THURSDAY, MARCH 14, 1912.

HEAT ENGINE LABORATORY PRACTICE.

The Testing of Motive-Power Engines, including Steam Engines and Turbines, Locomotives, Boilers, Condensers, Internal Combustion Engines, Gas Producers, Refrigerators, Air Compressors, Fans, Pumps, &c. By R. Royds. Pp. xii+396. (London: Longmans, Green, and Co., 1911.) Price 9s. net.

DURING the last decade the training of engineering students has undergone a great change. Our colleges have recognised that the engineering laboratory is not only a place where the student may see various principles previously expounded in the lecture-room put into practice and experimentally proved, but that it is a place where tests and trials are carried out upon a commercial basis and in an up-to-date manner by the student himself. If the student be put in direct charge of such tests, he will most assuredly develop that faculty of self-reliance which is one of the characteristics of a successful engineer. Side by side with this internal development there has been a vast change in the design and nature of motive-power engines, so that the modern laboratory has developed into an assembly of many varied types of prime movers. In acquiring information which will enable him successfully to cope with the different practical difficulties met with amongst so many types, the student had to refer to many sources, the chief being the recent publications of the technical societies and Press. This book does that for them, and does it very thoroughly. It meets a distinct want, and at such a reasonable price it should be recommended to all college students.

After giving it a welcome, we hope the author will not take it amiss if we indulge in complaint. Chapter i. treats of general principles of thermodynamics, units, and cycles of operation. On p. 6 the author states that the centigrade scale of temperature measurement is used by some engineers, but more often by physicists and chemists. We believe we should be correct in saying all men of science save some, mostly engineers, use the centigrade scale. Why do not engineers come into line? If the author would have bravely adopted Cent. instead of Fahrenheit, he would have aided in bringing about a change which is slowly coming to pass. This leads us to suggest he might have included the pound-calorie in his enumeration of units of heat, a unit recognised by the University of London in their engineering examinations. Surely also it is more reasonable to expect the conversion of Fah. to Cent. readings to be made by subtracting 32, then multiply by $\frac{5}{9}$, than to remember the suggestion on p. 6, for which no reason is given. At the end of the book there is a series of tables, including conversion constants, properties of various vapours, and steam tables. We note that the latter are from "Marks and Davis." We were hoping that when the last edition of Prof. Ewing's book, "The Steam Engine," was produced, the researches of Prof. Callendar were going to be recognised by English engineers. In an appendix to his book Prof. Ewing gives some properties of steam, and tables, which are certainly more rational in form than any others compiled from data outside Prof. Callendar's papers. We hope that in his next edition the author will introduce the pound-calorie unit and a short explanation of Callendar's work in his chapter i., together with steam tables compiled therefrom, and thus associate himself with Prof. Ewing and Dr. Mollier in bringing about a desirable change. The explanations of the various cycles of operations of the working fluid are well given, and in conjunction with lectures will make an excellent combination for the earnest student.

The testing for accuracy of instruments such as gauges, indicators, &c., makes a long chapter for No. ii. This is good, as many are unduly predisposed to accept such as correct instead of always regarding them with suspicion. We should like to see a device for testing indicator springs hot, the methods shown being all under conditions dissimilar to their actual working state. Does the author use an indicator cock and connect an indicator to a dead-weight gauge tester, as shown in Fig 34? The fluid pressure will more nearly reproduce actual working conditions. Carefully and well written as chapter ii. is, the author is best in chapter iii., on measurement of brake horse-power. We are glad to see a description of a band brake which will give torque without causing a bending action due to large brake loads on one side.

Chapter iv. is outside the scope of English laboratory work. The testing of locomotives is in the hands of a few, and those highly skilled, and therefore needs not a general treatment as is here given, but a special treatise. Is it too much to hope that soon we may have in such a city as London an experimental plant for locomotive testing? It would surely prove of great use even if only for training up stokers at short notice. Chapters v., vi., and vii. are concerned with the testing of steam engines, turbines, and boilers. We are glad to see so much of the report of the Institution of Civil Engineers, vol. cl., embodied in these chapters. The author deals carefully with the "missing quantity" of steam as passed by the

engine, and the pages dealing with leakage to exhaust are very good.

The testing of internal combustion engines is an up-to-date review of work which is being done by the British Association Committee, and also includes gas producers, the Diesel type, &c. The chapter on refrigeration tests is helpful, but, as the author would probably admit, it is very difficult to get all the conditions steady enough to make the tests as satisfactory as could be wished. The testing of water-turbines and pumps complete the book, which is the more valuable for a carefully compiled index at the end. As we stated above, it is a book which is needed, and we can heartily recommend every student to place it on his work-desk. It is comprehensive, but it deals very thoroughly with the most general types of engines and boilers. The illustrations are good and plentiful, and we conclude by congratulating the author on producing such a practical treatise.

A. J. M.

GROWING OUR OWN SUGAR.

Sugar Beet: Some Facts and Some Illusions. A Study in Rural Therapeutics. By "Home Counties" (J. W. Robertson-Scott). Pp. xx. + 424. (London: Horace Cox, "Field" Office, 1911.) 6*s.* net.

THIS work is based largely upon articles published in *The Field* and *The Times* during the years 1910–11, and is essentially an examination of the arguments for and against the proposals to establish a beet sugar industry in this country. "There are those," the author remarks, "who hail sugar beet as the saviour of the countryside; and there are those who are sure that the notion of growing our own sugar at a profit is preposterous." For each of these classes he has collected a large number of "facts," and to some of the former he indicates what in his judgment are "illusions."

That sugar beets can be grown here, and of as good quality as on the Continent, hardly needed demonstration. What did require investigation was whether, in all the circumstances, it was worth our while to do it.

The author examines this question step by step. He describes the chief experiments that have been made in this country, from the Lavenham venture some forty years ago to the East Anglian trials made under Dutch auspices in 1910. In these trials, it may be mentioned, more than three hundred acres were planted with beet intended for exportation to Holland, and the quantity registered as actually exported was 3909 tons. This weight, however, is untrustworthy, as it includes a large proportion of adherent soil. The factory purchasing the roots pays upon the weight of the cleaned beets only; and heavy deductions had to be made from what the farmers supposed to be the weight of their crops. Probably one of the "illusions" indicated in the title arose from calculations based upon a crop yield which, for the reason mentioned, might be over-estimated as much as 10 to 50 per cent. Whilst average crops of more than 20 tons per acre have been talked about in this country, the cold fact remains that on the Continent in 1910 the average yield ranged from 9·3 tons in France to 13·3 tons in Germany.

For various reasons the East Anglian experiments were only moderately successful. The causes of this are indicated; and the author compares the results of these and other English efforts with the teachings of practical experience abroad. He quotes numerous reports, and generally gives chapter and verse for his carefully guarded conclusions. These are, briefly, that a cooperative factory, growing its own beets, or a large proportion of them, would have the best chance of success; but that an ordinary factory, established after careful investigation, under good management, and with proper support from farmers in the vicinity, would have fair prospects; also that the introduction of the beet sugar industry would help in bringing about in rural England changes of some value agriculturally and sociologically, and is deserving therefore of sympathetic study. Owing, however, to the developed condition of our agriculture, and also to the increasing competition of cane sugar, the benefit in England would not be likely to equal that obtained on the Continent.

Of purely scientific interest there is very little in this "study in rural therapeutics"; but from the agricultural point of view it ought to do a good deal towards clearing away misconceptions.

C. S.

COLLOIDS IN INDUSTRY.

Die Bedeutung der Kolloide für die Technik. Allgemein verständlich dargestellt von Prof. Kurt Arndt. Zweite Auflage. Pp. 46. (Dresden: Theodor Steinkopff, 1911.) Price mk. 1.50.

ALTHOUGH it is fifty years since the distinction between colloids and crystalloids was first drawn by Thomas Graham, it is only quite recently that the conception of colloid substances has been extended beyond the ranks of a few specialists to possess some meaning for the public at large. Almost as recent and remarkable in its suddenness has been the feverish eagerness with which the properties and behaviour of colloids have been investigated. In Germany, there are several journals devoted entirely to colloid chemistry, as well as text-books of every variety.

Unfortunately, there is a tendency to adopt an exaggerated terminology, and to obscure the problems by complicated methods of treatment instead of striving after the simplest possible language. In consequence, the subject is invested with a mysticism which is quite unnecessary.

For this reason a book of the type written by Dr. Arndt is to be welcomed, and the fact that an edition has been exhausted already shows that the work has met a demand.

Following a brief introduction, which, although necessarily condensed, is written in relatively simple style, attention is directed in turn to a number of industries in which the materials handled are colloids. It is the aim of these sections to emphasise the fact that the substances concerned are colloids rather than to explain their behaviour in practice. The list is a very extensive one, ranging from such inorganic materials as glass, tungsten lamp filaments, pottery, and cements to organic industries, including dyeing, tanning, soap-boiling, brewing. Finally, reference is made to the part played by colloids in sewage disposal and in agriculture. The examples are very comprehensive, and serve to show how generally colloids enter into industrial operations.

The discovery by Siedentopf and Zsigmondy of the ultra-microscope, an instrument whereby the single particles in colloid solutions are made visible, has facilitated greatly the investigation of colloidal solutions of metals. In the manufacture of ruby glass, for example, gold chloride is added to the molten glass; when quickly cooled this is colourless, but on subsequent heating up to the point of softening, it suddenly becomes ruby red. The ultramicroscope shows the presence in the coloured glass of colloidal gold particles; in the colourless glass none are to be seen. The explanation is that at first the gold particles are too small to colour the glass; on heating, they increase in size and give rise to the colour.

E. F. A.

PRACTICAL PYROMETRY.

Pyrometry: a Practical Treatise on the Measurement of High Temperatures. By Chas. R. Darling. Pp. xii + 200. (London: E. and F. N. Spon, Ltd.; New York: Spon and Chamberlain, 1911.) Price 5*s.* net.

WITHIN recent years pyrometry has become an essential factor in a large number of industrial operations where high temperatures are involved; particularly is this the case in the metallurgy of steel, where success or failure often entirely depends on correct adjustment of the temperature within narrow limits. Mr. Darling's excellent series of Cantor lectures were therefore very welcome, and no less welcome and of wider service will this small volume, the outcome of these lectures, prove.

The "practical man" has a love for the "practical" test in the furnace or kiln, and for many operations, such as those in pottery and china production, an actual firing test is to be commended, but generally manufacturers are devoting more attention to actual temperature measurements. Great advances have been made in recent years in perfecting forms of pyrometers suitable for works practice, amongst which mention may be made of temperature recorders continuous in action, and pyrometers of the radiation type, first introduced by Féry in 1902. The later form of these instruments, with fixed focus, enables excellent measurements of furnace, molten metal, and other high temperatures to be taken by the simple process of directing the pyrometer at the object and reading the deflection on a suitable portable galvanometer.

The author deals in a comprehensive manner with the various types of instruments, and gives valuable advice as to the suitability of those of different classes for special purposes, and emphasises the fact that choice of an unsuitable pattern has often led to considerable monetary loss and the condemnation of an instrument which, in its proper sphere, would have proved satisfactory.

After mentioning that for practical purposes the gas scale is in agreement with the thermodynamical scale of temperature, and serves as a standard of comparison for other instruments of practical form, the author points out that comparison is only possible to the present limit of the gas scale (1550° C.), and that beyond this the results can only be arrived at by extrapolation, which in some cases has led to grave errors. With instruments of the radiation type, however, assumption that the laws applicable for the lower ranges will hold for the higher ones appears to be justified.

Mr. Darling is a clear and concise writer on a scientific subject which has wide commercial application, and his treatment of the subject of practical high temperature measurement in this volume will commend itself to the practical man, who, whilst requiring sufficient of the scientific side to understand the principles involved, does not require abstruse science in his handbooks. This volume, like the author's well known "Heat for Engineers," admirably fulfils these requirements.

J. S. S. B.

POPULAR BOTANY.

British Trees, including the Finer Shrubs for Garden and Woodland. By the late Rev. C. A. Johns. Edited by E. T. Cook. Pp. xvi+285+56 plate (24 coloured).

British Fungi: with a Chapter on Lichens. By George Massee. Pp. x+551+40 plates (coloured).

(London: G. Routledge and Sons, Ltd.; New York: E. P. Dutton and Co., n.d.) Price 7*s.* 6*d.* net each.

ONE of these two books, which are uniform in external appearance only, represents, we presume, the demand which has affected publications of all kinds for books with coloured illustrations. The result has been an output of a large number of bad books, and to this class we unhesitatingly relegate the new edition of Johns's Trees and Shrubs. The coloured plates of the trees and shrubs are so poor—they appear to be photographs daubed with colour—that in most cases it is only from the label at the foot that one can discover what the picture is meant to represent. The value of coloured plates is, on the other hand, well shown by Mr. Massee's book on fungi, since in the bold and well-executed plates by Miss Ivy Massee the distinguishing characters of many of the species described can be seen at a glance and in a manner which would be otherwise impossible.

Mr. Massee's book is mainly intended to enable the naturalist to determine the names of our British fungi; but it should do more than this, and should help to create a real and intelligent interest in the subject.

The somewhat unorthodox statements met with here and there are decidedly refreshing, and should act as a stimulus to those who might otherwise be mere collectors of fungi. The first part of the book, consisting of 63 pages, serves as a general introduction to the systematic section of the book. In this earlier portion an adequate account of the structure and of the relationships of the various groups of fungi is given, which will enable the user of the book to understand the essential details of fungal morphology. The chapters on methods of collection and modes of preservation are equally valuable. On the recognition of edible and poisonous species the coloured plates play a most important part, and the dictum of Dr. M. C. Cooke, "Eat them; if you live they are edible; if you die they are poisonous," reminds us of the similar advice given by Mr. Belloc about the viper:—

"Yet another great truth I record in my verse,
That some vipers are venomous, some the reverse;
A fact you may prove if you try
By procuring two vipers and letting them bite;
With the first you are only the worse for the fight,
But after the second you die."

A few words of criticism must be added, since owing to some carelessness the enumeration of the figures on Plate ii. is incorrect, and the uninitiated person may not be able to recognise which is the poisonous fly agaric. It is also somewhat unreasonable suddenly to come across the explanation of Plate i. facing p. 83.

In the second part it is difficult to find one's way about, as no reference to pages is given from the generic keys, and this entails a good deal of tiresome hunting which might easily have been avoided. Apart from these slight blemishes, however, the book is deserving of all praise. The short concluding chapter on lichens is quite useful, but we hope, with the author, that before long we may have a good book on these plants, and that it will be written and illustrated in as able a manner as the volume under review.

To turn to the work on trees and shrubs is not a pleasant task. Had the truth of the saying about new wine and old bottles been appreciated, this new edition might not have been produced; and when the new wine proves to be bad, the disaster is all the more conspicuous. It is a book without order or definite plan of arrangement. Much useful and interesting information is given under the different trees and shrubs described, but turning over the pages is somewhat like fishing in a bran pie, as one never knows what the next article will be. The plates also afford no clue, as for the most part they are distributed haphazard through the text without any reference to their proper positions. There are a large number of reproductions from photographs, and these are in striking contrast to those in colour. Most of them and several of the coloured illustrations also have obviously been taken in the Royal Botanic Gardens, Kew, and there seems to be no reason why this fact should not be stated. The plate of *Salix fragilis* in colour is identical with a photograph published in the Kew Bulletin in 1907.

