mineral matters. It is to these, then, we must look for the explanation of the marvellous powers which the extract of flesh exerts on the human system.

What, then, are the creatine, and its associates creatinine, inosric acid, &c? All we know of creatine is that it is a crystallisable body, and that it has an alkaline action, and is capable of combining with acids to form salts. In this respect it is like quinine, morphine, strychnine, and other substances from the vegetable kingdom capable of exerting a great influence on the nervous system. It seems to stand between these latter bodies and theine, which is contained in tea and coffee, and which has not the power of combining with acids. Whatever may be its chemical character, we know little of its action on the human body. It is easily resolvable into urea, and seems to be one of those compounds which are the result of the decomposition of albumen and fibrine into nerves and muscles before these are ultimately removed from the body. Whatever may be the true chemical or physiological relations of creatine, we cannot but regard the presence of this substance in the extract of flesh as playing an important part in the action of the latter on the human system.

When creatine is boiled with mineral acids another product results, which differs from creatine, and is called creatinine. This again may be decomposed, and forms sarkosine. The special action of these substances on the animal system is unknown, but we know they are contained in the juice of flesh. Besides these substances, there is inosic acid, and inosite, or muscle sugar, found in the juice of flesh, and probably there are other compounds not yet made out, and of whose special action on animal organisms we as yet know nothing. But although our knowledge of the action of these things is very imperfect, there is one thing we know, and that is, that the albumen, the fibrine, the fat, and the gelatine, will none of them act separately or together, as they do when combined with the juice of flesh.

Many experiments have been performed in France, Belgium, and Germany, which show that fibrine alone will not support life, that albumen alone (as in white of eggs) will not support life, that gelatine alone will not support life; we are thus driven to the conclusion, seeing that all these substances are easily digested and appropriated when combined with the juice of flesh, that the alkaline and other substances referred to perform a most important part, if not in ultimate nutrition, at least in the previous process of digesting food.

If we study a little our individual experience in the matter of digestion, we may find perhaps an approximate solution of the mode in which Liebig's Extract acts in giving strength to the weak, and new life to the exhausted. If we are hungry and eat dry bread the appetite soon palls, and we give up the effort; if we take some cold water we can consume more of the bread, and even with warm water, especially if flavoured with tea and sugar, still more. The latter evidently acts as an incentive. If we add salt to the water the same effect is produced. But if we now take a basin of soup—for soup is but a solution of the juice of flesh—we shall find that we can take into our stomachs with relish four or five times the bread we could have eaten dry or with cold water. How is this? We are all aware of the fact without being able to give the explanation. It is evident that an effect has been produced upon the nerves of the stomach and its glandular apparatus, which has enabled it to digest and deal with food which before was a mere inanimate burden in its cavity. If the nervous system is excessively exhausted or unable to act, as it is sometimes in disease, the glass of "noble wine" recommended by Proust will increase the effect upon the paralysed nerves. It is in this way, it appears to me, that the extract of flesh taken with food acts in so beneficial a manner, as compared with tea, coffee, cocoa, beer, wine, or spirits. All these, whilst stimulating the nerves of the stomach to higher action, are attended with subsequent depressing and sedative effects, of which we see no sign in the action of a dilute solution of the juice of flesh.

There does not appear to exist any evidence of the subsequent beneficial action of the organic substances found in the Extract of Meat. Not that this ought to be denied to them. They may, like theine and quinine, supply more readily materials for the manufacture of working muscle and nerve than can be readily obtained otherwise than from the blood. The theory that these salts assist in nourishing the nerves has recently been put forward, with his accustomed ingenuity, by Professor Agassiz; and as the flesh of fish is known to contain more creatine than that of other animals, he recommends a diet of fish as especially adapted for the food of philosophers and those who work much with their brains.

But whatever doubts may arise as to the action of creatine and its consequences on the ultimate nutrition of the nerves and muscles, there can be no doubt of the beneficial action of the mineral matters contained in Liebig's Extract. We eat salt because we do not get enough in our ordinary food. Besides salt, which contains chloride and sodium, we require other elements in our bodies. We require phosphorus, calcium, potassium, sulphur, and iron. Now, we do not add these artificially to our food as we do the chloride of sodium, and yet in our ordinary system of cooking and feeding we may deprive our bodies of these necessary elements. In soup we supply them, and they are contained in the juice of flesh. Whilst one hundred pounds of beef contain five pounds of mineral matters, one hundred pounds of Liebig's Extract contain twenty-one pounds of the same substances. Above seventy per cent. of these consist of phosphorus and potassium, whilst the remainder consists of lime, iron, sulphur, and magnesia. Here then, perhaps, we may find a nutritive action for the Extract in supplying those elements to the nerves and muscles which are constantly being removed by the changes of composition in the tissues, through the vital activity of the body.

From the above statement it will be seen that the juice of flesh presents after its manufacture no new product, but that it contains the same constituents that are ordinarily met with in the flesh of animals. The great advantage that it confers is that it is already fit for use. A teaspoonful of the Extract in a pint of hot water is a stock for any kind of soup, and may be prepared in a few minutes. To this may be added bread, potatoes, vegetables, eggs, meat, or flavouring essences of any kind, and the most agreeable of soups can be thus prepared. Its use in this direction is not confined to the sick-room; it may be used economically for the daily manufacture of soup for the table, and where the speedy preparation of hot food is desirable there is nothing to equal it. For the dyspeptic, and those whose stomachs have become paralysed by the use of theine in tea and coffee, it quickly restores the digestive powers; and for a permanent beverage, morning and evening, it is better than tea or coffee. Of course, this solution should always be taken warm, although after cooling it is perfectly thin, and is not like soup made from meat, which becomes thick on cooling, an effect due to the gelatine, and greasy, from the fat floating on the surface.

The Extract is sold for ten or twelve shillings a pound, and a pound of Extract represents thirty pounds of lean beef. It is therefore no economy to make it and sell it at this price in England; but as it can be made in South America and Australia, where cattle and sheep are in abundance, even at the low price of ten shillings a pound, including carriage, a large profit is made. Within the last few years an establishment has been erected at Frey Bentos, in South America, for the manufacture of this Extract from the wild cattle of that part of the world. There are also two distinct manufactories on the Clarence, New South Wales. These places are worked by companies which supply immense quantities for public use. There are also private manufactories in many parts of America and Europe, and one in Scotland, supplying the same substance. As far as published analyses have gone, the Extract has the same general composition, and on that account one is not to be preferred above another. But there is a difference in flavour, and that which is preferred in that point will fetch the highest price and have the largest sale. Here, as in all other kinds of food, it is the flavour that makes the quality. It is the *bouquet* of wine and not the alcohol that constitutes its value. E. LANKESTER

THE SNAKES OF AUSTRALIA

The Snakes of Australia: an Illustrated and Descriptive Catalogue of all the known Species. By Gerard Krefft, F.L.S., C.M.Z.S., &c., &c., Curator and Secretary of the Australian Museum. Large 8vo. pp. 100, with 12 lithographic plates. (Sydney, 1869. London: Trübner and Co.)

WHEN we consider how very small is the number of zoologists who take an interest in, or make a special study of, the animals of the class Reptilia, and how little attraction this branch of zöology appears likely to have for the public, we cannot but feel surprised when, now and then, one bolder than his fellow-labourers prepares a comprehensive account of some portion of these animals, and ventures to put it forth in the shape of a goodly volume, which must have cost the author a vast amount of unappreciated labour, and the publisher a round sum of money without a prospect of its speedy return. Thus, on examining the work which has just been published under the above title by the Curator of the Sydney Museum, we find that the investigations on which it is based have been carried out by fourteen zoologists only, of whom not more than one half belong to the present generation, whilst the other half have only described a species or two incidentally.

The causes of this neglect of the study of reptiles are obvious. In Europe, a boy whom Nature has endowed with a taste for contemplating her works, begins to collect the objects most accessible in his neighbourhood, and most attractive by their variety of form or colour; he collects, and perhaps studies, birds and their eggs, beetles, butterflies, shells, or plants. What is more natural than that he should continue to devote himself to the same particular branch, if the duties of more mature years allow him to develop the fancy of his boyhood into scientific research? Consequently, ornithology, entomology, conchology, and botany are *popular* pursuits.

There are but few who become connected with public collections, and who, from more expanded views or duty, enter into the study of animals which have but rarely formed part of private collections. A boy in England would soon get tired of his taste for natural history, if he had to develop it through the scanty means afforded by the small number of British reptiles; and Ireland, as far as we are aware, has not yet produced a single herpetologist (although, as Mr. Krefft informs us, that island is inhabited by snakes—a fact which is certainly new to us).

On the other hand, we may predict that herpetology will become a more popular science in Australia, where reptilian life abounds. Snakes must be numerous there, for we are told that, "from six to ten specimens, belonging to different species, were captured some years ago under a single stone not many miles from the city of Sydney;" that, "to go snake-hunting has been a pastime with school-boys for years," and that "the collecting-bag often forms part of the outfit of the wallaby-hunters, by whom the old sport of boyhood is not forgotten." Snakes in Australia must also play quite as important a part in relation to mankind as in tropical countries; for not less than two-thirds of the species, and fully nine-tenths of the individuals, are venomous. Ten years ago only some forty species of Australian snakes were known; and it is chiefly due to the energy of Mr. Krefft, as collector and curator of the Australian Museum, that this number is now doubled.

The work begins with a copious introduction, in which the natural history of snakes generally is treated in a popular manner; then follow technical descriptions of the eighty species known, and their geographical distribution and habits are indicated, the volume being illustrated by twelve lithographic plates. The descriptions are chiefly reproductions of the original diagnoses given by the various authors; and we do not notice any species which has not been described elsewhere. Thus, whilst we bear witness to the great progress in Australian herpetology due to Mr. Krefft's labours, we must add that he has effected it previously to and independently of the publication of his book. But, like all conscientious compilations, it will be useful to the student, and will supply a real want among residents in Australia desirous of acquainting themselves with objects which daily come under their notice.

Great credit is likewise due to Mr. Krefft for the caution used in working up his materials. European collections contain by far the greatest number of the typical specimens of the species described within the last century; and men working at a distance from this principal source of information, and more or less dependent on descriptions, are only too much exposed to the risk of failing in the determination of species, applying old names to really new species, and describing old ones as new. No end of labour in rectifying these errors is caused to European naturalists by such premature publications. But Mr. Krefft has been for years in constant communication with his fellow-labourers in England and Germany, sending duplicate examples for identification; and thus creating a well-determined collection, he has laid a solid basis for his own future researches and for the instruction of Australian students. We have heard an authority on the subject express the belief that there is not in the book a single species erroneously determined.

The plates which accompany the volume are the work of two ladies, Miss Scott and Mrs. Edward Ford, who, considering the peculiar difficulty of drawing snakes, have accomplished their task extremely well.