A curious case is afforded under Robinia, where without any word of explanation an illustration of the curious and uncommon fastigiate variety at Kew is given, which would lead the ordinary reader to believe that this is the normal appearance of the tree. Then, again, the statement at the foot of a plate of a remarkably fine and healthy specimen of the monkey puzzle (*Araucaria imbricata*) that it "is not suitable for Britain, as it soon dies off," is, of course, a glaring error. The book is unworthy of further notice, for even the text figures are of no value.

OUR BOOKSHELF.

Das Pflanzenreich. Herausgegeben von A. Engler. Heft 48 (iv., 23C), Araceæ-Lasioideæ. By A. Engler. Pp. 130. Price 6.60 marks. Heft 49 (iv., 101, Nachträge), Monimiaceæ (Nachträge). By J. Perkins. Pp. 67. Price 3.60 marks. Heft 50 (iv., 50, ii. B. 21), Orchidaceæ-Monandræ-Dendrobiinæ. Pars ii. Genera n. 278–279, and (iv., 50, ii. B. 23) Orchidaceæ-Monandræ—Thelasinæ. Genera 280 and 280A. By Fr. Kränzlin. Pp. 182+46. Price 11.60 marks. (Leipzig: W. Engelmann, 1911.)

THE subfamily Lasioideæ includes Amorphophallus, Rhektophyllum, a West African climber, Montrichardia, an arborescent form, and many tuberous-stemmed plants such as *Thomsonia nepalensis*; vegetative shoots or bulbils are normally developed from such tubers, being produced in great profusion by *Dracontium asperum*. Entire sagittate leaves are not uncommon, but a much divided leaf with sagittate outline is more typical. The spadix is exceedingly variable in form; in the case of *Amorphophallus rex* it bears a peculiar appendage and a singular spathe. The various phylogenetic relationships of the various genera are discussed at length. Cytospermum is regarded as the most primitive on account of its perigoniate hermaphrodite flower, the presence of endosperm in the seed and its pantropic distribution; the genera Nephthylis and Montrichardia are placed at the other end of the scale by reason of their naked unisexual flowers and poral dehiscence of the anthers.

The supplement to the early volume on the Monimiaceæ contains the additions that have accumulated in ten years. A compliment is paid to a well-known benefactor by the establishment of a new genus Carnegiea, although the association with a type specimen from New Caledonia is not immediately obvious. Two new myrmecophilous plants are noted in *Steganthera insignis* and *S. torricelliensis*.

The fiftieth part is principally a monograph of the genus Eria, in which the author follows Lindley except in the separation of the subgenus Trichotosia; with these two, Porpax is closely associated, but Phreatia is removed from the Dendrobiinæ to a new combination with Thelasis.

Primitive Animals. By Geoffrey Smith. Pp. x+156. (Cambridge: University Press, 1911.) Price 1*s.* net.

IN this book the author gives a concise account of the principal characters of a number of primitive animals, and of the arguments based upon their study. He first shows the great antiquity of the chief phyla by instancing the fact that in the oldest fossil-bearing rocks (Cambrian) there are representatives of certain families of Crustacea (Nebaliidæ, Cypridæ) which exist at the present day. In considering the lowest forms of life, the author points out that animals depend ultimately for their food upon plants, and suggests that "the presence of chlorophyll was the necessary precursor of life," but concludes that the problem of the origin of life is not within range of solution. Special attention is devoted to the Appendiculata, and particularly to Peripatus as a connecting link between Annelids and Arthropods. The structure of Nebalia and Anaspides is discussed in reference to the light it throws on the course of crustacean evolution. The chief characters of several invertebrate larval forms are considered in regard to their bearing on the relationships of certain phyla to one another; in this connection Mr. Smith maintains that, although certain larval forms, *e.g.* the trochosphere and the nauplius, may be ancient, they are not to be regarded as representing the ancestral form of the phyla to which they belong.

The annelid theory of vertebrate descent is discussed, and the difficulty of reconciling this view with the conditions present in Balanoglossus is pointed out, the origin of vertebrates being relegated by the author to the category of unsolved problems. Among other subjects treated in an interesting manner are the derivation of lungs from the air-bladder of Dipnoi, the rise of the mammals, and the degeneracy of marsupials. The volume brings into prominence the special features which have been found to throw light on phylogenetic problems, and is a good introduction to the mode of application of the comparative method in morphology, and to some of the principal results obtained.

Micropetrology for Beginners. An Introduction to the Use of the Microscope in the Examination of Thin Sections of Igneous Rocks. By J. E. Wynfield Rhodes. With a preface by C. H. Sidebotham. Pp. xv+126. (London: Longmans, Green and Co., 1912.) Price 2*s.* 6*d.* net.

THE object of this work, as stated by its author, is to supply teachers in evening technical schools, and others, with practical information on the use of the petrological microscope—so far at least as is necessary in the instruction of students in geology for the Intermediate B.Sc. of the London University. It is disappointing to find that a work of this kind is considered to be necessary, for it might fairly be hoped that teachers, undertaking the preparation of candidates for university degrees, would themselves have the necessary practical knowledge for the guidance of their students in manipulation—seeing that an ounce of *showing* is worth a pound of *telling*.

So far as is possible in work of this kind, the practical directions given in the book are clear, and anticipate many of the difficulties that may arise. The weakest portion of the book is the second chapter, in which an attempt is made, in a few pages, to deal with the question of the optical properties of minerals. In the aim at condensation many unexplained terms are employed, and not a few statements are made which are open to serious criticism. Much more successful is the latter portion of the book, in which a number of rock-sections are described and illustrated; but as the selection of rocks is confined to

those of igneous origin, many important rock-forming minerals, like the garnets, are not among those figured. The preface of the book suggests that it is not intended to take the place of an ordinary text-book, but to supply the information which is not given in such works, being left for the laboratory-demonstrator to supply—and this would seem to be the limit of the book's usefulness.

Famous Chemists. By E. Roberts. Pp. 247. (London: G. Allen and Co., Ltd., 1911.) Price 2*s.* 6*d.*

IT seems a little difficult to understand the object of writing a series of disconnected short biographies of distinguished chemists now that we have several readable histories of chemistry of moderate compass in which biography is woven into connected narrative. At the same time it must be stated, after conscientiously reading the book from cover to cover, that these biographical epitomes are well done. The chief contributions of each master are clearly indicated, and the human touches on the whole artistically added. Boyle hardly has his due proportion, and Berthelot and van't Hoff are not included at all.

Perhaps the chief thing to be said for this compact gallery of chemists is that it may help to stimulate an interest in history, and lead the reader to a more thorough study of the life-work of the great men who have made chemistry what it is. This is an educational and liberalising side of chemical study which in the past has been much neglected. It is a pure convention, and a mischievous one, that isolates the study of natural philosophy itself from the study of its history.

A. S.

Earth and her Children. By Herbert M. Livens. Pp. 248. (London: T. Fisher Unwin, 1912.) Price 5*s.* net.

MR. LIVENS practises the art of teaching nature study by means of pleasant little stories in which plants and animals speak autobiographically. The nature knowledge imparted in the twenty-four chapters into which the book is divided is much diluted by the conversational matter introduced, but the stories will please many children, and may lead a few to observe nature for themselves.

LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of* NATURE. *No notice is taken of anonymous communications.*]

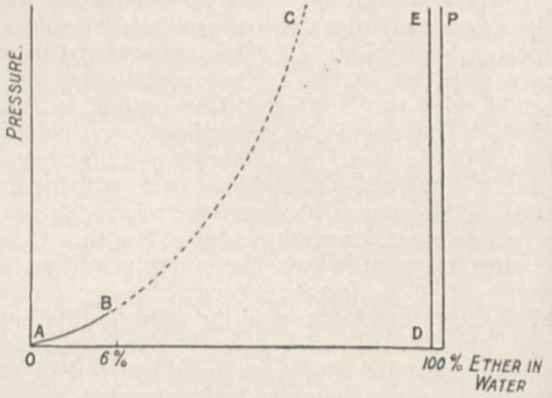
Osmotic and Liquid Membranes.

IN an interesting letter in NATURE of February 22 Lord Berkeley has considered the question of a possible osmotic cycle in which a liquid such as ether is placed at the same time in connection through membranes with an aqueous solution of sugar and with water, while the latter is also in similar connection with the solution.

The water is kept at zero pressure, while the ether and the solution are at the osmotic pressure of the latter.

As a consequence of a view of osmotic membranes which I have lately ventured to put forward in a paper in the Proc. Roy. Soc., he quite correctly deduces that equilibrium should exist for different strengths of the sugar solution provided the pressure is its osmotic pressure, and in addition that the ether should hold the same amount of water in solution at the different pressures. Or, to quote his words, "the same solution of water in ether has two different osmotic pressures." This he regards as impossible.

Perhaps the best way to consider this question is to examine first the simple case of water placed on either side of a membrane permeable to water, but not to ether, and to suppose ether gradually added to one side. The osmotic pressure will rise, as shown by AB, to a maximum value at about 6 per cent. of ether. No solution of greater strength than this is possible until we reach 98·95 per cent. The osmotic pressure is now again zero, but rapidly rises, as shown



along DE, approaching the pressure axis P asymptotically; so that practically without any concentration change we can have any osmotic pressure we please.

The dotted curve has been added to show the normal character of the curve for substances which dissolve in all proportions, and probably if the pressure on both sides of our membrane were raised to a sufficiently high value the two portions of the ether curve would unite somewhat after the fashion of the Van der Waals's isothermals, and ultimately form the normal case, because experiments (not yet published) show that the portion DE moves to the left under pressure.

If the above experiment be supposed repeated, but with sugar in solution on the other side of the membrane to that to which the ether is added, the first possible *strong* solution of ether is greater than 98·95 per cent., or DE is moved to the right. As in the case of water, so in the case of sugar solution, DE can be moved to the left by raising the pressure on both sides of the membrane. For a 60 per cent. solution of sugar the pressure to bring it back to its old position is 80 atmospheres.

Returning now to Lord Berkeley's cycle, we are in a position to see how equilibrium can exist without an appreciable change in strength of the ether solution when different strengths of the sugar solution are used. Referring to his figure, equilibrium exists across membrane *bd* at the osmotic pressure of the solution when the concentration of the ether is 98·95 per cent., and practically the same concentration is required for equilibrium at the membrane *bc*, no matter what the pressure may be.

Perhaps I may add that the view of osmotic membranes which I wished in my paper to emphasise is that a substance which acts as ether does in the condition at DE can, so long as the mechanical strength

is somehow supplied, cause water to pass into a solution; for on the side of the solution it holds less water than on the side of the water unless the solution is raised in pressure so as to bring the concentration of water in the ether to be the same throughout.

FRED. T. TROUTON.

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The Weather of 1911.

IT is probably no exaggeration to say that all students of meteorology who have been fortunate enough to read Sir Edward Fry's letter in NATURE of November 16 have been greatly impressed by it, and have awaited with eagerness the discussion to which it must inevitably lead. Already, at this early stage, they must feel a sense of gratitude to the writer of the letter for having enriched the science by calling forth the excellent reply from Dr. Shaw in the number of November 30.

Now, as was to be expected, that ultra-violet solar radiation has come up for consideration, and Dr. Carl Ramsauer, in the issue of December 14, has entered a strong plea for recognition of the part it did not play in producing rain, in Europe, during the summer and fall of 1911, the time seems ripe for "the other side of the world" to enter the discussion, so that European men of science may take a glance "out and beyond their latticed home," and realise that sunshine and meteorological changes are phenomena quite commonly witnessed in other regions of the earth.

It is to be understood that nothing in this letter is to be considered as the result of a careful study of observational data, and, furthermore, that the ideas here expressed have been inspired solely by articles in NATURE, by my personal experience, and by a cursory knowledge of meteorological changes gained from the weather chart of the Argentine Meteorological Office, which shows the daily changes over the southern half of South America, a region quite as extensive as, if not much greater than, all Europe.

In his interesting article, Dr. Ramsauer says, amongst other things, that he and Prof. Lenard have distinguished three actions of ultra-violet light on dust-free gases, and that one of these actions is the "formation of condensation nuclei." This, he says, gives us the *chief* source of nuclei in the earth's atmosphere, which are meteorologically so important; and his final conclusion is:—"Thus the lack of nuclei, and the consequent fine weather of the year, can be attributed to a *much diminished ultra-violet radiation of the sun.*" (The italics are mine.) He makes no mention as to variable efficiency in different parts of a bundle of solar rays, and so his conclusion must be taken as uniformly applicable to the entire bundle of rays impinging upon the earth. As the difference of longitude between the two continents is only a few hours, it may be assumed that the solar rays falling upon Europe and South America constitute separate parts of a single uniform bundle of rays; also, as ultra-violet rays are to be considered as the controlling agency in the production of condensation nuclei, they must be assumed to be most active, and rainfall therefore most copious, over the continent with the midsummer sun. Let us see how far his conclusions are justified by facts.

During the mid-year and later months of 1911 Europe experienced an unprecedented season of heat and drought, beneath the unobstructed rays of a high sun; Dr. Shaw states that apparently all requisites for dense clouds and heavy rains were frequently satisfied, and Dr. Ramsauer suggests that the poverty of the intense solar rays in ultra-violet waves was responsible for the fact that no precipitation occurred. During the same period, July to November, a portion of South America equal in extent to Europe, under the relatively feeble radiation of a low sun, was treated to a superabundance of condensation nuclei, and probably to the most excessive drenching ever noted in this part of the world. The current conditions, with reversed seasons, are really just as interesting. The rains continued here during the summer solstice and ended suddenly on January 1; so that, on passing through perihelion, although the sun was not far from the zenith, and was about five million miles nearer than when Europe experienced its extraordinary weather, sending out proportionately more intense ultra-violet and all other kinds of solar rays, the sky was clear, and has remained practically so during the past two weeks of our midsummer, notwithstanding that this is normally the rainy season of the year, and conditions are favourable for the development of showers and even general rains; meanwhile in Europe, *mirabile dictu*, the advent of the new year has been marked by disastrous floods in many parts.

Do not these facts constitute another exemplification of the saying that "one-half of the world does not know (usually realise) how the other half lives," and of the further thought that it is extremely difficult completely to interpret cosmical processes by means of laboratory experiments?

In the present state of the sciences of meteorology and solar physics it is impossible to look upon these perfect and abnormal contrasts of the past year in the conditions in Europe and South America as merely fortuitous occurrences. In seeking for their explanation we must inevitably follow Dr. Shaw in ascribing the important terrestrial activities to the dynamics of the upper air, and amplify his proposition slightly by naming the sun as the prime source of all the trouble. Is it not possible that with the already long period—nearly two years—of almost complete quiet on the solar disc, the conditions on the earth are approximating to what they would be if the sun were not a variable star? With a constant output of solar energy would not the atmospheric layer contained between the isothermal region and the earth's surface act more uniformly, like an engine—the part over the summer hemisphere, being heated by the most intense radiation during long days, acting as steam chest; the part over the winter hemisphere, cooling through long nights and feeble solar radiation, acting as condenser, while the convective processes of the equatorial region serve as the safety-valve through which would be brought about an orderly alternation of hot and relatively dry summers, and wet but not extremely cold winters in both hemispheres?