In conclusion, we must congratulate the trustees of the Sydney Museum on having found so able and zealous a curator as Mr. Krefft; and express the hope that his book may lead to new discoveries sufficiently numerous to call for a second edition. It is a good sign that the scientific literature of our colonies already contains such books as the one under review. May the number soon be largely increased.

A. GUNTHER

OUR BOOK SHELF

The Bottom of the Sea. By L. Sonrel. Translated and Edited by Elihu Rich. Pp. 402, 67 Illustrations. (London: S. Low, Son and Co. 1870.)

WE cannot do better than quote part of the translator's preface, wherein he states that the book "bears the same relation to the strictly scientific treatment of the subject as a popular lecture on art to instruction in the studio; a ramble through a museum to a lecture on science; or a short pleasure-sail on the coast, with here and there an opening glimpse of the scenery," &c. M. Sonrel devotes the first portion of his book to submarine orography, with full explanations of deep-sea soundings, configuration of sea-bottom, submarine scenery, the various charts of the sea-bottom, and the like. The phenomenon of phosphorescence is explained; and the colour and temperature of the ocean are also dwelt on; next comes submarine life, with a long description of wonderful sponges, polypi, and corals. He relates, also, many legends with regard to marine monsters. Then we have man, and his work at the bottom of the sea, divers, diving apparatus, raising of ships, construction of bridges, submersion of towns, submarine volcanoes—all are graphically described. The last part is devoted to the action of rivers and currents on the sea-bottom, the dunes of Gascony, and villages buried beneath them. M. Sonrel lastly illustrates the insignificance of man compared with the ocean, by telegraphic cables, with an engraving of a fossilised cable. The following passage ends this interesting volume:—"If the intelligence of man has placed him at the head of the creation, the feeble influence that he can exercise over Nature ought to humble his pride. All that he can accomplish by physical labour is almost imperceptible by the side of the work effected by the microscopic infusoria; man, the giant, is dwarfed in results by the almost invisible atom!" This book is well illustrated throughout, and is admirably adapted to those who require light scientific reading.

Lehrbuch der Chemie für Land und Forstwirthe. Von S. J. Möser. Large 8vo., pp. x. and 355. (Vienna: Braumüller, 1870.)

IN this work, which was written for agricultural students, Dr. Möser has made it his aim to supplement the educational deficiencies under which his German pupils labour; and as the time which they can devote to purely chemical study is (he informs us) unduly limited, he brings into prominence in this manual only the more general and important facts, while the minor details, which are described in a smaller type, are kept somewhat in the background. The inorganic part is comprised in 183 pages, inclusive of an appendix, in which we are pleased to notice special sections devoted to the formation of saltpetre and the soil. The organic part contains 202 pages, and is consequently cut very short; but certain parts of it and its appendix are occupied very fully with physiological chemistry, and seem to have been ably executed,—perhaps more *con amore* than the rest of the *Lehrbuch.* Dr. Möser offers an apology for adopting the old notation; but we think his views on this subject are likely to alter with a new edition.

La Chambre Noire et le Microscope: Photomicrographie pratique. Par Jules Girard. (Paris: F. Savy. London: Williams and Norgate.)

THIS little volume contains a useful description of the apparatus required for photographic representation of microscopic objects, and a detailed account of the various operations involved in this art. It also describes the application of photomicrographic plates for lectures and educational purposes, by means of the oxyhydrogen light and the lantern. The book is illustrated with several well-executed woodcuts. A translation of it would be very useful to those engaged in this kind of work.

LETTERS TO THE EDITOR

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

Oysters of the Chalk, and the Theory of Development

THE interesting notice, in your last number, of M. Coquand's "Oysters of the Chalk," draws inferences unfavourable to the Theory of Development or Evolution which scarcely seem warranted by the facts. It need not be "difficult to imagine the creature as existing under such conditions, that one species, while engaged in 'the struggle for existence,' should starve out and extinguish another;" for however widely we may find a fossil species dispersed, it is not probable that it occupied the whole of its territory at one and the same time, and in the limited area occupied immediately before its extinction, new varieties may have prevailed over and displaced the old by some slightly superior adaptation to the food-supply of the region. The extinction of any particular species may in some instances have been due to the extinction, or loss by other means, of its own appropriate food. Again, it is not necessary to suppose that the hinge, or the internal or external structure of the shell of an oyster, has been altered by what may be called the direct action of "Natural Selection," since by the well-established principle of "correlation" the variation in one part of an organism is nearly or quite certain to produce variations in other parts. "If any such change did occur," it is argued, "it must have been *per saltum*, since with these mollusks, numerous as they are, there are no forms that can fairly be recognised as transitional." But this appeal to the evidence of facts is somewhat premature. The immense difference pointed out between the geological records of England and France in regard to these very oysters of the chalk, leaves it perfectly open for us to suppose that even the comparatively full French record is itself exceedingly imperfect, and that the transitional forms have either not been preserved, or remain yet to be discovered. Mr. Darwin gives reasons for believing that when variation once begins it continues with some vigour; hence, between two settled widespread species connected genealogically together we might expect a large number of transitional varieties, each represented by only a few individuals, so that the whole number of these transitional forms might well be lost to the geological record.

Finally, the objection from the scarcity of oysters at the present day, compared with the great abundance of species in the past, does not really touch the theory of development, which is concerned to explain how species come into existence, not how they go out of it. That varieties, species, genera, have been superseded or extinguished, within longer or shorter periods, is a fact admitted on all hands. The general principle of natural selection will account for this in the rough, maintaining as it does, that fresh varieties, species, and genera better adapted to the surrounding circumstances have arisen, and by their superior adaptation, unavoidably ousted the older forms. Digging down into the records of history we find a time when the Romans were supreme in the civilised world; no two consecutive years of the interval present any remarkable divergence of the prevailing conditions, yet now we may say of that Roman supremacy in the civilised world, that, "like the Mastodon, it is a thing of the past." May it not be that both in races of men and every other race of creatures, there is a certain store of vitality and vigour, capable of very extensive and long-continued development, but capable also of exhaustion?

Torquay, May 14 THOMAS R. R. STEBBING

Euclid as a Text-book

THERE are many engaged in the work of education in this country, besides those who have come prominently forward in the matter, who feel strongly that Geometry as now taught falls far short of being that powerful means of education in the highest sense which it might easily be made. They find themselves, in the majority of cases, compelled to use in their classes a text-book which should long ago have become obsolete.

We have lately had instances in abundance of the power of combined action. If the leaders of the agitation for the reform of our geometrical teaching would organise an Anti-Euclid Association, I feel sure they would meet with considerable and daily-increasing support.

We of the rank and file do not feel strong enough to act alone, and yet think we might do something to help forward the good cause by co-operating with others.

The immediate objects of such an association should be in my opinion (1) To collect and distribute information connected with the subject; (2) To induce examining bodies to frame their questions in geometry without reference to any particular text-book.

RAWDON LEVETT

King Edward's School, Birmingham

Philology and Darwinism

MR. FARRAR'S interesting communication on this subject in a recent number of NATURE, suggests to me a few remarks. As one who has paid considerable attention to the various dialects existing throughout Scotland, as well as to the manner in which our Gaelic-speaking population is by stern necessity obliged to attempt the pronunciation of Anglo-Saxon words, I have become thoroughly convinced that the growth, life, and death of languages are subject to fixed laws. The Highlander whom I meet and who tells me this is a "Koot tay" is as unconsciously obeying Grimm's law of the transposition of consonants as the sun above him is obeying Newton's law of gravitation.

There is this difference, however, between Mr. Darwin's teachings regarding animals and the changes of language, that whereas those animals whose breeding and training are most subject to man's conscious action exhibit the greatest amount of variability, those dialects which are the most neglected and despised by educated men, and which, in this respect, may be called the weeds of speech, are far more variable than Queen's English, watched over as the latter is by such a host of school-masters, lexicons, and grammars. The difference of pronunciation of the same words in different counties is great, while many words in the dialect of one county are quite unknown in that of another, in this respect presenting a striking analogy to the Flora of the country. Even in words formed from sound, in which case, at first thought, we might expect considerable uniformity, the difference is often very marked, as between Scotland and England. The words imitative of the animal voice, or of the different cries of the same animal under different sensations are sometimes unlike, for the horse *neighs* and the cat *mews* in England, whereas they respectively *nicher* (*ch* guttural), and *nyioo* in Scotland. Sometimes the imitative word is from the sound of different organs, as *lapwing* in English from the flap of the wing; *peewit* in Scotland from the sound of the voice. Generally people so ignorant as to be necessitated always to express their thoughts in a rustic dialect, do so with the assistance of more or less gesture, and even this gesture is not quite whimsical, but has family and county resemblances. In conclusion, my impression is that the dialects which run wild are much more variable than those under man's care, which is the reverse of the case with wild and domestic animals and plants.

S. J.

Xanthidia in Flint

DR. CARPENTER, in his recent lecture at the Royal Institution on "the Temperature and Animal Life of the Deep Sea," speaks of the resemblance of the globigerina mud to chalk as being "greatly strengthened by the recognition of several characteristically cretaceous types among the foraminifera scattered through the mass of *globigerinæ*, of which it is principally composed; as also of the *Xanthidia* frequently presented in flint. (NATURE, vol. i., p. 564.)

The precise nature of the spinous orbicular bodies found in flint, and generally called *Xanthidia*, has hitherto been a matter of some doubt. Ehrenberg described them as fossil species of his genus of supposed polygastric animalculæ, *Xanthidium*. Their structure, however, differs in many respects from true *Xanthidia*, which form a genus of *Desmidieæ*, now universally admitted to be vegetable organisms, and, like nearly all desmids, having compressed bipartite cells, whilst the fossils have globose and entire cells. The most recent opinion has been that they are the fossil sporangia of other species of *Desmidieæ*, and they do indeed bear considerable resemblance to the sporangia of various species of the genera *Micrasterias*, *Euastrum*, *Staurastrum*, *Cosmarium*, and *Closterium*. An objection to this opinion arises from the fact that *Desmidieæ* are (so far at least as at present ascertained) exclusively fresh-water plants, and do not appear at all adapted for a deep-sea existence; whereas on the other hand, the chalk containing the flints may now be said to have been conclusively proved to have been formed at a considerable depth at the bottom of the sea: and the other organisms with which the fossils in question are found associated are undoubtedly marine.

The discovery of these *Xanthidia* (?) then, at an ocean depth of 767 fathoms, is a most important fact, whatever their nature may be; what that nature is, I, and I doubt not many others of your readers, would be glad to learn from Dr. Carpenter, or others who have had an opportunity of seeing the specimens he alludes to.

Winchester, May 14 FRED. J. WARNER

What is a Boulder?

WITH all terms in ordinary use there is a looseness of meaning, which, while not in the least degree inconvenient in common language, becomes so when transferred to the would-be-exact nomenclature of science.

Hobbes says, "A name is a word taken at pleasure to serve for a mark which may raise in our own mind a thought; like to some thought we had before, and which being pronounced to others may be to them a sign of what the speaker had or had not before in his mind."