It is probable that a complete answer to Sir Edward Fry's question will have to come from some such world-wide conception as this rather than from a study of meteorological conditions on a particular continent. Possibly the pronounced conditions during the past year may point out a way for alleviating to some extent the disappointment of those investigators who seek to establish a well-defined periodicity in temperature and rainfall variations based upon the variability of the sun, as they apparently emphasise the necessity of determining exactly the epochs of maxima and minima in the sun's own period, and taking account of his position in the ecliptic at such times. If a minimum, for instance, coincide with a solstice, then an abnormally hot and dry summer in one hemisphere, with an abnormally wet and probably warm winter in the opposite one, should be considered as confirming the sun-spot theory, and not as contradicting it, and so the effect may be graduated

around the ecliptic, being least pronounced probably when a minimum falls in an equinoctial month. A hasty comparison of Dr. Wolfer's relative sun-spot numbers with the rainfall data of a few widely separated stations appears to hold out some encouragement for treating the data in this way.

L. G. SCHULTZ.

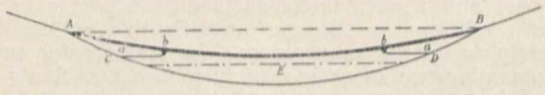
Oficina Meteorológica Argentina, Observatorio Magnético, Pilar, Córdoba, January 16.

Concentric Joints in Ice.

IN NATURE for January 25 a correspondent directed attention to concentric joints and bulbs which he noticed in the thin ice-sheets which covered several small partially dried-up pools, and stated that he would like to have an explanation of their cause.

I have seen circular ribs on the underside of ice-sheets on small pools which would appear to have been formed as shown by the accompanying diagram.

When the pool was full of water, a thin sheet of ice formed between A and B. As the water sank into the ground an air space *aa* formed near the margins, the ice at the same time sagging. During the frost the further inward spread of the air space was arrested for a time by the freezing of the ring *bb*. Soon, however, in spite of the growth of the ring, the fall of the water-level allowed the air space



aa suddenly to increase in size, and another ring was then formed inside the first, the process being repeated several times, until the water-level fell to E clear of the ice. From the water surface evaporation took place, and the vapour condensed on the underside of the ice-sheet, thickened it and made the ridges more pronounced and bulb-like.

The number of rings and the thickness of the ice depend upon the keenness of the frost and the rate at which the water-level falls.

A similar structure can be produced by perforations in thin ice-sheets partially supported by vegetation. The innermost ring is then the one first formed.

The fact that lines of weakness are produced above each rib is interesting, but has escaped my notice.

R. M. DEELEY.

Inglewood, Longcroft Avenue, Harpenden.

Remuneration of Public Analysts.

ON behalf of the Association of Chemical Technologists, I beg to enter a strong protest against the course of action that is being followed by the Lambeth and Wandsworth Borough Councils in regard to the filling of the appointments of public analyst for those boroughs which have become vacant by the death of Dr. John Muter.

The terms of remuneration offered by both these borough councils are far below the lowest of the very inadequate rates of payment made to public analysts in London and throughout the country, and the acceptance of such appointments by a qualified scientific chemist on such terms would be degrading to the chemical profession and detrimental in the highest degree to the interests of the public. On the terms offered, it is absolutely impossible that the responsible duties attaching to such appointments can be efficiently performed. A public analyst has great personal responsibility, his position is one of considerable anxiety, the value of his work is not generally understood, and the office he holds is widely disliked, for he is appointed under the provisions of Acts of Parliament which are extremely unpopular among certain sections of the community. It is therefore essential that he should be in a position of such independence that he may not be liable to influence or pressure from any persons whose interest it may be to prevent, so far as possible, the effective administration of the Acts. It must be remembered, too, that with the enormous increase in scientific adulteration, the work of a public analyst is to-day very different from the work required even ten years ago, and it is therefore all the more necessary that the general public for whose protection the Acts were passed should appreciate the advisability of preventing the ever-increasing attempts of local authorities of a certain type to reduce the remuneration of the scientific officers concerned to a level rendering the satisfactory discharge of their duties impossible.

J. WILBERFORCE GREEN (*Secretary*).

30 Victoria Street, Westminster, London, S.W., March 6.

The Storm of March 4.

IN NATURE of March 7 reference is made to the storm of March 4, and figures are quoted giving the velocity of the wind recorded at several stations. It would appear that the storm attained a greater velocity here than at either of the stations named, and a few particulars of the record made by the Dines pressure-tube anemometer erected at Pendennis Castle, Falmouth, by the Meteorological Office, may be of interest.

On the morning of March 4 a progressive mean velocity of from 20 to 50 miles an hour was recorded; at 6 p.m. it had increased to 65 miles per hour, and this velocity was maintained to midnight. The squalls were very violent; between 2 p.m. and midnight a maximum velocity of 80 miles or more was registered more than twenty times, whilst the greatest squall attained a velocity of 98 miles at 6 p.m. This has been but once exceeded (or reached) since the anemometer was erected in 1902, viz. 103 miles at 11.30 p.m. of March 14, 1905.

EDWARD KITTO (*Superintendent*).

The Observatory, Falmouth, March 11.

Observed Fall of an Aërolite near St. Albans.

DURING a heavy thunderstorm which ensued on Monday, March 4, between 2.30 p.m. and 4.15 p.m., an aërolite was observed to fall at Colney Heath, near St. Albans. The observer, who has placed the specimen in my hands for examination, stated that the stone fell within a few feet from where he was standing, and that it entered the ground for a distance of about 3 ft. Its fall was accompanied by an unusually heavy clap of thunder. The example weighs 5 lb. 14½ oz., and measures 6¾ in. × 5⅝ in. at its greatest length and breadth respectively. The mass is irregularly ovate on the one side, and broken in outline on the other. The actual surface throughout is fairly deeply pitted, and under magnification exhibits the usual chondritic structure of the crystalline matter, with interspersed particles of what appears to be nickeliferous iron.

G. E. BULLEN.

Hertfordshire Museum, St. Albans.

TRAVEL, SPORT, AND ADMINISTRATION.[1]

IN a handsome volume Mr. Hesketh Prichard tells the story of a short journey made by Mr. G. M. Gathorne-Hardy and himself in Labrador in 1910. The coast settlement of Nairn, from which the journey started up the Fraser River, lies somewhat north of the centre of the Labrador coast. In this latitude there is little enough to tempt men up to the interior plateau, and the explorers broke new ground in striking out of the Fraser Valley, climbing a tributary valley on its south flank, and striking southward and westward to the George River. They returned on their tracks, so were able to travel light when on the plateau by leaving caches of food at different points against their return. They depended largely on game and fish, and were fortunate in obtaining a sufficiency of both, though more than once they went hungry. The writer points out, and it is easy to realise, how near to the margin of safety an expedition travels thus lightly equipped and in so desolate a country. Adverse circumstances carried Leonidas Hubbard across that margin and drove him to starvation; Mr. Prichard pays a moving tribute to his efforts. It does not appear that the present expedition attempted more than to see "what the country looks like"; scientific observation was not systematically attempted in any direction. But valuable details as to the physical geography of the country traversed are to be gathered from the narrative, and among several photographs of interest in this connection, that of a raised beach in the George Valley may be selected for mention. And the travellers can speak with authority on sub-Arctic insect pests.

FIG. 1.—A "raised beach" in the George Valley. From "Through Trackless Labrador."

The Rocky Mountains and Selkirks in Canada have been visited by more than one scientific mountaineer, and Prof. Coleman's name stands very high among the number. In the present volume the scientific side of his work gives place for the most part to the interests of the mountaineer and the simple love of the mountains which is shared by all who visit them. Sometimes, however, occasion is found for an easy lesson on mountain-building and like topics; on page 357 and following pages there is an admirable explanation of the raising and shaping of Mount Robson, the summit of which the author was not destined to reach, in spite of more than one attempt. The accounts of the author's journeys range back over a number of years. His first visit to the Rockies was made in 1884. In 1885 he was in the Selkirks, and in 1888 he made a venturesome journey by canoe on the Columbia River. The latest journey described in the book is that above referred to, when Mount Robson was visited in 1908. It is not always easy to say exactly where a traveller has broken new ground in these mountains; hunters, prospectors, and railway reconnaissance surveyors have covered much of the ground. Moreover, instances have often been mentioned (and Prof. Coleman mentions some) of existing maps being found so untrustworthy as to be unrecognisable on the spot. In localities where he was not actually treading a new trail Prof. Coleman was sometimes the first scientific traveller to tread an old one, and mountaineers and tourists who may in the future follow him in increasing numbers as the country is opened up will find many occasions to thank him for what is obviously to him a labour of love.

The area dealt with in "Abdullah Mansûr's" book is, broadly speaking, south-western Arabia, and more particularly the Aden protectorate and its hinterland. The writer brings to his task the experience of ten years' service in the protectorate and a keen sense of humour, which together make his book no less entertaining than instructive. He points out, on the opening page of a very able introduction, how on leaving the sphere of imme-

[1] "Through Trackless Labrador." By H. Hesketh Prichard. With a Chapter on Fishing, by G. M Gathorne-Hardy. Pp. xv+254. (London: Wm. Heinemann, 1911.) Price 15*s.* net.

"The Canadian Rockies. New and Old Trails." By Prof. A. P. Coleman, F.R.S. Pp. 383+3 maps. (London: T. Fisher Unwin, 1911.) Price 12*s.* 6*d.* net.

"The Land of Uz." By Abdullah Mansûr (G. Wyman Bury). Pp. xxviii+354+plates+map. (London: Macmillan and Co., Ltd., 1911.) Price 8*s.* 6*d.* net.

"Sporting Reminiscences." By Sir Edward Durand, Bart. Pp. xi+200. (London: John Murray, 1911.) Price 8*s.* net.

"The Making of Northern Nigeria." By Capt C. W. J. Orr. Pp. x+306+4 maps. (London: Macmillan and Co., Ltd., 1911.) Price 8*s.* 6*d.* net.

"The Story of the Zulus." By J. Y. Gibson. New edition, revised and extended. Pp. vii+338. (London: Longmans, Green, and Co., 1911.) Price 7*s.* 6*d.*

diate British influence the traveller feels the impression of "having stepped back in the pages of history to mediæval times. This illusion is further enhanced by ancestral castles and a working feudal system." This being so, the author might perhaps be criticised on the score of anachronism when he tells his story in good colloquial language of the most modern kind, and even makes the native characters on his stage converse in it—were it not that the change from the conventional biblical style in rendering native speech is frankly refreshing. The Aden hinterland merges into a region which is one of the least known in the world—the seat of an early civilisation which must either have existed under more favourable climatic conditions than now obtain there, or must have learned means of contending against conditions now forbidding settlement, if not mere passage. Mr. Bury clearly feels regret at having stood on the threshold of the unknown without entering it. Nevertheless, he adds much to the knowledge of the parts which he visited—their geography, their inhabitants, and their fauna. History is dealt with in an appendix, as well as in a preface by Major-General Maitland, an ex-political resident at Aden. A compliment is due to the few lines which close the book, entitled "A Desert Vesper."

FIG. 2.—The Selkirks from Asulkan Pass. From "The Canadian Rockies."

Sir Edward Durand's book is the record of a mighty hunter, though it makes "no pretence of posing as a sporting classic." In its pages will be found stories of practically every form of sport in India from tiger-shooting to mahseer-fishing. The writer had exceptional opportunities of enjoying the best sport that the country could furnish. His experiences, therefore, should serve as a guide to others, and his stories are often made to point a moral. He writes, perhaps, on no subject with more authority than on horses in his third chapter, at the opening of which he says, "I have had a large number pass through my hands, from racers and hunters to polo ponies." He greatly favours the Arab, with its "cannon-bone of the consistence of ivory"—in respect of this particular feature there is an interesting comparison between various breeds. This chapter is full of sound advice. There are very effective illustrations in half-tone from drawings portraying the chase of the tiger, wild pig, and other animals.

It is difficult to realise that the bulk of the matter which makes up Capt. Orr's history of Northern Nigeria deals with events confined within the last decade. It was in 1900 that the British Government assumed direct control in this territory. This form of administration had been preceded by chartered company administration, but Sir George Goldie had shown that "the absorption of the company in the Imperial Government" was a process contemplated when the company first applied for its charter. The company had deserved well of the Empire as an administrative organisation; it had to contend not only with internal native opposition, but with external complications, until the Anglo-French Convention of 1898 settled the frontier question. Having had assistance from Sir George Goldie himself and the Earl of Scarborough, Capt. Orr is able to tell

the story of the company with no less authority than that of the ten years of Imperial government, in which he himself took part, being attached to the political department of the colony. He treats in full detail of the events of the early years of the century, the occupations of Bauchi, Bornu, Kano, and Sokoto, which were carried out in 1902–1903, followed by the organisation of provinces. The difficulties of establishing a general and equitable system of taxation in place of a local and inequitable native system are fully brought out, and the genius of Sir F. Lugard in attacking this and other problems is clearly seen and acknowledged. Each other important department of administration has its chapter. Introductory to the whole is the survey of the history, such as it is, of the country from the earliest known times, and a chapter descriptive of the country and its people enables the reader to appreciate the problems faced by the administration, especially in respect of dealings with the native peoples. The Hausas and the Fulanis or Fulahs, and particularly the latter, are of especial interest. From this descriptive chapter it appears, as is probably not generally realised, that the Northern Nigerian Government has had to deal, not with uncivilised natives alone, but with peoples who possess or at least claim a certain degree of civilisation and systems of government which already, in some cases, recognise the principles of vassalage and slavery, and are not easily tolerant of a suzerain power. Capt. Orr's volume is illustrated by simple but sufficient maps, save that no attempt is made towards the portrayal of relief or other physical characteristics. There is ground for regret here, especially when it is remembered what admirable geographical work so many Nigerian Government officials have found time to accomplish amid all their strenuous duties.

"The Story of the Zulus" is a rather sombre story, though even by strict historical methods it is not shorn of all the romance attached to it through the medium of fiction. Mr. Gibson has been a magistrate in Zululand, and was brought up in Natal at a time when Zulu opposition to white settlement was active. In this new edition he has been able to make use of new material discovered since the first issue, and the matter of the book has in consequence been not only revised but extended. Its claim to recognition as an authoritative work is thus strengthened.

O. J. R. H.

THE HUMAN FORM.[1]

MANKIND in general is imbued with a deep-rooted instinct of interest in the human form, the reality of which is substantiated by the contrast between the uncouthness of the ape and the gracefulness of man, which this interest, working through sexual selection, has brought about.

But while it is thus ingrained in the nature of all human beings, not excepting even Schopenhauer, to find some fascination in the contemplation of the forms of the rest of our species, there are two classes of students whose business it is, during the course of the technical training for their professional work, to familiarise themselves with the exact topography of the surface of the human body and to inquire into the nature of the factors which determine its form. The artist, be he sculptor or painter, studies the body for the purpose of reproducing its features in the creation of statues or pictures; the medical man because the visible parts of the body afford the landmarks to guide him in the perilous undertakings incidental to his professional labours in the hidden depths of the body.

Although these two classes of students work in the same field of investigation they are seeking different kinds of knowledge, for much of the information that is of vital importance to the surgeon is of no interest to the sculptor. Teachers of anatomy have recently begun to realise that the usefulness of teaching in surface anatomy can be enhanced by taking a wider view of the subject in imparting knowledge to either class of students by borrowing judiciously, both in methods and knowledge, from the other class.

It is now widely acknowledged among teachers of anatomy in medical schools that the use of living models, after the manner of the art-teacher, is essential as a corrective to the mistaken ideas of the surface form of the body acquired from the cadaver in the dissecting-room; and the professional teacher of art-anatomy, if he is in the habit of dissecting, is able to impart to the medical student a great deal of useful information which he acquires when looking at the body from his own viewpoint. The time has come when the real teacher of anatomy for artists has begun to realise that it is not enough to show his students the human skeleton and demonstrate its muscles. He must give him facilities for examining and handling the muscles, and for investigating the nature and arrangement of tendons, aponeuroses, and intermuscular septa, and for studying the varieties of fatty tissues, and the factors (sex, age, and the individual and racial characters) that modify these packing tissues.

But, most important of all, he must be taught the difference between a dead and a live muscle, and between a living muscle that is in active contraction and one that, though "resting," is in a state of tonicity, which is a condition vastly different from the flaccidity of a dead or paralysed muscle.

Such studies are essential if the artist is to portray living men in action, and not merely models in the attitude of performing the given act. By this it is not meant that the student of art should attempt to fathom the mysteries of the "Integrative Action of the Central Nervous System," but he should learn the general principles of reciprocal action of muscles and the meaning of tonus.

[1] "Die äusseren Formen des menschlichen Körpers in ihrem allgemeinen Zustandekommen. By Prof. E. Gaupp. Pp. 57. Thirteenth part of the "Sammlung anatomischer und physiologischer Vorträge und Aufsätze." (Jena: Gustav Fischer, 1911.) Price 1·50 marks.

As a concise and well-balanced introduction to these wider aspects of surface anatomy, Prof. Gaupp's most admirable little brochure deserves to be read by every student of art and medicine; and it is to be hoped that the kind of teaching his book supplies will soon become available in all schools of true art.

In Manchester during the last four years we have had an excellent demonstration of the strikingly beneficial results that can accrue to the student of art when anatomy is taught by an adequately trained teacher with the facilities which a dissecting-room affords.

At a moment when the constitution of the provincial schools of art in this country is in the melting-pot, and new alliances are being discussed with local universities, it is important to emphasise the benefits of such a working association between a school of art and a school of medicine, which will be useful to both.

G. ELLIOT SMITH.

NOTES.

DR. H. BRERETON BAKER, F.R.S., has been appointed to succeed Sir Edward Thorpe, F.R.S., as professor of chemistry in the Imperial College of Science and Technology, South Kensington, at the end of the present session.

MLLE. E. CHANDON has been appointed assistant astronomer at Paris Observatory.

THE widow of the late Prof. Hitzig has given 84,000 marks to the Prussian Academy of Sciences for the encouragement of researches on the brain.

IN reply to a question relating to the protection of ancient buildings and other historic monuments, asked in the House of Commons on March 6, the Prime Minister announced that the First Commissioner of his Majesty's Office of Works proposes to introduce at an early date a Bill dealing with the question of the preservation of ancient monuments and buildings.

THE death is reported, in his fifty-second year, of Dr. Charles Robert Sanger, assistant professor of chemistry at Harvard University from 1899 to 1903, and full professor since the latter date. Before his call to Harvard he occupied the chair of chemistry at the United States Naval Academy and at Washington University, St. Louis, successively. He was a member of the American Chemical Society and of the Deutsche Chemische Gesellschaft.

PROF. HENRY WILLIAMSON HAYNES, says *Science*, has bequeathed to the Peabody Museum of Harvard University 200*l*. for the library and all his prehistoric and archæological objects, and his books and pamphlets relating to such subjects. To the Boston Society of Natural History is given his fossils, minerals, and other objects of natural history. To Harvard College is given Mr. Haynes's Etruscan, Greek, and Roman vases, and his ancient coins and medals. The Boston Museum of Fine Arts is to receive his Egyptian antiquities.

AT the meeting of the Royal Geographical Society on Monday last, Dr. J. Mackintosh Bell described some New Zealand volcanoes, and treated of recent volcanic activity in the central and northern parts of the North Island, and among the islands in the Bay of Plenty. The great eruption of Mount Tarawera in 1886 was treated exhaustively, and the present topography of the mountain as the result of twenty-five years' erosion on the material piled up in the course of the eruption was shown. The other volcanic regions were similarly dealt with.

THE Biological Survey of the U.S. Agricultural Department has secured the cooperation of the National Zoological Park in experiments in breeding mink for the purpose of ascertaining the possibilities of rearing them in captivity for commercial purposes. This has never been attempted by the Government heretofore, but it is hoped that by the combined efforts of the two organisations something of practical importance can be accomplished. The main object in view is to secure data relative to the best methods of rearing mink for their fur, especially as to details of housing, feeding, mating, and caring for them.

A REUTER message from Calcutta reports that in the Legislative Council on March 8 Sir S. Harcourt Butler opposed a motion (which was afterwards withdrawn) to abolish the office of Director-General of Archæology, and said that the Government is determined to carry forward Lord Curzon's archæological work. The Government of India, he stated, contemplates increased expenditure, an increased establishment, an improvement in the production and circulation of publications, and especially the training of Indians for research and other work. Part of the scheme is the absorption of the Director-General in the Research Institute.

As statements have been published from time to time relating to the transmission of tuberculosis through the use of telephones, and especially of those in public call offices, the Postmaster-General has had the matter thoroughly investigated by Dr. Spitta, of St. George's Hospital. He has just issued a statement, in the course of which it is remarked that the final report which has now been received from Dr. Spitta shows that the results have been entirely negative. Dr. Spitta is of opinion, in view of the whole course of the experimental work, "that the transmission of tuberculosis through the medium of the telephone mouthpiece is practically impossible." These results are supported by an independent inquiry initiated some time ago by the American Government as to the condition of public telephones in the United States. They fully confirm the results of work carried out by Dr. Klein, of St. Bartholomew's Hospital, in 1905, at the instance of Dr. Collingridge, the City Medical Officer of Health, who caused a number of telephones in use at call offices of the National Telephone Company to be removed for bacteriological examination.

A PROVISIONAL programme of the first International Eugenics Congress, to be held at the University of London on July 24–30, has been issued. The general heads under which the subjects to be discussed at the

Congress will be grouped are:—the bearing upon eugenics of (*a*) biological research, (*b*) sociological and historical research, (*c*) legislation and social customs; and the consideration of the practical applications of eugenic principles. An exhibition is being arranged which will include charts, pedigrees, photographs, and specimens illustrative of heredity, especially in man; relics of Charles Darwin, Francis Galton, and Gregor Mendel; and portraits of notable workers. Major Leonard Darwin is to be the president of the Congress. Particulars may be obtained from the honorary secretary, Mrs. Gotto, 6 York Buildings, Adelphi, W.C.

A SMALL committee has recently been formed in Manchester, with Mr. R. H. Clayton as chairman and Mr. W. F. A. Ermen as secretary, the object of which is to further the movement for the purification of the atmosphere from coal smoke. The committee has sent circulars to scientific and other societies in Manchester asking them to appoint delegates to a meeting, at which arrangements are to be made for a deputation to go before the City Council. This deputation will urge the council to inaugurate a separate and independent department with a committee formed from the various existing departments of the Corporation which are affected directly or indirectly by smoke, with co-opted representatives of various societies. The duty of this department would be to study the various sources of pollution, and to investigate the possible applications of existing or new methods which might be adopted for the prevention of the present pollution.

FROM the *Rendiconti del R. Istituto Lombardo* we learn that a prize offered by the late Dr. Cagnola for "a well-proved discovery on the directing of flying balloons" has been unawarded. A reference to the issues of previous years shows that the same result has occurred practically without exception during the whole period in which aërial navigation has made the greatest progress. There have been recently numerous discoveries on the directing of flying balloons, which have been well proved by the performance of long-distance flights, and this prize has played no part in their successful development. In view of the fact that it was founded long before the days when aërial navigation became an accomplished fact, it should be evident that the title of the prize is sufficiently elastic to cover such developments as improvements in motors and propellers, even when tested by such methods as are employed successfully in our own National Physical Laboratory.

IT is with sincere regret that we learn of the death of Mr. A. E. Hodgson, senior assistant at the Natal Observatory, which took place at Durban on February 11. Born at Leeds in 1880, Mr. Hodgson was trained at the Royal College of Science, London, where he afterwards became a demonstrator in astrophysics, and later joined the staff of the Solar Physics Observatory under Sir Norman Lockyer. In 1903 he accepted a post as assistant under Mr. Nevill at the Natal Observatory, subsequently becoming senior assistant. Here he performed the routine duties of the time service, &c., and also made observations of comets, putting into all his work a whole-hearted enthusiasm which was ever characteristic of him. According to an appreciation appearing in *The Natal Mercury*, Mr. Hodgson, had he lived, would probably have been placed in sole charge of the observatory on the retirement of Mr. Nevill. He was a fellow of the Royal Astronomical and Physical Societies, and his early death will be a great loss to those who enjoyed his friendship, both in Natal and in this country. The funeral took place at Durban on February 12.

THE arrangements in connection with the Optical Convention which is to be held during six days in the last fortnight of June this year are making satisfactory progress. The Board of Education has consented to provide space for the exhibition forming part of the Convention in the Science Museum at South Kensington. The guarantee fund has reached 1055*l.*, and active steps are being taken to ensure the success of the Convention. An exhibition and catalogue committee has been constituted, and is subdivided into twenty-four sections. A committee upon papers has been appointed, and it is expected that the result of their labours will be the publication after the meetings of a valuable volume of Proceedings. Prof. S. P. Thompson, F.R.S., is the president of the Convention, and the list of vice-presidents includes the names of many distinguished physicists and astronomers. Dr. R. Mullineux Walmsley, principal of the Northampton Polytechnic Institute, Clerkenwell, is the chairman of the executive committee, and Mr. J. W. Gordon, 113 Broadhurst Gardens, Hampstead, N.W., is honorary secretary.

ON Thursday last, March 7, *The Times* recorded the discovery of an oak-tree trunk during the excavations for the extension of the Hampstead and Highgate Railway at the shaft near the Charing Cross District Railway Station. The tree was found at a depth of 40 ft. beneath the present surface in a bed of sand forming part of the younger gravels of the Thames. It was quite black, but perfectly sound. The roots and a portion of the trunk some 2 ft. in diameter were exposed in a prone position, as if the tree had been transported during flood time and then stranded. A stag's horn has been found in the same formation. No special importance attaches to these particular finds; the really significant circumstance is that their existence does not appear to have been made known to interested parties until a paragraph was written for the daily papers by a passing observer. The tree had been found long before, and lay in the wooden enclosure which surrounds the shaft, and it was not until it was turned out to be carted away that attention was directed to it. The geology of the shallow deposits underlying London is full of interest to all and is of considerable importance, and it can only be elucidated, now that so large an area is completely built over, by careful observation and correlation of the numerous deep foundation excavations and tunnels that are constantly being made and rapidly obscured. It is much to be regretted that no official exists to attend to the scientific aspects of these excavations in a systematic manner.

THE September (1911) number of *The Museum Journal*, issued by the University of Pennsylvania, is largely devoted to a description of the Polynesian department of the splendid collection made by Mr. E. W. Clark. This includes remarkable exhibits of finely carved ceremonial axes from Mangaia, clubs from Marquesas and Samoa, paddles from the Austral Islands, and a magnificent series of state clubs from Tonga, which exhibit in the most perfect way the artistic capacity of the Polynesian races.

IN a paper entitled "The Distribution of Early Bronze Settlements in Britain," read by Mr. O. G. S. Crawford before the Royal Geographical Society on February 14, an attempt is made to determine the geographical and racial elements in the type of culture represented by the class of pottery designated "beakers" by Mr. Abercromby, and one of the earliest forms of metal implements known, the flat celts or axes of copper or bronze. The British areas in which these articles are found together fall into several groups:—first, the east coast of North Britain extending from Cromarty Firth to the River Tees; second, the Yorkshire Wolds south of the Vale of Pickering and east of the Vale of York; third, the Peak District of Derbyshire; fourth, the Fen country between Stoke Ferry and Newmarket; fifth, between the Thames at Oxford and the chalk hills of South Dorset. It is pointed out that the incidence of the discoveries of these articles in juxtaposition is connected with the movement of the short-headed groups of peoples from various parts of Europe and the northern Mediterranean areas.

THE March issue of *Pearson's Magazine* contains an article by Mr. C. G. Crosley on the problem of the feeble-minded. More than 150,000 feeble-minded persons form part of the present population of this country. The majority of them, says Mr. Crosley, drift continually in and out of our workhouses and prisons, unable to support themselves or to lead a decent life; worst of all, they are free, by marrying and having children, to pass on the taint of degeneracy to the next generation. Of the 150,000 feeble-minded, nearly 70,000 are urgently in need at the moment of special provision for their care and control. Feeble-minded people are wonderfully prolific. The average birth-rate per marriage among the feeble-minded is seven, as against the four of normal persons. It is urged by Mr. Crosley that an essential preliminary to reform is that we should realise that feeble-mindedness is incurable. The State, he says, must have powers to care for and control, for so long a time as is thought expedient, all feeble-minded persons not properly provided for who are a danger to themselves or to society. Accommodation must be provided, in the shape of colonies, which could be cheaply built and would be practically self-supporting, where the inmates could be happily and usefully employed in agricultural or industrial work.

DR. CRESSWELL SHEARER contributes a remarkable memoir to *The Quarterly Journal of Microscopical Science* (February) on the problem of sex determination in *Dinophilus gyrociliatus*. This minute annelid worm lays its eggs in capsules, several together. Some of the eggs in each capsule develop into males and others into females, and the young females are actually fertilised by the males before they leave the egg-capsule, and while they are still in the larval condition. Their ova are, however, not yet formed, and the spermatozoa actually conjugate with the so-called oogonia. Henceforth the oogonium has a double nucleus, half derived from the male and half from the female parent. During subsequent divisions of the oogonium each half of the nucleus divides independently. Dr. Shearer calls the two halves "male and female pronuclei," but they are clearly not male and female pronuclei in the ordinary sense. The greater part of the process of oogenesis, then, appears to take place after the nucleus of the spermatozoon has entered the oogonium and the sperm nucleus continues dividing with the nucleus of the oogonium. Towards the close of oogenesis the final products of the division of the so-called pronuclei appear to conjugate. In some cases, however, division takes place in such a way that one of the daughter cells contains no representative of the male "pronucleus," and thus two kinds of mature eggs arise, those which contain chromatin substance derived from both male and female parents, and those which contain chromatin substance from the female parent only. The former are believed to give rise to female and the latter to male individuals.