It is obvious, however, that a name pronounced by a speaker, or written by an author, can only raise, in the minds of others, the proper thought, when the exact meaning of such a name has been agreed upon by those who make use of the name; and it appears to me desirable that in all cases when names in common use are transferred to the language of science, their exact meaning should be stated. In some sciences, as in botany, this is done, where such terms as leaf, stem, root, &c., are defined apart from their ordinary signification, but much remains to be done in this way. Thus, take the query at the head of this letter. I have tried to find out exactly what a boulder is, and I completely fail. According to Dance a boulder is "a mass of rock, whether rounded or not, which has been transported by natural agencies from its native bed." This definition is excellent at first sight, but it fails, as the term "mass of rock" conveys no clear idea as to size. Ask half-a-dozen persons the smallest size they would attribute to a mass of granite, and the answers would vary considerably. One cannot see why the smallest piece that would contain the constituents of the rock should not be called a mass, and in that case many of the large grains of sand on a granitic coast would be included in the term "boulder." But this is absurd, for we might then speak of carrying half a dozen boulders in the waistcoat pocket, or a geologist might suffer from having a boulder blown accidentally into his eye! There is apparently no determinate size at which a boulder begins or ends; but it seems to me desirable that some idea of size included should be given in the definition, and I would ask some of your readers to be good enough to state what they understand by a "boulder," with a view of getting an exact idea of the meaning of this frequently used term.

Midland Institute, May 9 C. J. WOODWARD

The Anglo-Saxon Conquest

A CORRESPONDENT, writing under the signature "A. Hall," in your issue of last week, suggests that in laying certain statistics as to the longevity of the Romano-Britons before the Royal Institution, I had "forgotten that the youth of Romano-Britain had for many generations been forcibly expatriated, drafted abroad to feed the armies of Imperial Rome." Your correspondent "appears to have forgotten" what the *résumé* of my lecture stated, viz., that my observations related to the time of Cerdic; and he will now no doubt recollect that a space of about three generations intervened between this period and the one to which he refers. Less than three generations is a sufficiently long period to allow of the balance which the Romano-British population is supposed to have suffered by being drafted into the Roman armies, righting itself.

I have, in a memoir which the Society of Antiquarians has honoured me by publishing in the "Archæologia" of this year, given other reasons, and these at greater length, for holding the explanation which your correspondent suggests for my statistics to be erroneous. I do not in that memoir quote, in illustration of and as a means of expressing that explanation, some lines from Mr. Henry Lushington's poem "Inkermann." These lines I did quote in my lecture, and will quote them here, as they may give pleasure to some of your readers. Speaking of the Russian slain, Mr. Lushington says :—

Lay them there like soldiers—
Men that did not blench.
Many a sad serf-mother
Yearns for these at home ;
Yet she thinks, "My children
Never more shall come.
Few, alas, of many
Come back from the wars.
There they die, fulfilling
God's will and the Czar's !"

Oxford, May 23 G. ROLLESTON

Carp and Toads

IN reference to *Bufo calamita* attaching itself to the carp, and pressing its thumbs into the fish's eyes (see NATURE, May 12th), I would mention that the male Batrachia in the spawning season often attach themselves to any object, pressing the hands, on which is developed, at this season, a peculiar, black, wart-like structure, into the object which they seize—a stick, a human finger, or a carp as it appears, being sometimes hugged with spasmodic violence. A curious illustration of the reflex nature of this movement, and the inhibitory function of the cerebrum in regard to reflex actions, was witnessed by me lately, on cutting through the neck of a male toad. My finger was between the animal's fore legs, but on account of fright, or some other cerebral operation, no hugging action took place ; but directly the connection between the spinal cord and cerebrum was severed, the arms joined closely upon my finger, the thumbs being pressed into it in the usual way, and the headless body held firmly to me with considerable muscular power. Just as the leg of the brainless frog is withdrawn more rapidly from acidulated water, than is that of a perfectly sound and healthy specimen, so did the hugging action of the forearms fail to be brought about by contact of the extremities with a foreign body whilst the animal was whole, but took place immediately upon the severance of the cerebrum from connection with the rest of the cerebro-spinal axis.

Hampstead, May 16 E. RAY LANKESTER

WITH reference to the disease existing amongst the carp at the Château de Montigny, and its presumed connection with "the first days of spring," and the animosity of the toad for the carp, permit me to take up the cudgels, not for the early spring but for the poor maligned toad, which like other possessors of jewelled heads has already but too many enemies. On two occasions I have noticed the curious train of symptoms detailed by M. Duchemin, commencing with blindness, and ending in death. One occurred in Norway, and the trout and grayling were the only fish affected ; the other in Lord Bathurst's park in this town, when the pike only were attacked whilst the perch and tench escaped. In both these instances I instituted a series of experiments to ascertain the probable cause of death. No intestinal worms were discoverable, nor did any of the tissues appear congested or otherwise diseased, with the exception of the eyes, in which the cornea became opaque and friable so that on very slight pressure the crystalline lens escaped. The long duration of this blindness before death supervened, rendered it probable that starvation was at least usually the cause of death. In both cases spring was the time of the attack, but in neither were toads observed in proximity to the diseased fish ; indeed, in that part of Norway where the disease existed, toads are almost unknown. One cause only has as yet suggested itself to me, and that is the presence of diffused mud in the water. As both in Norway and Cirencester, works had been undertaken, just previous to the outbreak of the disease, which had had the effect of introducing a large amount of clay into the water, and the "early days of spring" were so far implicated that they were days of rain and melting snow, and thus the products of degradation were added to the mischief caused by the hand of man.

Cirencester, May 14 W. D. CROTCH

Meteorological Phenomenon

ON the afternoon of Sunday, the 22nd, a very curious appearance was noticed by many. The sky was hazy, and the sun was seen through the haze of a pink colour, inclining to purple. I see by a newspaper that the same was noticed at Dublin. A red or orange sun is common, but I never before saw its colour on the purple side of red. JOSEPH JOHN MURPHY

Old Forge, Dunmurry, Co. Antrim, May 24

Keen Sight of Fish

THE following extract from the remark book of Captain Robert A. Parr, of H.M.S. *Lyra*, may be of interest to your readers, bearing, as it does, such remarkable and trustworthy evidence of the keen sight of fish :—

"December 17th, 1867.—At noon, in lat. 0° 33′ S., long. 46° 13′ E., caught an Albacore, with 28 pistol bullets in its stomach. The ship's company had been exercised at pistol practice during the forenoon." G. F. M'DOUGALL

Hydrographic Dept., Admiralty, May 24

THE MULBERRY TREE

AN effort is being made to introduce once more into England the cultivation of the mulberry tree, and as the leaves of either the white or black variety (but especially those of the former) afford food for the silkworm, and both kinds will flourish in a tolerably mild and moist climate, there seems to be no reason why we should be altogether dependent upon foreign sources for a supply of raw material for the looms of Coventry and Macclesfield. Certainly the present is a favourable opportunity for making the experiment, as the price of silk has been largely enhanced by disease amongst the worms in the south of Europe, and by the destruction of the mulberry trees in China during the rebellion. At Yately, in Hampshire, Captain Mason has for the last three or four years been successfully engaged in rearing silkworms, and he calculates that if his mulberry plantations had been made upon a sufficiently extensive scale, a profit of 10*l.* an acre might have been easily realised. King James I. preceded him in this speculation, and imported ship-loads of mulberry trees from France with the view of encouraging the production of silk in England. In 1629 Walter Lord Aston was appointed "to the custody of the garden, mulberry trees, and silkworms near St. James's, in the county of Middlesex." But the scheme, like many others framed by the same monarch, proved abortive, and within a few years the mulberry garden became, in the words of Evelyn, "the only place of refreshment about the town for persons of the best quality to be exceedingly cheated at." Pursuing its history a little further we find the gardens converted into the site of Buckingham House, and in our own time Dr. King's allusion, written a century and a half ago, is a good deal more true than when he penned it :—

The fate of things lies always in the dark ;
What cavalier would know St. James's Park ?
A princely palace on that space does rise,
Where Sedley's noble muse found mulberries.

Within our own memory a similar experiment was tried in the neighbourhood of Slough, but it failed, not from any deficiency in the supply of food, but from the difficulty and expense incurred in tending the worms and carding the silk. Mechanical processes have now, in a great measure, removed these drawbacks, and the whole process of cultivation is one which would afford suitable employment for women and children.

The vicissitudes of fortune experienced by the mulberry tree in England belong to a curious chapter in the yet unwritten history of Botany. In common with the vine and several other trees, the mulberry has been alternately fostered and neglected : but in spite of royal favour and many intrinsic merits (for its fruit is wholesome and its timber valuable), it has now become a rare tree in Britain. The specimens at Sion House enjoy the reputation of being the first planted in England; but the probability is that the mulberry was introduced by the Romans, for the Saxon name for the tree "mor-beam," is little more than an echo of the Latin *morus*, which again can be traced to a still more Eastern source. The Sion House trees were, perhaps, some of those imported by James I., but their interest is far inferior to that which attaches to the celebrated tree planted at Stratford by Shakespeare's own hand, and ruthlessly destroyed by a Goth of modern times. C. J. ROBINSON

NEW TREES AND SHRUBS FOR ENGLISH PLANTATIONS*

WITHIN the last twenty years a complete revolution has taken place in the character of our out-of-door planting of ornamental trees and shrubs; trees which twenty years ago were rarities that a lover of arboriculture would go miles to see, are now to be met with in every gentleman's shrubbery or lawn with any pretensions to artistic arrangement. A really good hand-book was greatly wanted, to enable a planter to choose the species best suited to the climate, and best adapted to the special circumstances of his own particular estate. Such a hand-book Mr. Mongredien's "Planter's Guide" proposes to furnish, and to a great extent successfully. The plan of the book is admirable. We first have a list of 621 species of trees and shrubs, "selected from the large multitude which from time to time have been introduced from all parts of the world, and of which the vast majority are not worth cultivation for ornamental purposes." A brief description accompanies each name, with instructions as to the best aspect or position, and other needful particulars. These 621 species are then looked at from different points of view, and in the second part are classified accordingly: first, as to their height, then as to their foliage, next as to their flowers, and finally as to their fruit. Furthermore, we have selected lists of species remarkable for singularity of aspect, for rapidity of growth, suitable for hedges, thriving under the drip of trees or in the smoke of cities, adapted for different soils, &c. On looking closer into the manner in which this programme is carried out, we certainly find defects, as might be expected in a work which covers so much ground; but the defects are such as the author is sure to have brought under his notice, and which may easily be remedied in a second edition. Thus, although the list seems an extensive one, we miss many species, either old favourites or newly introduced, which ought to have had a place in it for their beauty or their useful properties: such as, among flowering shrubs, the *Berberis aquifolium*, a desideratum in every shrubbery, from its early flowering and the beautiful gloss of its evergreen leaves; *B. vulgaris*, the scarlet fruit of which is one of the most beautiful ornaments for the table; and the butcher's broom, *Ruscus aculeatus*, very easy of cultivation, and striking from the weirdness of its appearance, and the very peculiar growth of its flowers: and among climbing-plants, the common hop, used in some of the London parks in a very graceful manner to cover the stems of the poplar-trees. The list of plants thriving in the smoke of cities might also have been more than doubled by any of the author's friends who happen to have a London suburban garden. The illustrations interspersed here and there are very pretty; the frontispiece, however, a magnificent specimen of *Araucaria imbricata*, is unfortunate. If really taken from that tree, and not from another species of *Araucaria* not mentioned in Mr. Mongredien's list, it is very badly drawn.