THE recently published report of the advisory committee for the Tropical Diseases Research Fund for 1911 (Cd. 6024) testifies by its bulk to the numerous investigations on tropical sanitation and the etiology of disease that are being carried on throughout the Empire, since it is nearly double the size of the report for the previous year. The actual report of the committee occupies three pages; against an income of 3345*l.*, the committee has incurred an expenditure of 3795*l.* 6*s.* 8*d.*, and attention is directed to the urgent need of further sums being placed at its disposal. The remainder of the volume consists of appendices containing reports on anti-malarial measures in the colonies and protectorates, and on the work done in the laboratories or schools of tropical medicine in this country and in the colonies. Many of these reports contain detailed accounts of researches as yet unpublished; for example, the account given on pp. 71–76 of the investigations of Prof. Minchin and Dr. J. D. Thomson on the transmission of the rat-trypanosome by the rat-flea and the development of the parasite in the insect host. Many interesting and novel observations are contained also in the reports of Dr. Castellani for Ceylon, of the bacteriologist for British East Africa, and especially in the three reports of Dr. L. Nicholls for St. Lucia, which are very full and are accompanied by numerous illustrations. It is to be hoped that these investigations are not destined to remain buried in a Blue-book.

THE biology of the delta and the inundation-area of the Danube, with a short notice of the fisheries, formed the subject of an address by Dr. G. Antipa, director of the Bucharest Museum, delivered at the

eighth International Congress held at Gratz in August, 1910. The paper has lately been published at Jena in pamphlet form by Mr. Gustav Fischer. The subject is divided into two sections, one dealing with the physical conditions of the inundation-area and its relations to the periodical oscillations in the water-level of the Danube generally, and the other with the life of different portions of this area and its variation according to the different water-levels of the river. Of particular interest is the author's description of the various means by which the fauna and flora accommodate themselves to the varying levels of the water, but, for reasons of space, these cannot receive detailed notice. A high water-level in the inundation-area is the delight of the fishermen, as will be evident from the statement that whereas in 1904, when the water-level only reached the 3·50 m. mark, and there was no overflowing of the banks, the catch of fish was 920,000 kg., in 1907, when the water rose to 5·40 m., and the banks were overflowed for 128 days, the product was no less than 6,447,000 kg. This abundance of fish during big inundations is, however, only a part of a general phenomenon, the water-organisms at such seasons attaining a preponderating development at the expense of the land fauna and flora.

PART IV. of the "Selected Reports from the Scientific and Technical Department of the Imperial Institute" (Cd. 6022, 1912) is devoted to rubber and gutta-percha. It relates chiefly to the composition and quality of rubbers prepared in different ways, and obtained from trees and plants grown under various climatic conditions in a number of British colonies. The trees and plants in question include not only well-known kinds such as Hevea, Funtumia, and Castilloa, but others less well known which may prove to be of value where the cultivation of the more important rubber-producers is not possible. The reports show the chemical composition of the samples submitted, and in many cases indicate the technical valuation also. In several instances the differences produced in the quality of the rubber by different methods of coagulating the latex are pointed out. Much work has been done by the department in studying the problems of coagulation, "curing," and "tackiness" in rubber, but the conclusions are withheld for the present, pending confirmation by further experiments now in progress. A few specimens of gutta-percha from the Straits Settlements and other districts, and of balata from British Guiana and Venezuela, are described. Attention is directed to the question of utilising Para rubber seed, enormous quantities of which are now becoming available through the maturing of large plantations. The seed yields about 20 per cent. of oil, which is of commercial value as a substitute for linseed oil, and the residual cake may be of use for feeding cattle; some preliminary trials of it have given promising results, but require to be supplemented by experiments on a larger scale.

AT the meeting of the Mathematical Section of the Vienna Academy on February 8, Prof. J. Hann submitted an important work entitled "The Diurnal Variations of Wind-force on the Summit of Ben Nevis." The wind-force observations had not been discussed before; to a great extent only estimates of the hourly values could be given in the valuable published tables, as rime and snow-drift frequently interrupted the record of the anemometer. Dr. Hann carefully investigated the relations between the estimated and registered values during fifteen summer months, and found corrections applicable to the values at different parts of the day; afterwards he subjected the estimated monthly means to harmonic analysis. The maximum wind-force at Ben Nevis occurs with extraordinary regularity between 1h. and 2h. a.m. in all months. The minimum occurs at 4h. p.m. from November to March; at 5h. p.m. from April to June; at 3h. p.m. from July to October. The diurnal variation, even in winter, is well marked, with a large amplitude; at this season the difference of the daily extremes amounts to 1·05 m.p.s., and in summer to 1·55. The smallest values occur in spring and autumn. Storm frequency shows a regular daily variation in both half-years, with two maxima and two minima; in winter the maxima occur at 2h. and 9h. a.m., and the minima at 6h. a.m. and 3h. p.m. In summer the daily period agrees completely with that of air-pressure: maxima, 9h. a.m. and 10h. p.m.; minima, 4h. a.m. and 3h. p.m. In the yearly mean this agreement still holds, with the trifling exception that the second maximum occurs at midnight. This double daily period of storm frequency is a very singular phenomenon; it is also shown at Vienna and other places.

THE photometric equipment of the laboratory of the Holophane Company of Newark, Ohio, is described and illustrated in the February number of *The Illuminating Engineer* of New York. The photometer is of the Dibdin radial type, the standard lamp moving on horizontal rails, while the lamp to be tested moves up and down a vertical shaft extending through three stories of the building. The photometer screen is maintained by two rods at a fixed distance from the lamp under test, and bisects the angle between the rays coming from the two sources. Arrangements are provided which allow the lamp under test and its reflector to be rotated either together or independently of each other. The Lummer-Brodhun contrast photometer screen is used, and in addition rotating sectors are provided which cut down the light on either side to a known fraction of its original amount. For direct-current tests the current is supplied by storage cells, and for alternating currents a small motor generator is run from the cells.

COMMUNICATION No. 124 from the Physical Laboratory of the University of Leyden contains a short paper on the magnetic properties of solid oxygen, glass, and anhydrous ferrous sulphate at low temperatures down to 14° on the absolute scale, by Prof. Onnes and Dr. Perrier. In each case the susceptibility increases rapidly as the temperature falls, but appears in the case of oxygen and ferrous sulphate to reach a maximum at about 20° absolute. In the case of oxygen, the susceptibility increases fourfold on liquefaction. The deviations from Curie's law are considerable throughout. A second paper in the same

communication is by Prof. Onnes, and deals with the electrical resistance of mercury at these low temperatures. The resistivity of mercury in the solid state at the melting point is about 50 ohms per centimetre cube. As the temperature decreases it falls regularly to 0·12 ohm at 4·3° absolute. In the interval between 4·23° and 4·18° absolute it falls to a value of the order 10^{-5} ohms per centimetre cube, that is, it practically disappears.

Two of the late Prof. Van't Hoff's former students, Dr. W. P. Jorissen, of Leyden, and Dr. L. Th. Reicher, of Amsterdam, have recently published a very interesting volume entitled "J. H. Van't Hoff's Amsterdamer Periode, 1877–1895" (Helder: C. de Boer, jun., 1912, pp. 106). Dealing principally with Van't Hoff's work as a university professor in Amsterdam, the book contains also an account of the teaching of chemistry in Amsterdam before Van't Hoff's arrival, a short account of his life, and a detailed bibliography of his published books and papers, and of the biographical and other notices which have been written concerning the great Dutch chemist. The illustrations form a very interesting feature of the volume, consisting of portraits of Van't Hoff at different periods of his life, portraits of his predecessors at Amsterdam, and pictures of the Amsterdam Chemical Laboratory in the various stages of its history. The book forms an important contribution to the history of Van't Hoff's life and work, and the authors are to be warmly congratulated, not only on the affectionate piety which has inspired their work, but also on the care and labour that they have bestowed upon it.

Engineering for March 8 gives some additional particulars of the oil-engined ship *Selandia*, the first passenger sea-going vessel fitted with Diesel engines. There are two main engines, driving twin screws, each engine consisting of a set of eight single-acting cylinders 20⅞ in. in diameter by 28·75 in. stroke, working on the four-stroke cycle. It is evident from the successful running that no pains and no expense have been spared in rendering the auxiliary machinery as immune from breakdown as is possible. During the voyage from London to Antwerp, the indicated-horse-power developed in eight cylinders was 1190, or 1000 brake-horse-power, assuming 84 per cent. efficiency as obtained on the test bed at the maker's works. The fuel-oil consumption is about 0·45 lb. per brake-horse-power hour. The indicator diagram shows a mean pressure of about 91 lb. per square inch at 129 revolutions per minute. It is claimed that this type of engine has increased the cargo-carrying capacity by 1000 tons.

In the article upon "Soot" which appeared in NATURE of February 29, reference was made to an article upon "The Sootfall of London" which appeared in *The Lancet* of January 6. Mr. S. Archibald Vasey writes to point out that the experimental portion of the inquiry was done entirely in *The Lancet* laboratory under his personal supervision. Messrs. des Vœux and Owens took no part in the laboratory work, which included some 400 analyses, though their names were associated with it in our article.

OUR ASTRONOMICAL COLUMN.

DISCOVERY OF A NOVA.—A telegram received from Kiel yesterday states that a new star, of the fourth magnitude, has been discovered in the neighbourhood of η Geminorum by Herr Enebo, of Domaas, Norway. η Geminorum transits about 6.30 p.m., and sets near the north-west at about 2 a.m.

EPHEMERIDES OF COMETS.—A continuation of the ephemeris of Brooks's comet (1911*c*) is published by Prof. Millosevich in No. 4558 of the *Astronomische Nachrichten*, and shows that the comet is in the southern extremity of Circinus, and is very faint.

Schaumasse's comet (1911*h*), according to the ephemeris published by the discoverer in the same journal, is almost stationary about half-way between β and ζ Ophiuchi, and is about eight times less bright than when discovered. An observation on February 16 showed the comet to be excessively feeble.

In No. 4559 of the journal Dr. Ebell publishes new elements for Quénisset's comet (1911*f*), and gives an ephemeris covering the period April 5 to May 15. The comet is now in Carina, and is of about the tenth magnitude.

OBSERVATIONS OF BIELIDS IN NOVEMBER, 1911.—Assisted by four students, Prof. Pokrowski kept watch for the Bielid shower of meteors on November 17 and the succeeding nights. On the first night twenty-six meteors were seen between 8h. and 12h. (Dorpat M.T.), and of twelve seen between 8h. and 10h. nine appeared to come from a radiant at 24°, +42°. Four meteors from 25°, +42° were seen on November 24, and on several nights other radiants given in Denning's catalogue were seen to be active.

THE SMITHSONIAN ASTROPHYSICAL OBSERVATORY.—Mr. Abbot's report for the year ended June 30, 1911, contains some most interesting results, chiefly concerning the sun's radiation.

He emphasises the fact that simultaneous observations have now been made at Washington (sea-level), Mount Wilson (altitude, more than a mile), and Mount Whitney (altitude, nearly three miles), and that the close agreement of the results indicates that the effects of the earth's atmospheric absorption are practically eliminated. From the observations made during 1902–10, the general mean for the solar constant is found to be 1·922 calories (15° C.) per sq. cm. per minute. The solar radiation appears relatively greater in the infra-red than in the ultra-violet, possibly because the shorter radiation from the deeper layers of the solar atmosphere are selectively absorbed during their passage through the upper layers; but, taking all things into consideration, it is probable that we receive solar radiations from sources having temperatures between 5000° and 7000° abs. C., and mostly between 6000° and 7000°. The observations tend to confirm the existence of an irregular variation in the solar radiation from day to day; its amplitude is from 3 per cent. to 10 per cent., and its period ranges between five and ten days.

Observations from the summit of Mount Whitney show that one square degree of polar sky, at night, gives 0·0746 the light given by a first-magnitude star, and that the observed increased brightness of the night sky near the horizon must be ascribed to some terrestrial agent, such as a continuous faint aurora.

OBSERVATIONS OF SUN-SPOTS AND FACULÆ IN 1911.—Prof. Ricco's annual summary of the solar observations made at Catania during 1911 appears in No. 1, vol. i. (second series), of the *Memorie della Società*

degli Spettroscopisti Italiani, and indicates a general decrease of the solar activity, not only as compared with the preceding year, but also during 1911. The daily frequency of spots was 0·5, and of faculæ 0·8, while on 196, or 64 per cent., of the days of observation no spots were recorded.

THE NORWEGIAN SOUTH POLAR EXPEDITION.

LAST Thursday we published an article by Dr. William S. Bruce on the Antarctic campaign, in which the plans of the several expeditions were described. The same day Captain Amundsen arrived at Hobart, Tasmania, and it became known in London late in the evening that he had reached the South Pole, and was returning.

The news was made public by *The Daily Chronicle*, which also published the full narrative of Captain Amundsen's journey. We congratulate our contemporary upon its enterprise in this respect, and upon the excellent accounts it has given of polar exploration. The following facts are taken from the narrative published in *The Daily Chronicle*.

The Attainment of the South Pole.

Amundsen began his journey south on February 10, 1911, and from this date to April 11 he established three depôts. The winter was spent in changing the entire outfit. The lowest temperature recorded during the expedition was −59° C. The mean temperature for the year 1911 was −26° C. Amundsen set out on the second journey on September 8, but had to return to await the arrival of spring. It was in the middle of October that the spring came in earnest. On October 31 the depôt in lat. 81° S. was reached, that in 82° on November 5. On November 9, 83° was attained, and depôt number four established. On November 13 and 14, 84° S. and 85° S. were reached, and other depôts established. On November 17 the barrier was reached, and climbing began, and many distressing experiences, of which Amundsen's narrative tells. The concluding steps of the arduous enterprise may thus be summarised.

On December 6, 1911, Amundsen attained his greatest height, 10,750 ft., as measured by the hypsometer and aneroid. This was at latitude 87° 14′ south. On December 9, 88° 39′ was reached, and on some following days the latitudes attained were as follows:—December 10, 88° 56′; December 11, 89° 15′; December 12, 89° 30′; and December 13, 89° 45′.

On December 14 the Pole itself was reached, and the temperature recorded was −23° C. The plateau on which the Pole was located is a vast plain, alike in all directions, mile after mile.

The following day, December 15, in fine weather, a series of observations, which lasted from 6 a.m. to 7 p.m., were taken, the result giving 89° 55′. In order to observe the position of the Pole as closely as possible, Amundsen and his men travelled as near true south as they could for the remaining 9 kilometres.

On December 16 four members of the expedition took observations every hour of the day's twenty-four. The exact result will be a matter for expert examination.

Amundsen states he observed the position of the Pole as closely as it is in human power to do with the instruments he had—sextant and artificial horizon.