ABIES PINSAPO   BIOTA PENDULA

The introduction from China, about thirty years since, by Mr. Fortune, of a number of perfectly hardy evergreen conifers, previously unknown in this country, set the fashion among gardeners and planters strongly in that direction; and the proportion of this class, recommended in the "Planter's Guide," is very large. Out of the 621

* "Trees and Shrubs for English Plantations; a selection and description of the most ornamental trees and shrubs, native and foreign, which will flourish in the open air in our climate." By Augustus Mongredien. With Illustrations. (London: Murray, 1870.)

species, 254 are evergreens, 85 of them belonging to the coniferous tribe. As the author remarks, however, there are both advantages and disadvantages connected with the choice of evergreens for ornamental planting; while the persistent leaves of evergreens are generally of a dark and sombre hue, the young leaves put forth by deciduous trees in the spring are of a much brighter livelier tint, and during the summer months add much more to the freshness and beauty of the landscape. It seems probable that the great rage for new conifers is now somewhat going by, and that more attention will in future be paid to shrubs remarkable for the beauty of their flowers or fruit. A great acquisition has been the recent introduction of male plants of the *Aucuba japonica*, or common "variegated laurel," which thrives in every London garden or area. Till recently female plants only had been known in this country, which consequently never bore fruit. The fertilising of these by pollen, or the planting of a male plant, will ensure their being covered in the summer and autumn with a quantity of ornamental red berries.

There is much yet to be learnt with regard to the laws of acclimatisation and naturalisation. It appears by no means always to follow that we must look for trees and herbaceous plants suitable for introduction into our own country to those regions of the earth, the climate and soil of which most closely resemble our own. On looking over Mr. Mongredien's list, the countries which seem to have furnished the greatest number of perfectly hardy trees and shrubs are China and Japan, Northern India, Chili, California, and the more southern of the United States. Australia and New Zealand, on the other hand, have sent us very few species. A very large number of new kinds were introduced between 1840 and 1850; and we have therefore had no opportunity yet of knowing whether they will attain with us the size that some of them do in their native forests. An elm-tree eighty feet high is with us a fine tree; a very large number of the conifers are described in this work as attaining a height of from 100 to 140 feet, while the *Wellingtonia gigantea* of California, the monarch of trees, rears its head to the enormous altitude of 350 or 400 feet. Should our descendants witness their growth to their normal size, they will probably in many cases regret the want of forethought in their ancestors who planted them so near their houses; and at all events our parks and pleasure-grounds will present a very different appearance to what they do now. There is little doubt that a considerable number of trees and shrubs which are reckoned by gardeners to be half-hardy will, with a little care, grow very well out of doors in the southern counties of England. Even the Camellia requires, according to our author, protection for the first year or two only, to become a permanent and magnificently ornamental denizen of our shrubberies.

As a specimen of the author's style we may quote his description of the elegant *Cupressus Lawsoniana*:—

"California, 1852. Tree 60—80 feet. Leaves in alternate opposite pairs, closely adpressed, of a glaucous green. Branchlets slender, flattened, thickly clothed with leaves, gracefully pendulous, the leading shoots (as in the cedars) drooping until the ensuing season's growth; cones of the size of a large pea, with a glaucous bloom while young. This is one of the most beautiful trees of a beautiful tribe. It is very hardy, a rapid grower, and should find a place in every collection. It is frequently so laden with its beautiful cones (which, however, have more the appearance of berries) that the fruitful branchlets are quite borne down by their weight, like the boughs of a prolific apple-tree. Nothing can be more graceful or attractive."

GLEDITSCHIA TRIACANTHOS

Mr. Mongredien's book should be in the hands of every one interested in the planting of trees—and who is not who has the money to spend and the space to spare? The man who introduces on an extensive scale a new ornamental tree adapted to our climate performs a service to mankind, not only to his contemporaries, but to his descendants for many generations.

NOTES

HERE is some welcome news from the *London Gazette*—"The Queen has been pleased to appoint the most Noble William, Duke of Devonshire, K.G.; the Most Honourable Henry Charles Keith, Marquis of Lansdowne; Sir John Lubbock, Sir James Phillips Kay-Shuttleworth, Bernard Samuelson, Esq., William Sharpey, Esq., M.D., Thomas Henry Huxley, Esq., Professor of Natural History in the Royal School of Mines; William Allen Miller, Esq., M.D., Professor of Chemistry in King's College, London; and George Gabriel Stokes, Esq., M. A., Lucasian Professor of Mathematics in the University of Cambridge, to be Her Majesty's Commissioners to make inquiry with regard to Scientific Instruction and the Advancement of Science, and to inquire what aid thereto is derived from grants voted by Parliament, or from endowments belonging to the several Universities in Great Britain and Ireland, and the Colleges thereof, and whether such aid could be rendered in a manner more effectual for the purpose."

WE believe that the Government will propose to Parliament that the New Natural History Museum shall be built on the site occupied by the Exhibition of 1862, south of the Royal Horticultural Gardens. The ground was purchased some time ago for the sum of 120,000*l.*

THE annual visitation of the Royal Observatory, by the Board of Visitors is fixed for the 4th of June, at 3 p.m. The visitors, according to custom, will dine afterwards at the Ship.

MR. ERASMUS WILSON, who some time ago presented to the Council of the Royal College of Surgeons, of which institution he is a Fellow, the handsome sum of 5,000*l.*, with which to endow a Professorship of Dermatology, has now devoted a further sum to the liquidation of the debt incurred by the College in fitting up the costly cases in the museum for the large and valuable collection of dermatological preparations since presented by him.

WE are requested to state that, to provide space at the South Kensington Museum for the examination and exhibition of the National Competition Drawings of the Schools of Art in the United Kingdom, the Gallery of Raphael's Cartoons will be used, and must be closed for a short time.

THE Council of the Royal Society have decided to recommend J. A. Ångström, of Upsala, and J. A. F. Plateau, of Ghent, to fill the two vacancies in the list of Foreign Members of the Society.

THE Commission of the Imperial Observatory of France for 1870 consists of the following members:—Members of the Council: President, M. Delaunay; Vice-president, Rear-Admiral de Penhoat; M. Balard, of the Academy of Sciences; M. Puiseux, of the Bureau of Longitudes; M. Yvon Villarceau, M. Marié-Davy, M. Loevy, M. Wolff. Members of the Committee of Examination: President, Vice-Admiral Touchard, Rear-Admiral Baron Didelot, M. Faye, and M. Serret, members of the Institute; M. Briot, professor at the Faculty of Sciences, and M. Delaunay, director of the Imperial Observatory.

AS mentioned in our last number, the French Minister of the Fine Arts is in future to bear the title of Minister of Letters, Sciences, and the Fine Arts. The following duties and institutions are separated from the Ministry of Instruction to be attached to the new ministry:—The Imperial Institute of France; the Imperial Academy of Medicine; the Museum and Library of Algiers, and instruction in living Oriental languages; the Imperial School of Letters Patent; the Imperial Library and curriculum of Archæology which are attached to it; the Mazarin library, and those of the Arsenal and St. Geneviève; the general care of the libraries, and editing the catalogues of the libraries of the departments; the learned societies of Paris and of the departments; the *Revue des Sociétés savantes*, and library of the committee of historical works, and of the learned societies; the *Journal des Savants*; subscriptions to scientific and literary works, and distribution of these works among the public libraries; the consulting committee of subscriptions and committee of historical works; encouragement and assistance to scientific and literary men; subsidies and encouragements for voyages and scientific and literary missions; publication and distribution of the unpublished documents concerning the history of France and topographical map of Gaul; the legal dêpot; reception and distribution of works proceeding from the legal dêpot. And all this time *we* have not even a Minister of Public Instruction!

THE annual Rede lecture was delivered on the 18th inst. in the Senate House, Cambridge, by Prof. W. A. Miller, of King's College, London, to a numerous audience, the subject being, "Aniline, and the various Products of Coal-tar." The lecture, which was eloquently delivered, and was illustrated by many beautiful and successful experiments, was listened to with great attention; and at the conclusion a vote of thanks, proposed by the Vice-Chancellor and seconded by Professor Sedgwick, was carried enthusiastically. The honorary degree of LL.D. was afterwards conferred on Prof. Miller and on Mr. Huggins, the Rede lecturer of last year.

THE council of the Senate of the University of Cambridge have referred the report of the Physical Science Syndicate back to that body, with a request that they would reconsider it, having regard to the late debate in the Arts Schools, the general tone of which was decidedly adverse to the scheme recommended by the Syndicate, and favourable to the general principle of the fund being raised by some system of taxation of the College revenues.

WE are extremely glad to learn that Trinity College, Cambridge, has instituted a Prælectorship of Pure Physiology, and that Dr. Michael Foster, who has for some years been Professor of Practical Physiology at University College, has been appointed the first occupant of the chair. This will, we trust, give great impulse to the study of Natural Science, especially of Biology, in Cambridge. Trinity College could scarcely have found a more earnest, able man, and a better teacher than Dr. Foster.

DR. CARPENTER will deliver a lecture "On the Physical and Biological conditions of the Deep Sea," in the Senate House of the University of Cambridge, to-morrow, at 2.30 P.M.

THE "Sars Fund" in this country now amounts to 343*l.* 12*s.* 10*d.*, and we understand that it will soon be closed. Every zoologist and geologist has subscribed; but there are many lovers of science and of Scandinavia to whom we may venture to make a last appeal on behalf of this truly deserving and interesting case. Some copies of the *carte de visite* of the late Professor Sars will soon be received by Mr. J. G. Jeffreys for those subscribers who may care to possess such a memorial.

THE Admiralty have acceded to the request of the Royal Society by again placing Her Majesty's surveying steam-vessel the *Porcupine* at their disposal for another deep-sea exploration, to commence in the latter part of June. Mr J. Gwyn Jeffreys will take charge of the first cruise, which is intended to be across the Bay of Biscay, along the coasts of Spain and Portugal, to Gibraltar. Dr. Carpenter will there succeed him in the beginning of August, and proceed into the Mediterranean, after endeavouring to trace the direction and nature of the currents at the Straits. Prof. Wyville Thomson will probably join Mr. Jeffreys. A photometric apparatus has been contrived by Mr. Siemens for the purpose of ascertaining the depth to which solar light penetrates the sea; and other questions of considerable interest will be investigated in this expedition. But we regret to find that the time is so limited for such an important object.