The distance from the winter quarters to the Pole was about 1400 kilometres, so that on an average Amundsen's party marched 25 kilometres a day.

No news has yet been received from Captain Scott, whose base was 400 miles from Captain Amundsen's, but it is possible that he has also reached the South Pole by another route.

CONSIDERATION OF RESULTS.

Captain Amundsen's brilliant expedition has not only reached the South Pole, but appears to have settled the question of the possible connection between Ross Sea and Weddell Sea by a sea-filled rift valley passing to the east of the Pole. This hypothesis was maintained by Lieut. Filchner, and his plans for the present German Antarctic Expedition are based upon it.

The general evidence seemed to be opposed to this theory, as was remarked in NATURE (vol. lxxxiii., p. 318). Subsequently Sir George Darwin announced that the tidal evidence appeared to indicate a direct sea way from the Ross Sea to the South Atlantic, and the great weight of this evidence in favour of Lieut. Filchner's view was referred to in NATURE of December 29, 1910.

Captain Amundsen has now discovered that the barrier ice ends to the south in a "bight" in lat. 86° and long. 163° W.; there may perhaps be some cable error in the latitude, as the discovery was made on November 11, when the explorers were at about 83½° S., and statements elsewhere in the report suggest that the end of the barrier may be at about 85° S.

The bight which forms the southern shore of the barrier appears to be formed by the union of the mountains that continue southward from South Victoria Land with a chain which trends southwestward, and which Captain Amundsen describes as probably the continuation of King Edward VII. Land. He does not, however, mention having seen any mountains on the eastern side of the barrier during the first part of the journey southward.

Captain Amundsen climbed to the South Polar plateau further south than the Beardmore Glacier, by which Sir Ernest Shackleton reached it. The new route seems to have given an easier ascent; but after reaching the plateau its level was more undulating, as he crossed a series of glaciers which apparently flow eastward, and therefore may indicate that the Ross Sea is continued southward by a depression. Hence the hypothetical Transantarctic rift valley may possibly exist, but with its floor above sea-level. The strongest argument for it has, however, been disproved.

Speculation on this question may, however, await the publication of the more detailed evidence as to the nature and trend of the new mountains discovered to the east and north-east of the Pole.

The meteorological results also promise to be of special interest, for Captain Amundsen experienced fine weather and light breezes when on the South Polar plateau. The fierce southern gales that hindered Sir Ernest Shackleton were perhaps exceptional, for Captain Amundsen describes the ice on the plateau as level, and "only here and there marked with a tiny sastrugi." Captain Amundsen's general results fully confirm the descriptions of Sir Ernest Shackleton.

The outward journey, including the ascent to the height of 10,500 ft., was made at the rate of 25 kilometres a day, and the return at 36 kilometres. This high speed was probably due to the use of dogs, which have again shown their value in polar work.

A party under Lieut. Prestud reached King Edward VII. Land, to the east of the Great Ice Barrier, and the geological collections made there may throw much light on the relations of that land to South Victoria Land.

Reaching the South Pole, discovering the end of Ross's Great Ice Barrier, and making the first landing on King Edward VII. Land is a remarkable triple achievement, and the Norwegian expedition has certainly gained results of first-rate geographical value. Dr. Nansen is to be congratulated on the latest success of his school of polar heroes.

THE TEACHING OF MATHEMATICS.[1]

THE papers before us on "The Teaching of Mathematics in the United Kingdom" are published by the Board of Education as special reports on educational subjects. Each paper of the series (eleven papers are now before us) is written by an expert on the particular subject he treats, and their substantial agreement on educational principles shows the revolution which has taken place in the last decade, and is still taking place in mathematical education.

Last century the subject was taught on the most conventional lines. Few thought of comparing the values, for either mental discipline or knowledge, of different portions of the subject or of different methods of teaching. Such books as the "Inventional Geometry" of Herbert Spencer's father proves the existence of occasional thoughtful men; but in the deadness of the time such books were lost sight of until rediscovered to-day.

The reformers of the later nineteenth century dealt with rigour of proof and completeness of logical development. They aimed at doing for other branches of mathematics what Euclid had done for geometry. A system of mathematics in which the whole subject develops by irrefragable reasoning from a small number of assumptions is a lofty ideal and is an entrancing occupation for certain mature minds; but the school is no place for it. The examination in recent years of attempts at such a system, Euclid's included, leads to the view that no system can do more than approximate roughly to the ideal; the statement of the preliminary assumptions cannot be made complete or the logical development rigorous. This conclusion has added strength to the arm of the band of reformers who hold that this ideal, even if attainable, is out of place in the school.

These reformers recognise that the boy's mind is not the adult mind writ small, that reasoning power develops from an approximate zero in the infant to something far short of perfection in the adult; perfection of reasoning not being attained even in the greatest mathematicians. Consequently they replace this ideal of logical perfection by the ideal of a course suited at every age to the mental development of that age, both in matter and in method of presentation. The matter must in the earliest years be entirely concrete, and must gradually become more abstract with the increasing age and power of the pupil. It should never become entirely abstract, to the exclusion of the concrete, for even in its highest developments mathematics is merely a tool for ultimate application to concrete problems. It is true that it is an economy of labour to have a few mathematicians who work chiefly in the abstract and improve the tool for others to use; but even for these few some knowledge of concrete problems has value for the proper direction of their efforts.

The method of presentation must likewise have regard to the age of the learner. At first there is little reasoning, the teacher's object being to provide in connection with concrete material the abstract ideas for later reasoning, as well as to give precision to such abstract ideas as the pupil already possesses. In the earlier stages evidence is chiefly experimental and intuitional. By appropriate training and increase of years the mind develops and demands more logical evidence. The evidence, suited always to the needs of the pupil, and restricted to the kind which he asks and can grasp, gradually approaches that Euclidean form at which the nineteenth century aimed.

The choice of material out of the various branches of mathematics is important in two ways. The first and obvious criterion is that, other things being equal, the branch which has a direct use in after life, a "bread-and-butter" value, is to be preferred to the branch which has not. The other is that the branch which is the better mental gymnastic is to be chosen. Fortunately these two criteria generally indicate the same branches, the bread-and-butter subject by its relation to life exciting an interest which goes far to give it the preference as mental gymnastic.

The above views run through most of the eleven papers now under review. The battle was first fought in the secondary school, and has been won there as far as the principles are concerned, the questions now at issue being the working out of courses founded on them. The principles are being brought to bear even on the classical boy, naturally enough the last to be affected by a reform in mathematics. In the first paper of the series, "Higher Mathematics for the Classical Sixth Form," Mr. Newbold shows how, in place of the dull committing to memory of Euclid's propositions, such a Form has, by a discussion of problems of everyday life, been given a real and useful grasp of the ideas of the infinitesimal calculus.

In the universities the battle for the new principles is beginning, and Dr. Filon, in his paper on "The Relations of Mathematics and Physics," does yeoman service. As evils requiring regulation he names "(1) mutual misunderstanding due to over-specialisation; (2) the accumulation of uninterpreted material in physics and of abstract concepts in mathematics; (3) the neglect of applied mathematics."

It is unfortunate for the mathematical students at Cambridge that in the rearrangement which admitted physics to a position of consequence, that subject was placed in a tripos distinct from mathematics. Since this estrangement between the two subjects, Cambridge has produced no mathematicians to compare with giants like Kelvin, Stokes, Clerk Maxwell, and Sir J. J. Thomson. Recently a move in the right direction has been made in the attempt to combine the early training of mathematicians, physicists, and engineers; but the success of such a scheme requires more than the revision of regulations.

The third and fourth papers are on "The Teaching of Mathematics in Public Elementary Schools." In these schools the position is somewhat disappointing. The teachers are slow to avail themselves of the free-

[1] Board of Education. Special Reports on Educational Subjects. "The Teaching of Mathematics in the United Kingdom," being a Series of Papers prepared for the International Commission on the Teaching of Mathematics.
(1) "Higher Mathematics for the Classical Sixth Form." By W. Newbold. Pp. 14. Price 1d.
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(11) "The Teaching of Mathematics to Young Children." By Miss Irene Stephens. Pp. ii+19. Price 1½d.

dom now allowed to them, partly no doubt because of their long discipline under fixed syllabuses, probably partly also because in their work (chiefly arithmetic) there exists no association like the public-spirited Mathematical Association, which has contributed so greatly to the solution of the problem of courses of mathematics in secondary schools.

However, there is progress. Ten years ago, in answer to the simplest question not introduced by one of the mystic words, "multiply," "add," &c., pupils would reply, "I don't know what rule it belongs to." Or they would determine how long Mr. Gladstone lived by multiplying together the years of his birth and death. The two papers now under review show a great advance on that time. And if stocks and shares are still too much in evidence, and the portions of geometry and algebra selected for addition to the curriculum leave something to be desired, there is yet evidence of a great ferment, from which sooner or later good must come. In particular the new Central Schools are full of promise.

The fifth pamphlet of the series, "The Algebra Syllabus in the Secondary School," is a statesmanlike discussion by Mr. Godfrey of the reforms which are at present most urgent in school mathematics. The present ferment in education is acting not only on mathematical masters, but on all other masters, headmasters included. The number of subjects claiming recognition in the school is so great that all cannot be successful in their claims. The inquiry is made with regard to every subject, whether, by reason of its value for knowledge, training, or discipline, it deserves a place in the curriculum or no. Difficult as it is for the mathematician to believe, it is the fact that, so far as concerns non-mathematical boys, the verdict is in danger of going against algebra as at present taught. Many public schools would like to curtail seriously the time given to mathematics.

Something is wrong when headmasters of position and judgment look back on their mathematical training as the "transient but blighting shadow of $x+y$." And those who believe in the value of a mathematical training for all boys must give earnest consideration to the remedy advocated by Mr. Godfrey, a remedy which is already applied in some schools.

Algebra as at present taught is so abstract as to be incomprehensible to the majority of boys. It includes also many portions which lead nowhere in particular, and have no exceptional value as mental discipline. Mr. Godfrey reviews the customary algebra course, and shows severe pruning to be possible and desirable. The time saved by this pruning it is proposed to utilise in giving a useful and educational acquaintance with numerical trigonometry, mechanics on an experimental basis, and the ideas of the infinitesimal calculus. On the calculus Mr. Godfrey's proposals may be usefully studied along with the first pamphlet of this series.

A paper on "The Correlation of Elementary Practical Geometry and Geography" (6) is appropriately included in the series. Geography supplies many illustrations and problems for the use of the mathematical master. In return, when the geography master discusses maps and plans and their making, he finds as a result of the work of his mathematical colleague a readier comprehension on the part of his pupils.

Mr. Eggar's views on "The Teaching of Elementary Mechanics" (7) are shared by the best masters. That they are not more generally put into practice is mainly due to the backwardness of most examining bodies to recognise their merit. It is also partly due to the want of faith of the teacher, for a preliminary or concurrent practical course undoubtedly gives a better grasp, and fits a boy better than the old plan, even for the oldest-fashioned theoretical examination in mechanics. The value of a practical course is placed beyond doubt when the two associations, which represent science and mathematical masters respectively, unite in so strong a recommendation as is contained in the report quoted by Mr. Eggar.

Many words of wisdom are scattered through the paper. One valuable aspiration is that in the future mathematics and physics will be in the hands of one master. For the teaching of mechanics this has the merit of more complete correlation between the practical and theoretical courses. For the mathematical master a knowledge of physics will give a breadth of understanding which is not always found at the present day.

For details of the course Mr. Eggar's paper must be consulted. We will only say here that he wisely follows the historical order in beginning with statics.

(8) "Geometry for Engineers" is less pleasing than the preceding ones. The elaboration of the proposed treatment of conic sections, and (to a less extent) the time it is proposed to devote to synthetic geometry, would appear to necessitate the postponement to a very late stage of subjects so essential to an engineer as mechanics and the infinitesimal calculus. On the other hand, one sympathises with the author's view of the importance of descriptive geometry, both on account of its direct usefulness and on account of the mental training involved in thinking in three dimensions.

(9) "Mathematics in Secondary Schools for Girls." Miss Story's pupils are fortunate in having a mistress so well able to distinguish the gold from the dross. While selection of material is very desirable for boys, it is all-essential for girls. After half a century of attempts to fashion girls' education on the lines fixed by tradition for boys, the country is now realising that it wants to have its girls made into good women and not into inferior men.

(10) "Examinations from the School Point of View" opens with the sound doctrine that qualifying and competitive examinations should be kept distinct, the former being intended to determine which pupils have attained a certain standard, the latter to pick out a certain number of the best. The union of the two tests in a single examination makes the questions too difficult to be a fair test of a moderate general education. On a given range of work fairly complete answers to easy questions are better evidence of ability and knowledge than fragmentary answers to difficult questions.

The author's next proposition is more difficult of acceptance: that in a matriculation examination 70 or 80 per cent. of the candidates should be passed. The object of such an examination being to test fitness to study at a university, the examiners are surely already generous in deciding that 50 per cent. possess that fitness.

Objection to the technical bent of the Army Entrance Examination is possible only in a country which plays at keeping an army. In France and Germany the army is a highly technical profession, and the school education carefully arranged on that understanding. With the author's statement that better ability cannot be secured by stiffening the examination we entirely agree; the remedy lies elsewhere.

In (11) Miss Stephens describes an interesting experiment on the "Teaching of Mathematics to Young Children." The excellent method of the ten-bundle and the hundred-bundle will no doubt lead up to the 100-times table, the 1000-times table, &c., which are more valuable than the 11- and 12-times tables.

DAVID BEVERIDGE MAIR.

THE EXTENSION OF THE PHYSICAL AND ELECTROTECHNICAL LABORATORIES OF THE UNIVERSITY OF MANCHESTER.

THE new extension of the physical and electrotechnical laboratories of the University of Manchester was formally opened on Friday evening, March 1, by Prof. Schuster, F.R.S. A well-attended reception and conversazione was held on Friday evening in the old and new laboratories. Many interesting experiments and exhibits of apparatus were on view during the conversazione and on Saturday morning. In the course of the evening a meeting was held in the large lecture theatre. The Vice-Chancellor, Sir Alfred Hopkinson, referred to the growth of the work in the physical laboratory and the necessity of providing more space for research. Mr. S. Z. de Ferranti, president of the Institution of Electrical Engineers, was awarded the honorary degree of doctor of science. Prof. Lamb, in presenting Mr. Ferranti to the Vice-Chancellor, said that more than a quarter of a century ago he attacked the problem of the transmission of electrical energy in its most concentrated form, and, undaunted by discouragements and prophecies of disaster, he solved it in practice on a commercial scale with complete success. It was largely to his initiative and his labours that we owed the plentiful use of the light which supplemented and often, alas! superseded and surpassed the sunshine of Manchester.

Prof. Schuster, before declaring the new buildings opened, addressed the meeting, and described the development of the physical department of the University. In a subsequent portion of his address he spoke of the great field for the student of physics in India and the colonies.