AT the anniversary meeting of the Royal Geographical Society held on Monday last, the Founder's Medal was awarded to Mr. George W. Hayward, the Society's envoy to Central Asia, for the map of his journey across the Kuen Lun into Eastern Turkistan, and for the perseverance with which he is endeavouring to carry out his object of reaching the Pamir Steppe. The Patron's, or Victoria Medal, to Lieutenant Francis Garnier, of the French navy, second in command of the French Exploring Expedition from Cambodia to the Yang-tsze-Kiang, for the part he took in the extensive surveys executed by the commission, for his journey to Tali-fu, and for the ability with which, after the death of his chief, Captain de la Grée, he brought the expedition in safety to Hankow. The medals presented by the society to the chief public schools were awarded to G. G. Butler, Liverpool College; M. Stuart, Rossall School; G. W. Gent, Rossall School; and J. H. Collins, Liverpool College. Sir Roderick Murchison, in the course of his opening address, said that he grieved at being unable to offer some encouraging sentences on the prospect of speedily welcoming Dr. Livingstone home; at the same time (he proceeded) there is no cause for despondency as to his life and safety. He had been for some time at Ujiji, on the Lake Tanganyika, whence he wrote home on the 30th May last, though unable to make any movement for want of carriers and supplies. These were, indeed, forwarded to him by Dr. Kirk from Zanzibar, when an outbreak of cholera stopped and paralysed the relieving party. Recent intelligence, however, has reached the Foreign Office to the effect that the pestilence had subsided to so great an extent that we may presume the communication between the coast and Ujiji has before now been re-opened. The work which still lies before Livingstone has been often adverted to, and it is hoped that he will live to advance to the north end of the Tanganyika, and there ascertain if its waters flow into the Albert Nyanza of Baker. If the junction should be proved, we may indulge the thought that, informed as Livingstone must now be of the actual carrying out of the great project of Sir Samuel Baker, he may endeavour to meet his great contemporary. The progress of the great Egyptian expedition of Baker having been delayed in its outset, we know that it only left Khartoum to ascend the White Nile in February. After reaching Gondokoro, as was expected to be the case in the first days of March, some time must necessarily elapse in establishing a factory above the upper rapids, and beyond the tributary Asua, where the steam-vessels are to be put together before they are launched on the Nile water, on which they are to pass to the great Lake Albert Nyanza. As soon, however, as a steamer is on that lake, we may be assured that Baker, with his well-known energy and promptitude, will lose not a moment in the endeavour to reach its southern end, in the expectation of there giving hand and help to Livingstone.

THE paragraph inserted among our "Notes" of April respecting Mr. Wilson Saunders's collection of "mimetic" plants at the recent Linnean *soirée* having been copied by our able contemporary the *Gardener's Chronicle*, a correspondent in that paper asks for a complete list of the mimetic pairs. In giving us the list, Mr. Saunders states that the plants were none of them grown for the purpose, but simply selected from his greenhouse on the spur of the moment for the purposes of the *soirée*.

Olea europœa	Oleaceæ
Swammerdamia Antennaria	Compositæ
Kleinia ficoides	Compositæ
Cotyledon tricuspidata	Crassulaceæ
Thujopsis lætevirens	Coniferæ
Selaginella circinata	Lycopodiaceæ
Euphorbia xylophylla	Euphorbiaceæ
Polygonum platycladon	Polygoneæ
Peperomia sp. Brazil	Piperaceæ
Nematanthus longipes	Gesneraceæ
Haworthia planifolia	Liliaceæ
Cotyledon (Echeveria) aloides	Crassulaceæ
Gymnostachylum Verschaffetii	Acanthaceæ
Echites rubro-venosa	Apocyneæ
Sempervivum arenarium	Crassulaceæ
Haworthia atrovirens	Liliaceæ
Echinoceras Blankii	Cacteæ
Euphorbia echinata	Euphorbiaceæ
Aralia sp. Bahia	Araliaceæ
Philodendron sp. Trinidad	Araceæ
Dorstenia sp. (near villosa) Brazil	Moreæ
Eranthemum sp. Brazil	Acanthaceæ
Grevillea sp.	Proteaceæ
Acacia chordophylla	Leguminosæ
Euonymus Catifolius	Celastraceæ
Hedera canariensis var	Araliaceæ
Ilex Aquifolium var	Aquifoliaceæ
Osmanthus Aquifolium var	Oleaceæ

AN admirable article appears in the *British Medical Journal* for May 21st, on Government Honours to Medical Science. Starting with Faraday's reply, when consulted by the Government of the day as to the propriety of a more liberal distribution of titles and other honours amongst men of science, that "Government should, *for its own sake*, honour the men who do honour and service to the country," the writer shows how this principle might be carried out by the appointment of Medical Sanitary Inspectors for the whole country, instead of merely for large towns; of State Inspectors of Civil Hospitals; and other similar arrangements.

WE quote from the *Moniteur Scientifique*:—"M. R. Wolf, of Zürich, has just published the *résumé* of his observations on the solar spots made since 1864. The minimum occurs in 1867, and agrees with the period of $11\frac{1}{9}$ years, found by Sabine and himself. Designating the relative frequency of the spots by r, M. Wolf expresses the variation of the magnetic declination at Christiania by the formula $v = 0'{\cdot}0413r + 4'{\cdot}921$, which does not, however, completely agree with observation."

WE quote the following from the *Pall Mall Gazette* for the benefit of our Darwinian readers:—"Two new birds have arrived at the Zoological Gardens the alleged habits of which afford a curious theme for speculation, and serve to supply an illustration to poets and philosophers. The male has a strong, short, curved beak; the female, a much longer bill. The naturalists tell us that the male breaks open the bark of the tree, within which lies hid the grub on which they feed; and the female pulls out the worm and presents her mate with half the meal. Here is a delightful instance of the essential incompleteness and mutual helpfulness of the sexes, the two forming one, as we are told they should, in perfect conjugal union. We hope that observation may confirm the tale; but animals at the Zoological Gardens are painfully apt to disappoint the expectations which we have been led to form of them. There is the aye-aye, for instance. Every one has heard of its marvellously long nail, and its singular adaptation to the necessities of the creature's existence. Professor Owen has founded an exquisite argument on the use of the long nail in extracting the creature's food from the deep crevices in which it is supposed to find it. It is an admirable instance of design. But although all sorts of ingenious devices have been adopted to induce the aye-aye to use its nail for these purposes, it seems to have a rooted objection to do so, and has never been known to do anything else than scratch its nose with it, which nobody can suppose to be a final cause."

WE have received from the Colonial Government of Victoria a copy of the Reports of the Mining Surveyors and Registrars for the quarter ending 31st December 1869, containing the Gold Mining Statistics for the quarter, the estimated yield of gold and quantity of gold exported; the summary of yield of gold from quartz, quartz tailings, &c., crushed; and the number and distribution of miners on the gold fields of the Colony on the 31st of December.

THE Botanical Garden at Rotterdam is about to be suppressed by the communal administration. M. Rauwenhoff, the director, and M. Witte, the head gardener, have given this information to their European *confrères*.

A JOURNAL of Horticulture has been started in Portugal under the title of *Journal de Horticultura Fratica de Portugal*, by M. José Marques Loureiro. M. Welwitsch has shown how wide a field for further exploration by botanists still remains in the Portuguese settlements in Africa.

A NINTH supplement to the Annals of the Munich Observatory is published, containing the particulars of 4793 telescopic stars between -3° and -9° declination, together with the observations of Lalande, Bessel, Rümker, and Schjellerup.

THE ABRADING AND TRANSPORTING POWER OF WATER

III.—PRACTICAL CONCLUSIONS

HAVING on two former occasions, when treating of the abrading and transporting power of water (which is supposed to increase as the velocity increases, but to decrease as the depth increases), dwelt on the mechanical property of water, and shown how it rolls rather than slides: the following conclusions may be arrived at :—

I. That all particles of water have an affinity to each other as well as to other bodies, and that force is required to separate them ;

II. That friction sets these particles rotating in all directions in larger or smaller circles, and that the friction or force increases in some proportion to the area of surface exposed ;

III. That this rolling motion becomes rarer the larger the diameter of the circles may be, that is, the resistance decreases as the depth and breadth of a stream increase, or in other words, the velocity increases proportionally to the "hydraulic mean depth ;"

IV. Lastly, that any increase to the rapidity of this rotatory motion, must increase the abrading and transporting power of water, by enabling it to remove from the channel of a stream grains of solid matter, and hold them in suspension.

The following deductions are arrived at :—

1. That a smooth surface offers the smallest area for the water to attach itself to, and fewer irregularities ; consequently the rotatory motion given to the water is reduced to a minimum, that is, the power expended is least, or the friction among the particles of water flowing through a smooth uniform channel is less than when it flows through an irregular and rough one.

2. That in the lines of a ship not only should there be no sudden changes in direction, but the surfaces should be as smooth as possible.

3. That the area of this surface should be as small as possible ; hence convex lines are preferable to concave ones, as with the same area they afford greater buoyancy, while there would be less friction for the water to roll along a convex surface than a concave one.

4. That additional length given to a ship, leaving out all other questions, must retard a ship passing through the water, by increasing the area exposed to friction ; consequently there is probably some limit owing to this increased resistance, where the length midships should not exceed certain proportions of the midship section.

5. That a ship passing over shallow water must be retarded, as the diameter of the vertical circles revolving under her bottom must be less than the diameter of the circles where the water is deep ; hence the smaller circles will be set in quicker rotation, and therefore loss of power ensues.

6. That the same will be the effect from the same cause where the channel is narrow and contracted.

These deductions apply to cases where the abrasion may be considered "nil," such as the discharge of water through pipes, and the sailing of ships ; and the practical conclusion is, that for pipes with glazed surfaces, and ships having coppered bottoms, the water passes with the least friction.* In the case of ships, *speed* is not the only question to be considered, so the subject becomes very complicated, and though believing in the general soundness of the above deductions, the solution of these problems may be left to the naval architect to consider.

Viewing the subject on the large scale, very important conclusions are arrived at from these facts—namely, that the depth of a river depends on the nature of the materials it has got to transport ; thus those which have to carry down coarse sand should be broad and shallow, while those which have to convey fine mud would naturally be narrow and deep. And as this depends on the geological nature of the catchment basin of the river, are we not naturally led to the conclusion that where we find rivers navigable, the rocks of the catchment basin which predominate are of an aqueous formation, while those rivers which are difficult of approach from the sea must drain a country where crystalline rocks predominate ? Judging, therefore, on this hypothesis, are we not right in conjecturing that the rocks of Central India, and also of that vast, but hitherto almost unexplored, country, Central Africa, must be generally of a crystalline nature ?

This interesting question, however, like that of the best form of ships, had better be left for the consideration of the professional inquirer, whose investigations lead him to study that branch of geology which treats of the denudation of rocks now going on on the earth's crust, and the deposits now being formed. I pass on to those questions which affect the hydraulic engineer, and they are so numerous that it would be difficult even to enumerate and classify them, while their importance is so great that it can hardly be over-estimated. On this occasion only one or two of the more prominent subjects will be glanced at, more for the purpose of leading to future investigation, than to lay down rules for guidance, which at this present stage it would be premature to attempt.