When the main physical laboratories were built in 1900, a large part of one floor was set aside for the department of electrical engineering, while a special laboratory, known as the John Hopkinson Dynamo Laboratory, was built. The steady growth of the department and the increase of the number of those engaged in original investigation have, in recent years, placed great pressure on the space of the laboratory. This was emphasised by the nature of many of the researches in radio-activity, in which large quantities of radium are employed. The effect of the γ rays, which are able to traverse the walls and floors of the laboratory, disturbed the measurements of the workers not only in the immediate vicinity, but also in the neighbouring rooms. In order to provide additional space, the Council of the University decided to remove the department of electrical engineering from the physical laboratory proper and to locate it in a new building. In these new engineering laboratories, part of the first floor, containing six research rooms, has been set aside for physics, while a small electrochemical laboratory has been erected outside for work on radio-active substances. The physics department has thus the use of the space formerly occupied by electrical engineering. The addition of a number of new research rooms for physics, removed some distance from the main physical laboratory, will prove of great advantage for the purpose of original investigation, especially for radio-activity and allied subjects. It is intended to keep the new laboratories uncontaminated by radio-active matter, and they will be employed mainly for the more delicate measurements.

The new buildings were designed by Mr. J. W. Beaumont, the architect of the main physical laboratories. They form a simple but substantial structure faced externally in red Ruabon brick with stone dressings so as to harmonise with the main physics buildings.

A noteworthy feature of the new buildings is the system of bare wires run on insulators, which has been adopted throughout for the experimental circuits. This system has proved so satisfactory in the main laboratory that it has been employed wherever possible in the present extension. From the battery, which is of 600 ampere-hour capacity, with a maximum discharge rate of 300 amperes, heavy bare copper conductors run along a subway beneath the main corridor to the switchboard room in the north wing. From this, by means of plug boards, current can be distributed over the whole building.

CALENDAR REFORM.

AN article by Mr. Victor Anestin, of Bukarest, on calendar reform in the States of the Greek Church, extracted from A. Richter's "Kalender" (Riga, 1912), has been received. The author gives an interesting account of the efforts which have been made in the Balkan States and in Greece towards the adoption of the Gregorian calendar, and describes the state of public opinion on the question at the present time. It is a pathetic story of ecclesiastical prejudice and jealousy on one side and political irresolution and instability on the other. The chief obstacle to following the practice of western Europe lies in the fear entertained by each national church of being denounced as schismatic by the other adherents of the Greek faith, and this prevents any one of the churches, though nominally independent, from taking the lead and sanctioning the reform. Hence the outlook at present is not promising. Mr. Anestin expresses the opinion that the fate of the reform in these States depends on the action of Russia, since the other Greek churches would not be likely to impugn the Russian church, but would probably follow its initiative. In the meantime, the matter does not advance. Roumania seems to have gone further than the other States, and though a Bill enacting the change which was presented to the Chamber came to nothing owing to the political circumstances of the time, the postal and telegraph services and the railways use the Western calendar, and all the almanacs show both styles side by side.

A certain value in the existence of two calendars is suggested by the following quite charming story which happens to appear in close juxtaposition to Mr. Anestin's article, and, if not bearing seriously on the question, may be reproduced as an interesting piece of folklore. It appears that the gipsies of Servia and Montenegro go in fear of the evil spirits which are abroad at Christmas. Therefore an old gipsy living on the Hungarian-Servian border has devised this subtle means of protecting himself. On Christmas Day (N.S.) he hangs up in his hut a Servian (O.S.) calendar; thus any prowling demons will see at once that he is a Serb, and as such observes the Julian Christmas. Thirteen days later he hangs up a Hungarian (Western) calendar; and then, of course, the evil spirits will recognise their powerlessness over him since, so far as he is concerned, Christmas is already a thing of the past. H. C. P.

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MATHEMATICAL AND PHYSICAL SCIENCE.

D. Appleton and Co.—The Sun, C. G. Abbot, illustrated. *Cambridge University Press.*—Clouds, C. T. R. Wilson, F.R.S.; The Physical Basis of Music, A. Wood; The Meteorology of the Globe, Dr. W. N. Shaw, F.R.S.; Beyond the Atom, Prof. J.

Cox; The Measurement of Time, the Astronomer Royal; Principia Mathematica, A. N. Whitehead, F.R.S., and B. Russell, vol. ii.; Differential Geometry, Dr. A. R. Forsyth, F.R.S.; Statics, Prof. S. L. Loney; Structure of the Atmosphere, C. J. P. Cave. *Gauthier-Villars (Paris).*—L'Electricité et l'Optique, A. Potier, illustrated; Leçons sur les principes de l'Analyse, R. Adhémar, Tome i., illustrated; Grandeur et Figure de la Terre, J. B. J. Delambre, illustrated; Calcul des Probabilités, Carvallo; Passage de l'Electricité à travers les Gaz, Thomson; Leçons d'Optique, Drude, Tome ii. *W. Heinemann.*—Introductory Electricity and Magnetism, C. W. Hansel; Experimental Mensuration: an Elementary Text-book of Inductive Geometry, H. S. Redgrove. *Hodder and Stoughton.*—The Electrical Properties of Flames and of Incandescent Solids, H. A. Wilson. *H. Holt and Co. (New York).*—Elements of Physics, E. H. Hall. *T. C. and E. C. Jack.*—Radiation, Dr. P. Phillips; Light, according to Modern Science, Dr. P. Phillips; Weather-science, G. F. K. Lempfert; Lord Kelvin, Dr. A. E. Russell; Sir W. Huggins and Spectroscopic Astronomy, E. W. Maunder. *Longmans and Co.*—A Treatise on the Analytic Geometry of Three Dimensions, Dr. G. Salmon, F.R.S., new edition, revised by R. A. P. Rogers, 2 vols., vol. ii. *Macmillan and Co., Ltd.*—Studies in Terrestrial Magnetism, Dr. C. Chree, F.R.S. (Science Monographs); Studies in Radioactivity, Prof. W. H. Bragg, F.R.S. (Science Monographs). *Mills and Boon, Ltd.*—Graphs in Arithmetic, Algebra and Trigonometry, W. J. Stainer, illustrated. *John Murray.*—A New Geometry, A. E. Layng. *R. Oldenbourg (Munich and Berlin).*—Einführung in die Mathematische Behandlung der Naturwissenschaften, Kurz gefasztes Lehrbuch der Differential- und Integralrechnung mit besonderer Berücksichtigung der Chemie, Profs. W. Nernst and A. Schönflies, new edition, illustrated. *G. P. Putnam's Sons.*—Astronomy in a Nutshell, G. P. Serviss, illustrated; A Beginner's Star Book, K. McKready, illustrated. *W. Rider and Son, Ltd.*—Mathematical Theory of Spirit, H. S. Redgrove. *The University Tutorial Press, Ltd.*—Mathematical Physics, vol. i., Magnetism and Electricity: a Mathematical Treatment for Students of Physics, C. W. C. Barlow; Qualitative Determination of Organic Compounds: a Systematic Treatment of Advanced Practical Organic Chemistry, J. W. Shepherd; Junior Heat: for the Cambridge Junior Local Examination, Dr. J. Satterly. *J. Wiley and Sons (New York).*—Practical Mathematics for Second Year Students in Applied Electricity Courses, E. H. Koch, jun.; An Introduction to General Thermodynamics, Prof. H. A. Perkins.

MEDICAL SCIENCE.

F. Alcan (Paris).—Bréviaire de l'Arthritique, Dr. M. de Fleury; Les Opiomanes: Mangeurs, Buveurs et Fumeurs d'Opium, Dr. R. Dupouy; La Fatigue et le Repos: la Fatigue, la Conservation des Forces, la Médication par le Repos, Dr. F. Lagrange; Les Sporotrichoses, Drs. de Beurmann and Gougerot; Traitement des Neurasthéniques, Dr. P. Hartenberg; Manuel de Kinesithérapie, Drs. Wetterwald and others, 2 vols. *Edward Arnold.*—Practical Anatomy, F. G. Parsons and Dr. W. Wright, 2 vols., illustrated; Caisson Disease and Diver's Palsy, Dr. L. Hill, F.R.S.; Lead Poisoning and Lead Absorption: the Symptoms, Pathology, and Prevention, with Special Reference to their Industrial Origin and an Account of the Principal Processes involving Risk, Dr. T. M. Legge and K. W. Goadby; The Protein Element in Nutrition, Major D. McCay; Shock: the Pathological Physiology of some Modes of Dying, Prof. Y. Henderson; The Carrier Problem in Infectious Disease, with Particular Reference to Enteric Fever, Diphtheria, Cerebro-spinal Meningitis, Bacillary Dysentery, and Cholera, Drs. J. C. G. Ledingham and G. F. Petrie. *Baillière, Tindall and Cox.*—Veterinary Toxicology, G. D. Lander; Foods: their Origin, Manufacture, and Composition, W. Tibbles. *John Bale, Sons and Danielsson, Ltd.*—Translations of Prof. Hermann Sahli's Tuberculin and Innere Sekretion: Ihre Physiologischen Grundlagen und ihre Bedeutung für die Pathologie, Prof. A. Biedl. *Cassell and Co., Ltd.*—British Red Cross Society Training Manual, J. Cantlie; Health Culture for Busy Men, illustrated; Health Habits and How to Train Them, illustrated; Healthy Brain and Healthy Body, illustrated; A System of Surgery, edited by Drs. C. C. Choyce and J. M. Beattie, 3 vols., illustrated. *Gustav Fischer (Jena).*—Hermiszbildungen: ein Atlas von Querschnitten angeborener Herzfehler mit besonderer Berücksichtigung des Verhaltens des Atrioventrikularsystems, Prof. J. G. Mönckberg, illustrated; Die Ursachen des chronischen Magengeschwürs, J. W. T. Lichtenbelt, illustrated; Das Bakterien-Anaphylatoxin und seine Bedeutung für die Infektion, Dr. H. Dold; Ueber die Regenerationsvorgänge in den Nieren des Menschen, Dr. A. Tilp, illustrated; Die Blutbildung und seine klinische Verwertung, Dr. V. Schilling, illustrated; Intoxications-Psychosen, Dr. F. Kanngiesser. *Hodder and Stoughton.*—Infectious Diseases and their Preventive Treatment, E. C. Seaton. *T. C. and E. C. Jack.*—Hypnotism, Dr. A. Hutchison. *H. Kimpton.* A Text-book of Dental Histology and Embryology, including Laboratory Directions, Prof. F. B. Noyes, illustrated. *Longmans and Co.*—A Manual of Surgical Treatment, Sir W. Watson Cheyne, Bart., F.R.S., and F. F. Burghard, with the assistance of T. P. Legg and A. Edmunds, new edition, in five volumes, vol. ii. *Macmillan and Co., Ltd.*—Anæsthetics and their Administration: a Text-book for Medical and Dental Practitioners and Students, Sir F. W. Hewitt, M.V.O., new edition, illustrated. *Methuen and Co., Ltd.*—The Science of Hygiene: a Text-book of Laboratory Practice, Dr. W. C. C. Pakes, edited and revised by Dr. A. T. Nankivell, illustrated. *G. Routledge and Sons, Ltd.*—Return to Nature, authorised Translation of "Kehrt zur Natur Zurück," A. Just, by H. A. Nesbitt, illustrated. *The University Tutorial Press, Ltd.*—Text-book of Hygiene for Teachers: an Account of School Hygiene based on Elementary Physiology, Dr. R. A. Lyster.

TECHNOLOGY.

A. and C. Black.—Tea, E. A. Browne (Peeps at Great Industries), illustrated. *Gebrüder Borntraeger (Berlin).*—Metallographie, Dr. W. Guertler, Erster Band, Heft 10. *Cassell and Co., Ltd.*—Wool Carding and Combing, Prof. A. F. Barker and E. Priestley, illustrated; The Steel Square Simply Explained, illustrated; Bevels and Cuts: Easy Methods of Marking Them, E. Hardy; Incubators and Chicken-rearers. *Constable and Co., Ltd.*—Commercial Paints and Painting, A. S. Jennings; Brewing and Distilling, J. Grant. *John Lane.*—Bricks and Mortar, F. I. Thomas. *Crosby Lockwood and Son.*—Crushing and Grinding Machinery Practice: a Handbook on the Machinery used in Crushing and Grinding Operations on all Classes of Materials, T. G. Marlow, illustrated. *Methuen and Co., Ltd.*—Gem-stones, and their Distinctive Characters, Dr. G. F. H. Smith, illustrated. *John Murray.*—Cocoa: its Cultivation and Preparation, W. H. Johnson, illustrated. *Sir Isaac Pitman and Sons, Ltd.*—Tobacco: from Grower to Consumer, A. E. Tanner; Wool: from the Raw Material to the Finished Product, J. A.

Hunter; Coal: its Origin, Method of Working, and Preparation for the Market, F. H. Wilson. *T. Fisher Unwin.*—Unwin's Technological Dictionary, three parts, in French, German, and English, edited by Dr. A. Tolhausen, revised by L. Tolhausen, with a supplement, including all modern terms and expressions in electricity, telegraphy, and telephony. *Whittaker and Co.*—Manufacture of Nitro-lignin and Sporting Powder, E. H. Durnford, illustrated; The Radio-telegraphists' Guide and Log-book: a Manual of Wireless Telegraphy for the Use of Operators, W. H. Marchant, illustrated. *J. Wiley and Sons (New York).*—Handbook of Sugar Analysis, C. A. Browne, jun.; German and American Varnish-making, Prof. Max Bottler, translated, with notes on American varnish and paint manufacture, by A. H. Sabin, illustrated; Analysis of Paint and Varnish Products, Dr. C. D. Holley.

MISCELLANEOUS.

Baillière, Tindall and Cox.—The Economics of Feeding Horses, Prof. H. A. Woodruff. *Cambridge University Press.*—The Psychology of Insanity, Dr. B. Hart; Metals, F. E. C. Lamplough; Prehistoric Britain, L. McL. Mann. *Chatto and Windus.*—A History of Babylonia and Assyria from Prehistoric Times to the Persian Conquest, L. W. King, vol. ii., illustrated. *W. Heinemann.*—Introductory Science, W. Tunna Walker. *T. C. and E. C. Jack.*—Introduction to Science, W. C. D. Whetham, F.R.S.; The Meaning of Philosophy, Prof. A. E. Taylor; Psychology, Dr. H. J. Watt. *Macmillan and Co., Ltd.*—Manual of Statistics, the late Sir R. Giffen, F.R.S. *Milner and Co.*—Dactylography: or Finger Prints in Relation to Evidence of Man's Genetic Descent, &c., H. Faulds, illustrated. *John Murray.*—Science of the Sea: an Elementary Handbook of Practical Oceanography for Travellers, Sailors, and Yachtsmen, prepared by the Challenger Society for the Promotion of the Study of Oceanography, and edited by Dr. G. Herbert Fowler, illustrated. *G. P. Putnam's Sons.*—Nature's Harmonic Unity: a Treatise on its Relation to Proportional Form, S. Colman. *J. Wiley and Sons (New York).*—Fire Prevention and Fire Protection, J. K. Freitag; Applied Methods of Scientific Management, F. A. Parkhurst, illustrated.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—In a letter to the Vice-Chancellor, dated March 7, Viscount Esher states that a generous benefactor, who stipulates that his name shall not be mentioned, has placed in his hands a sum of 20,000*l.* for the purpose of endowing a professorship at Cambridge in connection with the experimental study of heredity and of development by descent. It is stipulated also that the new chair shall be called the Balfour Professorship of Genetics. The same benefactor "is willing to furnish such funds as may be necessary to provide and equip a small station at Cambridge for the use of the professor should such a course be considered desirable after careful examination of the methods likely to be most satisfactory for the purposes of research in the domain of genetics."