From the foregoing remarks, suggestions, and deductions, it may be supposed that there are certain laws of nature which adapt each case to its own particular circumstances. Take, for example, the course of a river. It has been before said that streams which have to transport coarse, solid matter, such as sand, are usually broad and shallow, while those which convey chiefly fine mud are deep and narrow. The reason why those streams which convey a large proportion of sand should be broad and shallow, is that the water has thus sufficient power to hold the solid matter in suspension ; and to still further aid them in this, it will be often observed that Nature generally gives such rivers comparatively speaking straight channels, in comparison to those which convey fine mud. The object in this case would appear to be that Nature in the former instance takes the shortest route, so as to obtain as great a fall as possible in the bed of the stream ; while with the deep muddy stream, to prevent the water rushing off too fast, and so to keep up the surface of the stream to a level with the banks, or in floods often above them, Nature takes her tortuous courses, and is thus enabled year after year to deposit those fine grains of mud which add so much to the fertility of the soil.

So evidently is this the case, that in Egypt the irrigation canals are all carried in a zigzag direction, so as to check the velocity, and prevent the coarser particles of solid matter from being transported, while at the same time the surface of the water is kept at a sufficient elevation, so as to admit of easy irrigation. Thus, probably, Joseph, or whoever started irrigation in the land of the Pharaohs, took a leaf out of Nature's book ; and it is by the study of this volume that the engineer of the present day will be most certain to arrive at satisfactory results.

That rivers have certain general principles by which they are governed, as to breadth, depth, slope, velocity, and load of solid matter held in suspension, it appears reasonable to suppose ; and any change introduced in any

* On reading over the above conclusions to an experienced ship-builder here in London, he said that one of the reasons why Aberdeen clippers sailed so fast, was owing to the smoothness of the ships' bottoms, which were first planed before the copper was put on. He also remarked that where the copper is very smoothly put on, the first place where the sheet wears through is just behind where the sheets overlap, showing that even an irregularity of $\frac{1}{16}$ of an inch causes an extra action, not as might be supposed at the point of greatest obstruction, but just beyond it, proving that there must be this whirling motion which causes this abrasion. This gentleman also observed that experience showed that the speed of a ship chiefly depends on the fineness of the lines of the after rim of a ship, and that "ingoing" or concave lines should be avoided if possible.

one of these proportions must cause a corresponding change in one or all of the above conditions.

Thus, let there be a stream which in flood contains 5 per cent. by weight of solid matter, and let it be 8 ft. deep, discharging 50,000 cubic feet a second, with a mean velocity of $7\frac{1}{2}$ ft. a second—the breadth of this stream would be $\frac{50,000}{8 \times 7 \cdot 5} = 833\frac{1}{3}$. To add one-fourth to the discharge of this stream of pure water would increase the discharge from 50,000 to 62,500 cubic feet a second, and the proportion of solid matter, instead of being 5 per cent., would be only 4 per cent. But, by the example before given, a depth approaching 9 ft. instead of 8 ft. would be the natural depth, so the bed would be lowered 1 ft., and the breadth would only be increased $\frac{12,500}{2 \times 9 \times 7\frac{1}{2}} = 92$ ft., instead of having to give an increase of one-fourth more, or $\frac{833}{4} = 208$ ft., and still keep matters much as they are found in nature.

So in bridging such a stream the whole additional length of viaduct would be only 92 ft., or 116 ft. would be saved by simply sinking the foundations 1 ft. more. But as water rolls rather than slides, and never flows in straight lines, the shape of the section of a stream can be changed at pleasure; so the depth may be increased without much danger by decreasing the breadth. Taking, then, the same stream which it was proposed to make $833 + 92 = 925$ ft. broad by 9 ft. deep, suppose the mean depth be made 15 ft., this increase of depth would decrease the transporting power, while at the same time the velocity would also be increased; and suppose it to be now 10 ft. a second, instead of $7\frac{1}{2}$ ft., and with a depth of 15 ft. with such a velocity only 4 per cent. of solid matter could be held in suspension, and the waterway would be $\frac{62,500}{15 \times 10} = 416\frac{2}{3}$ ft. broad instead of 925 ft., or less than one-half. That is, by adding 8 ft. to the general depth of a stream where the river discharges 50,000 cubic feet a second in the main channel, and 12,500 cubic feet a second of inundation water, which is comparatively free of silt, the whole volume or 62,500 cubic feet could be passed through a bridge only half the breadth of the original stream, which was 833 ft. broad. So the whole question reduces itself now into one of cost.

The question is whether it be cheaper to sink the foundations an extra 8 or 10 ft., or to double the length of viaduct. By the use of the sand-pump foundations can now be sunk through sand at a very moderate cost; so it is believed that the extra sinking would not involve anything like the cost of the shallower foundations for the bridge built on the extended plan; thus the whole cost of the superstructure and extra girders could be saved—that is speaking approximately. In such a case the bridge built on this deep foundation principle could be built at nearly half the cost of the old plan; but to guard against accidents, and scooping out to excessive depths, it would appear that at least one-third may be saved by building bridges on this principle; while the river, by having a deep channel under the bridge, could be kept in better control than by the present extended method, as it would not have such a tendency to desert its course, but would always keep to the deep channel.

Several other examples may be brought forward to illustrate the practical advantages that a better knowledge of the action of flowing water would be sure to confer on science and hydraulic engineering; but it is hoped that the foregoing will assist in bringing the importance of the subject more prominently forward. When once the subject is properly discussed I am convinced its importance will be manifested.

T. LOGIN

SOCIETIES AND ACADEMIES

LONDON

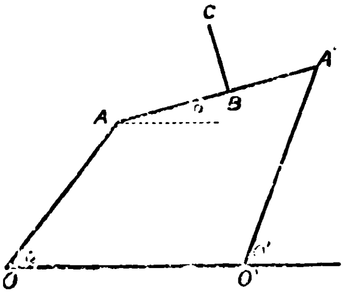
Royal Society, May 19.—"Experiments on the Effects of Alcohol (*Ethyl Alcohol*) on the Human Body." By E. A. Parkes, M.D., F.R.S., Professor of Hygiene in the Army Medical School, and Count Cyprian Wollowicz, M.D., assistant-surgeon, Army Medical Staff.

"On Deep-sea Thermometers." By Staff-Commander John E. Davis, R.N. Communicated by Captain Richards, R.N., Hydrographer of the Admiralty. The results of thermometric observations at great depths in the ocean not being of a satisfactory nature, the attention of the hydrographer of the navy was directed to the defects in the construction of the Six's self-registering thermometers then in use, and also to the want of knowledge of the effects of compression on the bulb; and as it was known that a delicate thermometer was affected *in vacuo*, it was natural to suppose that an opposite effect would be had by placing them under pressure, and particularly such as they would be subjected to at great depths. Several thermometers, of a superior construction, were made by different makers, and permission was granted to make experiments by pressure in a hydraulic press; but much delay was caused by not being able to obtain a press suitable to the requirements, until Mr. Casella, the optician, had a testing-apparatus constructed at his own expense, and the experiments were commenced. Previous to the experiments being made, Dr. W. A. Miller, V.P.R.S., proposed, or rather revived, a mode of protecting the bulb from compression by encasing the full bulb in glass, the space between the case and the bulb being nearly filled with alcohol.* A wrought-iron bottle had been made to contain a thermometer, for the purpose of comparison with those subjected to compression; but it failed, and finally burst under great compression; it proved, however, of but little consequence, as those designed by Dr. Miller showed so little difference under pressure that they were at once accepted as standards. Two series of experiments were then most carefully made, at pressures equal to depths of 250, 500, &c., to 2,500 fathoms, the results of which satisfactorily proved that the strongest made unprotected thermometers were liable to considerable error, and therefore that all previous observations made with such instruments were incorrect. Experiments were also made in the testing-apparatus with Sir Wm. Thomson's enclosed thermometers, to ascertain the calorific effect produced by the sudden compression of water, in order to find what error, if any, was due to compression in the Miller pattern: an error was proved to exist, but small, amounting to no more than $1^\circ \cdot 4$ under a pressure of 3 tons to the square inch. The dredging cruise of the *Porcupine* afforded an opportunity of comparing the results of the experiments made in the hydraulic testing apparatus, with actual observation in the ocean, and a most careful series of observations were obtained by Staff-Commander E. K. Calver at depths corresponding to the pressure applied in the testing apparatus; the result was that, although there was a difference in the curves drawn from the two modes of observation, still the general effect was the same, and the *means* of the two were identical. From these experiments and observations a scale has been made by which observations made by thermometers of similar construction to those with unprotected bulbs can be corrected and utilised, while it is proposed that by means of observations made with the Miller pattern in the positions and at the same depths at which observations have been made with instruments not now procurable for actual experiment, to form a scale for correcting all observations made with that particular type. In conclusion, it is suggested that to avoid error from the unsatisfactory working of the steel indices, which, from mechanical difficulties in their construction, cannot always be depended on, two instruments should be sent down for every observation; and although their occasional disagreement of record may raise a doubt, a little experience will enable the observer to detect the faulty indicator, while their agreement will create confidence.

London Mathematical Society, May 12.—Prof. Cayley, president, in the chair. The Hon. Sir J. Cockle, Chief Justice of Queensland, was proposed for election.—The President (Mr.

* *Vide* Proceedings of the Royal Society, vol. xvii. No. 113, June 17, 1869.

Spottiswoode, V.P., having taken the chair) gave an account of his paper "On the Mechanical Description of a nodal bicircular Quartic." Take a quadrilateral OAA'O', in which the adjacent



sides OA, AA' are equal to each other, and the other two adjacent sides OO', O'A' are also equal to each other. O, O' are fixed points, and we have thus a link, AA', the extremities of which are connected with the radii OA, O'A', respectively, and consequently describe circles about the centres O, O' respectively, the radius OA of the one circle being equal to the length AA' of the link, and the radius O'A' of the other circle being equal to the distance OO' of the centres. The theorem is that any point C rigidly connected with the link AA' describes a nodal bicircular Quartic; that is, a quartic curve with three nodes, two of the nodes being the circular points at infinity. Any such curve is the inverse of a conic, and it is also the antipode of a conic. For the analytical investigation, the origin is taken at O, the axis of x in the direction OO', and the axis of y at right angles thereto, upwards from O. The inclinations of OA, AA', O'A' to the axis Ox are taken to be θ, ϕ, θ' respectively. Also write OA = AA' = a, AB = b, BC = c, OO' = O'A' = a^1, and make $m = \frac{a^1 - a}{a^1 + a}$ then we have for the locus of C—

$$x = a \cos \theta + b \cos \phi - c \sin \phi$$
$$y = a \sin \theta + b \sin \phi + c \cos \phi;$$

since $\theta^1 = \theta + \phi$. Also we have $\tan \frac{\theta}{2} \tan \frac{\phi}{2} = m$;

whence writing $\tan \frac{\theta}{2} = u$, we have $\tan \frac{\phi}{2} = \frac{m}{u}$ and the equation to the locus may be written—

$$x = -a \frac{u^2 - 1}{u^2 + 1} + b \frac{u^2 - m^2}{u^2 + m^2} - c \frac{2 m u}{u^2 + m^2}$$
$$y = a \frac{2 u}{u^2 + 1} + b \frac{2 m u}{u^2 + m^2} + c \frac{u^2 - m^2}{u^2 + m^2};$$

which equations show that the locus is a bicircular quartic. The author then proceeds to show the existence of a third node, to express the locus as the inverse of a conic, and to exhibit it as the antipode of a conic. In the discussion on the paper Mr. Roberts gave some additional results bearing on the subject; and Mr. Spottiswoode stated that he recognised many of the curves (exhibited by Messrs. Cayley and Roberts) as having come under his notice in the course of experiments he had recently made with elastic strings.

Mr. Roberts then read his paper "On the Ovals of Des Cartes." It will suffice in this notice to give the heads under which the author treated the subject. On the polar equation and its interpretation; on the description of the curves by the transformation of a circle; on certain systems of the curves; on the normals; properties deducible from the general interpretation of the polar equation. Under the last head Mr. Roberts stated some interesting results: the sum of the areas of the Ovals—that is to say, in an obvious sense, the area of the Cartesian is equal to twice the area of the circle whose centre is at the triple focus, and which passes through the points of contact of the double tangent; the lengths of the ovals of a Cartesian are expressed by Zyzygetic relations between two elliptic quadrants; the difference of the lengths of the loops of a nodal Limaçon is four times the distance between the vertices.—Dr. Henrici exhibited a plaster cast of the surface, $x y z - \left(\frac{3}{7}\right)^3 \left(x + y + z - 1\right)^3 = 0$.

Royal Astronomical Society, May 13.—W. Lassell, F.R.S., President of the Society, in the chair. Thirty-one presents were announced, and the thanks of the society were voted to the respective donors. Prof. Selwyn read a communication from Sir John Herschel, referring to a chart in which the sun's spots observed by Mr. Carrington during his long study of the sun have been referred to their proper solar longitude and latitude. Sir John Herschel's object in preparing this chart was to determine what signs there are that any particular portions of the sun within the sun-spot latitude are more liable than others to be the scene of spot-formation. He found very few signs of any such arrangement. Mr. Proctor remarked that Sir John Herschel's communication seemed to dispose effectually of Prof. Kirkwood's recently propounded theory in explanation of the periodicity of sun-spots.—Papers on the occultation of Saturn, as observed by Messrs. Talmage, Joynson, and Captain Noble, were then read. Captain Noble remarked on the singularly clear definition of Saturn, "right up to the moon's limb," as being strikingly opposed to the theory brought forward by Mr. Watson at the last meeting of the society.—A paper by Mr. Penrose, on the Sun-spots recently seen, led to some controversy about the real nature of the spots. Mr. Howlett dwelt on the exaggerated character of the saucer-shaped depressions usually shown in text-books of astronomy. Mr. De La Rue mentioned the preponderance of evidence in favour of the spots being depressions. The Astronomer Royal also spoke in favour of this view. Mr. Lockyer dwelt on the evidence bearing on the subject derived from his method of detailed spectroscopic examination, and mentioned the interesting circumstance that so far as his spectroscopic observations had hitherto gone, it seemed almost as though the depressions were shallower now the spot period was nearly at its maximum than they were a year and a half ago. The Astronomer Royal expressed his admiration of the persistence and patience with which Mr. Lockyer had continued his solar observations, and stated his belief that in the course of the next two or three years we should gain much more new knowledge from this application of spectroscopic analysis to the sun.—At the President's request, Mr. Airy then referred to the expedition to be made to observe the eclipse of December next. He stated that the names of about sixty volunteers had been received. According to present arrangements, as many as twenty-six would be wanted at each station for general, spectroscopic, polariscopic, and photographic work. He expressed his anxiety that the observers who were to take part in the observations on the polarisation of the corona's light should understand their work, and clearly recognise—1st, what polarisation is; 2nd, what polarisation in a plane means; and, 3rd, when light *is* polarised in a plane how to recognise that plane. Mr. De La Rue spoke very favourably of the list of volunteers, saying that it included just those classes of observers which were really wanted. It was mentioned that the Poet Laureate had volunteered; and, in answer to a question by Prof. Grant, that good draughtsmen would accompany the expedition.—A paper by Mr. Lynn, on a star in Ursa Major, which has a very large proper motion, according to the researches of Argelander, was then read.—Mr. Proctor read a paper, "On the Resolvability of Star-groups regarded as a Test of Distance," dwelling on the evidence we have of variety of constitution as at least equally available to explain differences of resolvability as variety of distance can be. Mr. Stone said he thought Mr. Proctor exaggerated the theory of uniformity of stellar distribution; in reality, astronomers regarded the existence of very various degrees of real magnitude among stars as not only possible but probable, or even certain. Mr. Proctor said he was fully aware of that, and his views touched on quite a different matter. What he pointed to as wrong in accepted theories was that those theories failed to recognise the existence of definite aggregations of stars, in streams, clusters, groups, and so on, showing all degrees of richness of aggregation, &c.—Mr. Williams then described some antique telescopes of Campani's construction, amazingly long, with object-glasses varying apparently from about half an inch to an inch in diameter.

Zoological Society, May 12.—Prof. Newton, vice-president, in the chair. The secretary read some notes on the principal additions to the Society's menagerie during the month of April, and called particular attention to a Vulturine Guinea-fowl (*Numida vulturina*), presented by Dr. John Kirk, C.M.Z.S., being the first living specimen of this rare species received in England.—A communication was read from Dr. R. O. Cunningham, C.M.Z.S., on some peculiarities in the anatomy of three kingfishers, *Ceryle stellata*, *Dacelo gigas*, and *Alcedo ispida*.—A communication was read from Mr. George Gulliver, F.Z.S., on the taxonomic characters afforded by the muscular sheath of the œsophagus in sauropsida and other vertebrates.—Mr. R. B. Sharpe read a paper containing a full account of the swallows

(*Hirundinidæ*) of Africa, and pointed out their characters and geographical distribution. Particular attention was drawn to the affinities of the African *Hirundinidæ* with those of the New World, and also to the representation of various species by smaller races or sub-species throughout the Æthiopian region. Thirty-eight species of swallows were enumerated, of which number thirty were stated to be peculiar to the continent of Africa, and two to Madagascar and the adjacent islands. Two species only were common to India and Africa, and the remaining four were migratory throughout the Palæarctic and Æthiopian regions.—Dr. O. Finsch, C.M.Z.S., communicated the description of a new species of penguin in the collection of the Counts Turati, of Milan, which he proposed to call *Dasyrhamphus herculis*.—Messrs. P. L. Sclater and O. Salvin read descriptions of seven new species of birds collected by Dr. Habel during a recent expedition to the Galapagos Islands. These new species were mostly from Bindloes Island and Abingdon Island, which had not been visited by former explorers, and belonged principally to a peculiar group of *Fringillidæ*, containing *Geospiza* and its allied forms, which is characteristic of the Galapagoan Archipelago.—Mr. P. L. Sclater, F.R.S., read a paper on some new or little known species of South American birds, amongst which was a new woodpecker, proposed to be called *Melanerpes ulcher*, from New Granada.—Prof. Flower, F.R.S., communicated some additional notes on the specimen of the common fin whale (*Physalus antiquorum*) recently stranded in Langston Harbour.—Prof. Newton read a paper "on *Cricetus nigricans* as an European species," and exhibited a specimen of this mammal which had been lately killed in Bulgaria by Mr. T. E. Buckley, F.Z.S., and had been presented by him to the Cambridge Museum.

Leeds

Philosophical and Literary Society, May 3.—At the annual meeting, being the close of the fiftieth session of the Leeds Philosophical and Literary Society—Dr. Heaton, the retiring president, in the chair—it was announced that the following gentlemen had been elected as officers, council, and members for 1870-71 :—President, John Deakin Heaton, M.D., F.R.C.P. ; Vice-Presidents, C. Chadwick, M.D., F.R.C.P., Thomas Nunneley, F.R.C.S. ; Treasurer, Henry Oxley ; Honorary Secretaries, Thomas Wilson, M.A., Richard Reynolds, F.C.S. ; Honorary Curator in Geology, J. G. Marshall, F.G.S. ; Honorary Curators in Zoology, Edward Atkinson, F.L.S., T. C. Allbutt, M.A., M.D., F.L.S., F.S.A. ; Honorary Curator in Ethnology and Works of Art, &c., Thomas Nunneley, F.R.C.S.; Honorary Librarian, John Deakin Heaton, M.D., F.R.C.P. The above officers, and the following gentlemen, compose the Council :—John Edwin Eddison, M.D., E. Filliter, M. Inst. C.E., F.G.S., T. M. Greenhow, M.D., Joshua Ingham Ikin, F.R.C.S., Rev. J. H. M'Cheane, M.A., John Manning; T. W. Stansfeld, Rev. H. Temple, William Sykes Ward, F.C.S., Rev. Canon Woodford, D.D., General Curator and Assistant Secretary, Henry Denny, A.L.S.

Paris

Academy of Sciences, May 16.—The following mathematical papers were read :—Researches on pencils of right lines and normals, containing a new exposition of the theory of the curvature of surfaces, by M. A. Mannheim, communicated by M. Bertrand; a note on a peculiar property of the cassinoid with 3 foci, $\rho^6 - 2\ m\rho^3 \cos 3\ \theta = \pm 1$, by M. Allegret; and a note on the solution of the problem consisting in finding three whole numbers, such that the square of the one shall equal the sum of the squares of the other two. M. Bertrand also presented a report on a memoir by M. Moutard on the theory of partial differential equations of the second order.—M. Lecoq de Boisbaudran presented some remarks on the spectra of nitrogen, in which, after noticing his observations on this subject, he concluded that the changes of the spectra of this, and probably of other bodies, depend upon variations of temperature rather than of pressure, a circumstance which ought to lead to great caution in the astronomical application of spectrum analysis.—M. Regnault presented a note on the maximum of density and the temperature of congelation of solutions of alcohol in water, by M. F. Rossetti. These temperatures decrease in proportion to the amount of alcohol in solution.—M. Leray communicated a theory of the elasticity of media deduced from the principle that equal currents crossing in all directions exist in the midst of ether when not influenced by surrounding bodies ; and M. Delaurier presented a description of a battery for ringing telegraphic bells.—A communication from Father Secchi, containing the rectification of a numerical error in his last paper, was read, and in connection therewith M. Fizeau communicated some remarks on the displacement of the spectral rays by the movements of the luminous body or of the observer. A memoir on the theory of the tides, by M. Roumiantzoff, was read ; also a note by M. Trémaux on some questions relating to the movements of the planets.—M. Guyon presented a note on a meteorological observation made by the washerwomen of the south coast of Spain. The observation was that with a southerly wind linen put out to dry always acquires a yellow colour ; the author accounted for it by assuming that this coloration is due to impalpable dust conveyed from the African deserts.—M. A. Wurtz described a process for obtaining solid cresole, and some curious properties possessed by that body.—M. F. M. Raoult communicated a note on the composition of the gas of the burning spring of Saint Barthélemy (Isère) It consisted chiefly of marsh gas, 98·81 per cent. by volume, with small quantities of carbonic acid, nitrogen, and oxygen probably accidentally mixed with it.—M. Guyot presented a note on the examination of ammonia and nitric acid by means of rosolic acid and bromomercurate of potash.—M. Belgrand communicated a general account of the contents of his great work on the basin of Paris in prehistoric times, which has lately been published by the municipal administration of Paris.—M. Farez recommended the employment of silicate of potash for the purpose of giving solidity and cohesion to friable fossil bones.—M. Brongniart presented a report on a memoir by M. B. Renault, on some silicified plants of the neighbourhood of Autun.—A note was read from M. Marey, admitting that Dr. Pettigrew had the priority over him with regard to the figure of 8 described by the wing of an insect during flight ; and M. A. Dumeril presented a note by M. S. Legouis on the pancreas of the osseous fishes and the nature of the vessels discovered by Weber. The author described three forms of pancreas occurring in osseous fishes, which he called the *disseminated*, *diffused*, and *massive* pancreas ; the vessels discovered by Weber are the excretory ducts of the first two forms. The Plagiostomi have a pancreas resembling that of the higher animals.—A note from M. Didierjean was read, calling attention to the fact that milk is a preservative from the poisonous effects produced by lead upon the workmen who are engaged in the preparation of its compounds.—M. E. Decaisne presented a note on the use of the sewing machine and its influence on the health of workwomen. He considers that the ill effects of working with the sewing machine have been greatly exaggerated, and that the health of women working with the machine is quite as good as that of needlewomen.

Berlin

German Chemical Society, April 25.—H. Limpricht published a paper on oxyde of toluylene, to which he ascribes the formula $C\ H_2\ O\ C\ (C_6\ H_5)_2$.—M. Topsoï sent in a paper on preparing concentrated bromhydric acid, and a table on the boiling points of hydrobromic acids of different concentration.—A. Claus reports on the constitution of acroléine, looked upon by Kolbe as an acetone, on account of its transformation by hydrogen into isopropylic acid. This Prof. Claus denies to be the case; the alcohol obtained forming no acetone by oxidation.—W. Henneberg has found a source of error in using Pettenkofer's apparatus for determining the products of respiration ; the respiration of people approaching the apparatus influencing the amount of carbonic acid.—H. Schiff has found that acetic acid and oil of bitter almonds form cinnamic acid when treated with a minute quantity of HCl or $Zn\ Cl_2$. A larger quantity of these substances transforms the acid into metastyrol.—A. Oppenheim recommends the action of bibromide of copper for transforming organic iodides into bromides. With an alcoholic solution of this salt and iodide of allyle, the transformation is instantaneous, protoiodide of copper being precipitated at ordinary temperatures. An aqueous solution acts in the same way at a higher temperature. By the transformation of the bibromide into the protoiodide of copper, however, bromine is liberated, which will combine with non-saturated bromides. The method is, therefore, only applicable to saturated compounds.—C. Rammelsberg reported on isomorphous mixtures of selenium and sulphur.

May 9.—V Meyer, in order to decide whether the hydrate of chloral is a molecular combination—thus, $C\ Cl_3 - C = O\ H + H_2O$—or whether the water enters into the atomic constitution of the body—thus, $C\ Cl_3 - C\ H\ (O\ H)_2$—has tried its action on chloride of acetyl. H_2O is thereby separated, and one molecule of chloride of acetyle takes its place. The first supposition, therefore, appears the more probable of the two.—P. Groth has entered into a long series of important and difficult researches to investigate the connection between the chemical constitution and crystalline form of organic bodies. He communicates his first results, founded on his measurement of the form of benzol during the great cold of last winter, and comparing with it the forms of benzolic derivatives, in which one or more hydrogen are replaced by O H, N O_2, or Cl. He has come to the conclusion that, by these substitutions, *the numeric relations of two axes remain intact, the third axis only increasing or decreasing with the chemical substitution* The influence thus exercised by certain elements or groups taking the place of hydrogen, he calls their *morphotropic* power. The morphotropic power of chlorine appears far greater than that of N O_2 or of O H. The morphotropic changes, however, depend likewise on the position the element or group occupies in the molecule, and on the crystallographic system of the primary substance. The author has also investigated certain combinations of naphthalene in the same sense. They bear out the law quoted above. For the conclusions drawn from these highly interesting results we must refer to the original paper.—M. Lex has found that phenol mixed with nitrite of potassium and a reducing substance (such as sugar and lime, or hydrochloric acid and zinc), and then exposed to the air, or the oxidising action of chloride of lime, gives rise to a blue colour, much like indigo, but very unstable.—A. W. Hofmann reported on the curious researches of Prof. Church on the red colouring matter of the feathers of the Turacon.—C. Rammelsberg has analysed Indian steel, or wootz, without finding in it a trace of aluminium.—M. Topsöe has analysed platinic acid and platinate of barium, to which he gives the formula: Pt O_2, 2 H_2 O and Ba Pt O_3 + 3 H_2O respectively.—M. Clemenks, by treating the impure choride of pyroracemic acid with alcohol and with ammonia, has obtained the corresponding ether and amide.—MM. Kékulé and Quinke report on some reactions of metaldehyde and of paraldehyde.—M. Czumpelik has prepared the cyanide of nitrobenzyle and of amidobenzyle, and some derivatives of cuminic and of oxycuminic acids. The same author, by introducing one atom of chlorine into cymol, and treating the compound with acetate of potassium, obtained the corresponding organic acetate. —Mr. Buchanan, from Glasgow, has studied the complex action chloride of phosphorus shows with hyposulphite of lead.

Montreal

Natural History Society, April 25.—The Rev. Dr. DeSola presiding. Dr. Smallwood read the first paper, "On some phenomena of the Solar Eclipse of August 1869." It was intended to illustrate more fully a paper which he had contributed to the *Canadian Naturalist*, referring to the rose-coloured prominences of the sun's chromosphere, and their appearance before first contact. He exhibited diagrams of the several eclipses of 1851, 1860, 1868, and 1869, which showed the various shapes of the protuberance, and referred more particularly to the large one observed during the eclipse of last August, some 30,000 miles high, which was seen in a direct line with the passage of the moon across the sun's disc. He attributed the appearances which were observable a few seconds before the first contact of the Moon with the Sun's true limb to this circumstance, and cited and illustrated the experiments of Mr. J. N. Lockyer and Janssen, in confirmation of this opinion. The remarks of the Astronomer Royal, on the causes which, up to 1861, had prevented these prominences being seen, except during a solar eclipse, were quoted from the Transactions of the British Association. The spectroscope and other optical appliances have now made it possible to examine these phenomena at any time when the sun is shining. The experiments of Lockyer and Janssen seem fully to bear out the conclusions to which Dr. Smallwood had arrived, and the lecturer ended by expressing a hope that observations made on the eclipse of next December would tend to illustrate further the somewhat unusual appearances which he had recorded.—The Acting President made some remarks on the above paper, and expressed his regret at the want of good astronomical instruments in the city.—Mr. A. S. Ritchie then read a paper entitled "Aquaria Studies, No. 1." After some preliminary remarks, the principles upon which a fresh-water aquarium should be constructed and stocked were explained in detail, and particulars were given as to how the balance between animal and vegetable life might be best maintained. The author went on to describe some of the peculiarities of the larger tenants of his own aquarium. Commencing with the fishes, the various points of interest connected with the habits of several of the smaller Canadian fresh-water fishes were dwelt upon at some length. The species described were a new Stickleback, lately described by Principal Dawson in the pages of the *Canadian Naturalist*; the Darter, a fish which has no air-bladder, and swims by jerks; the Striped Minnow, the Sun-fish, American Perch, Black Bass, Cat-fish, Pond-sucker, the Black Minnow, a species allied to the Pike; and, although not a Canadian species, the Gold-fish. Illustrations were also given of the behaviour in captivity of the Painted Turtle, the Water Newt, the Shad Frog, and the American Crayfish. In conclusion the lecturer stated that in part No. 2 of Aquaria Studies, he hoped to give descriptions of the microscopical denizens of his miniature pond.

DIARY

THURSDAY, May 26.

Society of Antiquaries, at 8.30.—Election of Fellows.
Zoological Society, at 8.30.—On Dinornis (Part xvi.), containing Notices of Internal Organs of some Species, with a Description of the Brain and some Nerves and Muscles of the Head of the Apteryx australis: Professor Owen, F.R.S.—Notes on the Anatomy of the Prongbuck (Antilocapra americana): Dr. J. Murie.—Some Remarks on the Poison Glands of the Genus Callophis: Dr. A. B. Meyer.—Notes on some Fishes from the Western Coast of India: Surgeon Francis Day.
Royal Institution, at 3.—Electricity: Prof. Tyndall.

FRIDAY, May 27.

Royal Institution, at 8.—Primitive Vegetation of the Earth: Principal Dawson.
Quekett Microscopical Society, at 8.

SATURDAY, May 28.

Royal Institution, at 3.—Comets: Prof. Grant.

MONDAY, May 30.

London Institution, at 4.—Botany: Prof. Bentley.

TUESDAY, May 31.

Anthropological Society, at 8.—On the Armenians of Southern India: Dr. John Shortt.—The Races of Morocco: J. Stirling, M.A.
Royal Institution, at 3.—Present English History: Prof. Seeley.

WEDNESDAY, June 1.

Ethnological Society, at 8.30 (at the Royal United Service Institution, Whitehall Yard).—Report on the Prehistoric Antiquities of Dartmoor: C. Spence Bate.

THURSDAY, June 2.

Royal Society, at 8.30.
Society of Antiquaries, at 8.30.
Chemical Society, at 8.—On the Platinum Ammonias: Dr. Odling.
Linnean Society, at 8.—On some New Forms of Trichopterous Insects.
Royal Institution, at 3.—Electricity: Prof. Tyndall.

BOOKS RECEIVED

English.—On the Strength of Beams, Columns, and Arches: B. Baker (E. and F. Spon).—Flint Chips, a Guide to Prehistoric Archæology: E. T. Stevens (Bell and Daldy).—The Interior of the Earth: H. P. Malet (Hodder and Stoughton.)

Foreign (through Williams and Norgate).—Palæontographica, Beiträge zur Naturgeschichte der Vorwelt; Supplement (Die Fauna der ältern Cephalopoden): R. A. Zittel.—Protozoe Helvetica: W. A. and C. F. Ooster.

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