Lord Rayleigh, Chancellor of the University, has been nominated to represent the University on the occasion of the celebration in July next of the two hundred and fiftieth anniversary of the foundation of the Royal Society; Sir T. Clifford Allbutt, K.C.B., and Dr. Macalister, professor of anatomy, to represent the University at the bicentenary festival of the Medical School of Trinity College, Dublin, in July next; and Dr. E. W. Brown to represent the University at the centenary anniversary of the Academy of Natural Sciences of Philadelphia in the present month.

Syndicates have been appointed to obtain plans for the extension of the School of Agriculture on the Downing site, and for the erection of the building for the Forestry Department at the south-east corner of the same area, and the Vice-Chancellor has been authorised to obtain tenders for the extension of the engineering laboratory.

The next combined examination for fifty-seven entrance scholarships and a large number of exhibitions, at Pembroke, Gonville and Caius, Jesus, Christ's, St. John's, and Emmanuel Colleges, will be held on Tuesday, December 3, and following days. Mathematics, classics, natural sciences, and history will be the subjects of examination at all the above-mentioned colleges.

THE new hygiene and physiology laboratories of the Battersea Polytechnic will be opened on Monday, April 22, by the Master of the Worshipful Company of Drapers, his honour Judge Benson, who will deliver an address and distribute prizes and certificates.

PROF. A. WILLEY, F.R.S., and Dr. W. F. N. Woodland have been elected fellows of University College, London. Dr. Woodland, who is assistant professor of zoology at the college, has been appointed to the chair of zoology at the Muir Central College, Allahabad, India.

THE London County Council has arranged for maintenance grants of 5500*l.*, 11,460*l.*, and 11,610*l.*, respectively, to be paid to the University of London for the years 1911–12, 1912–13, and 1913–14. In each year 1000*l.* is intended for home science at King's College for Women, 1500*l.* for libraries, 500*l.* for the physiological laboratory, and 500*l.* for advanced lectures; 2000*l.* each year is intended for general university purposes. In each of the years 1912–13 and 1913–14 5400*l.* is intended for the university professoriate and for the encouragement of French and other Romance languages.

IN the *Popular Science Monthly* for February, Prof. A. F. Chamberlain directs attention to some interesting characteristics of the modern English language, which he considers may conduce towards English becoming the universal language of the future. These characteristics include the power of importing and assimilating foreign words when required for the exigencies of intercommunication without subordination to grammatical categories and merely formal canons; the formation of hybrid words, the use of prefixes and suffixes, and the reduction of long words by abbreviated forms. The author quotes the word "remacadamising" as an instance built up from five different languages—Latin, Gaelic, Hebrew, Greek, and English. He considers that no other language in the world possesses the same qualities, which, by the way, somewhat reflect England's qualities as a free-trade colonising nation, and may be intimately connected with our national characteristics.

IN the House of Commons on March 6 Sir Philip Magnus asked the Prime Minister whether the Government has made itself responsible for the housing of the University of London throughout its history; whether he was aware that in the Treasury minute of February 16, 1899, the liability to provide a suitable home for the University is acknowledged;

and what steps the Government proposes to take in the matter, in view of the unsatisfactory accommodation for the University disclosed in the report of the Royal Commission on University Education in London? In reply, Mr. Asquith said the Government has provided accommodation for the London University throughout its history. The minute cited was written before the removal of the old University to South Kensington, and refers to the possibility of an arrangement between the authorities of the Imperial Institute and the Treasury. It must not be construed as admitting liability on the part of the Government to provide for all possible requirements of the University in the future. The report of the Royal Commission points out that the University must depend to a large extent upon private endowments for its full development. The Government does not think that it would be opportune to take any steps in connection with the matter before the final report of the Commission is published.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, February 29.—Sir Archibald Geikie, K.C.B., president, in the chair.—Dr. A. **Harden** and Dorothy **Norris**. The bacterial production of acetylmethylcarbinol and 2 : 3-butylene glycol.—II. Péré considered that glyceraldehyde was produced during the bacterial fermentation of sugars, and advanced the hypothesis that all sugars undergoing such decomposition were primarily broken down to glycerose. The authors have repeated his experiments, and find that the volatile, reducing, and lævorotatory substance which he considered to be glyceraldehyde is in reality acetylmethylcarbinol. Hence the above hypothesis cannot be considered as proved. A quantitative examination has been made of the products formed by the action of *B. lactis aërogenes* (Escherich) on glycerol under anaërobic conditions. These consist of ethyl alcohol and formic acid, comprising 60 per cent. of the whole, together with smaller quantities of acetic, lactic and succinic acids and 2 : 3-butylene glycol, carbon dioxide, and hydrogen.—H. S. **Ryland** and B. T. **Lang**: An instrument for measuring the distance between the centres of rotation of the two eyes. The apparent position of a pin fixed at a known distance in front of a scale is taken with each eye singly. The operation is repeated with the pin at a different distance, the other conditions remaining unaltered. From the data thus obtained the distance between the centres of rotation of the two eyes can be calculated. The result is independent of variations in the distance between the pupils, and the process can be applied in cases of squint. In an alternative method three pins in a row parallel to the scale are used.—J. F. **Gemmill**: The locomotor function of the lantern in Echinus, with remarks on other allied lantern activities. (1) *Locomotion out of water* (reference is made to previous accounts by Romanes and Ewart).—The urchin raises itself from time to time on the tips of its teeth in preparation for a forward "step" or lurch. The "step" is then brought about (*a*) by strong pushing or poling on the part of the lantern, (*b*) by similar but weaker action on the part of the spines, (*c*) by the influence of gravity acting at a certain stage. Active progression by lantern alone is possible in small and medium-sized urchins. Progression by spines alone is very limited indeed. An urchin can travel with the help of its lantern even when loaded to the extent of half a pound or more. There is usually some rotation as well as progression, but the two are not associated as cause and effect. The causes of rotation are discussed, and an analysis is given of the lines or curves of progression in relation to rotation. Other points to which attention is directed are:—muscles involved; strength of effort; change of direction; inversion; equatorial section; recording surfaces of plasticene and other substances; the inertia and momentum of the rhythmic action. (2) *Locomotion under water.*—Here the lantern is not needed for ordinary locomotion, particularly over more or less horizontal surfaces. There are, however, various circumstances, normal and experimental, in which it is employed with effect—for example, when the urchins are loaded or travelling up a slope on certain surfaces, or only partially immersed, or mounting rapidly up a vertical surface. (3) The locomotor action of the lantern is a particular manifestation of a rhythmic functional activity which can also subserve feeding (no doubt the most important function), boring, and "forced respiration."—Captain A. D. **Fraser** and Dr. H. L. **Duke**: The relation of wild animals to trypanosomiasis. (1) *Trypanosoma uniforme* was the only species of trypanosome obtained as the result of examination of wild animals, including thirty-two Lake-shore antelopes. (2) The available evidence points to bush-pig, crocodile, monitor, frog, and fowls being refractory to *T. gambiense*. (3) The edible rat, which is susceptible to *T. gambiense*, can, by virtue of its habits, be of little importance in considering the question of a reservoir.—Dr. H. L. **Duke**: The transmission of *Trypanosoma nanum* (Laveran). This trypanosome can be transmitted by *Glossina palpalis*, the proportion of positive flies obtained being relatively large, and indicating that this fly may play an important part in the spread of the disease in Uganda.—E. H. **Ross**: The development of a leucocytozoon of guinea-pigs. The paper describes an investigation of some remarkable structures found in the mononuclear leucocytes (lymphocytes) of the blood of guinea-pigs; they are known as "Kurloff's bodies." There has been considerable controversy regarding the nature of these bodies, some authorities describing them as vacuoles containing secretion products, some as symbiotic structures, as chlamydozoa, as cytoryctes, as parasites, and as spurious parasites. By a new technique for *in vitro* staining, known as the jelly method, the minute structure of these bodies can be seen, while the lymphocytes which contain them are stained alive. The method shows conclusively that Kurloff's bodies are living parasites. The method also shows how the bodies develop within the lymphocyte host, for the chromatin within them stains in the various phases, and the whole development can be followed from the earliest Leishmania-like inclusion in the leucocytes until ultimately the leucocytozoon is seen to contain a mass of spirochæte-like bodies which have been likened to *gametes*. The blood of such guinea-pigs shows, when examined with the dark-ground illumination, free-swimming spirochætes, and these have been fixed and stained. The details of the jelly method are described.

March 7.—Sir Archibald Geikie, K.C.B., president, in the chair.—Sir William **Crookes**: The devitrification of silica glass. A clear and transparent tube of silica glass with a bulb blown at one end was exhausted to a high vacuum. It was heated in an electric resistance furnace in such a manner that the bulb was exposed to the greatest heat while the lower part of the tube was comparatively cool. After being kept at a temperature of 1300° C. for twenty hours the bulb and upper part of the tube had devitrified, becoming white and translucent like frosted glass. The tube was resealed, exhausted, and exposed to 1300° for eleven hours. On cooling, the point of the tube was broken under mercury, and from the

amount that entered it was ascertained that 7·79 per cent. of the tube's capacity had leaked through the devitrified silica.—Sir William **Crookes**: The volatility of metals of the platinum group.—Prof. W. M. **Hicks**: A critical study of spectral series. Part ii.—The principal and sharp sequences and the atomic volume term. This is a sequel to a paper on the same subject published in the Philosophical Transactions, vol. ccx. (1910). The sequences which give the principal and the sharp series are discussed as they occur in the second and third groups of the periodic table of the elements, and it is found that, in opposition to the rule in the alkalies, the P-series is based on the *s*-sequence and the S-series on the *p*-sequence. Additional evidence is afforded to show that these sequences depend on atomic volumes of elements in quite definite way.—Prof. W. E. **Dalby**: An optical load-extension indicator, together with some diagrams obtained therewith. The paper describes a new instrument by means of which automatic records of load-extension diagrams can be obtained with precision, the records being free from errors due to inertia, pencil-friction, and to any strains caused by the yielding of the testing machine in which the specimen is being tested.—R. **Whiddington**: The transmission of kathode rays through matter. It has been found experimentally that a kathode ray moving with velocity v_0 can possess, after traversing a thickness x of material, a velocity v_x given by the relation $v_0^4 - v_x^4 = ax$, where a is a constant depending on the nature of the material.—R. **Whiddington**: The velocity of the secondary kathode particles ejected by the characteristic Röntgen rays. Application of the results of the preceding paper to the experimental investigations of Beatty into the absorption of kathode particles in air leads to the conclusion that the fastest of the secondary kathode particles ejected from a plate by Röntgen rays characteristic of the element of atomic weight w possess a speed equal to $k'w$, where k' is a constant nearly equal to 10^8.—E. E. Fournier **d'Albe**: The potential effect in selenium. A new type of selenium bridge (or "selenium cell") was constructed by coating a plate of unglazed porcelain of high insulating power with graphite and dividing the surface into two conducting portions by cutting, with a diamond, a to-and-fro line through the graphite. The plate was then coated with selenium and sensitised. The bridges so constructed showed no polarisation, and were well adapted to the study of the "potential effect," or the change of resistance with the voltage applied.

Institution of Mining and Metallurgy, February 15.—Mr. H. Livingstone Sulman, president, in the chair.—C. O. **Bannister**: On the theory of blast-roasting of galena. This is an exhaustive record of researches made by the author, with the view of determining the nature of the reactions that take place during the blast-roasting of galena when present alone and when in admixture with lime, limestone, gypsum, etc. The introduction of the paper deals with the previous researches of Huntington and Heberlein, Carmichael and Bradford, Savelsburg, Austin, Dwight and Lloyd, and others, and the theories to which the published results of those authorities gave rise, and the author then goes on to describe his own recent series of experiments, with diagrams and tables showing the observed conditions in temperature at different periods of time during the course of roasting galena mixed with lime, silica, litharge and lime, limestone, calcium sulphate, magnesium oxide, ferric oxide, slaked lime, etc. As a result of his carefully conducted experiments the author has arrived at the conclusion that the older theories as to the formation and subsequent reaction of peroxides, plumbites, and plumbates are wrong, as also those depending on definite reactions between calcium sulphate and lead sulphide; that later theories depending on the diluent effect of various agents are only partially true; that the oxidation of lead sulphide takes place in three stages; that in the presence of lime, limestone, and magnesia, the sulphates of calcium or magnesium are formed in preference to sulphate of lead; that silica and calcium act merely as diluents, without chemical action until a temperature of over 1000° is reached; that ferric oxide in certain physical states acts as a catalysing agent; and that silica acts at high temperature in decomposing lead sulphate and calcium sulphate.—H. K. **Picard**: A graphic method of illustrating the results of extraction tests. The author has devised for his own use a system of placing in graphic form the results of extraction or concentration tests on ore samples, which is illustrated and described. It consists in the employment of "squared" paper, on which areas are marked out for the various weight units of the tests carried out, and the percentages of ore content are indicated by covering so many squares of these areas with a wash of solid colour. The result, as shown in an example submitted by the author, is at once apparent, and from the graphic indications it can be ascertained whether certain products should be rejected, re-treated, or mixed with other products.—A. T. **French**: Quick combination methods in smelter assays. This paper, which is practically a collection of laboratory notes presenting together a scheme for the combination of various approved methods of smelter analysis, was not discussed at the meeting owing to the lateness of the hour.

Geological Society, February 28.—Dr. Aubrey Strahan, F.R.S., president, in the chair.—L. J. **Wills**: Late Glacial and post-Glacial changes in the Lower Dee Valley.—E. B. **Bailey** and M. **Macgregor**: The Glen Orchy anticline (Argyllshire). The district described stretches from the head of Loch Awe to Beinn Achallader, and is the south-eastern continuation of the Fort William, Ballachulish, and Appin country dealt with by one of the authors two years ago. The subject is the tectonics of the schists.

CAMBRIDGE.

Philosophical Society, February 26.—Dr. A. E. Shipley, F.R.S., in the chair.—L. **Doncaster**: The chromosomes in oogenesis and spermatogenesis of *Pieris brassicae*.—R. P. **Gregory**: The chromosomes of a giant form of *Primula sinensis*.—Dr. **Cobbett**: Preliminary note on the occurrence of living bacteria in the organs and blood of normal animals.—S. R. **Price**: Some observations with dark-ground illumination on plant cells.—R. C. **McLean**: Rhizopods from the Carboniferous period.

EDINBURGH.

Royal Society, February 5.—Sir T. R. Fraser, F.R.S., vice-president, in the chair.—Dr. R. Stewart **MacDougall**: The bionomics of *Nematus ericksoni* (Hartig), the large larch-sawfly. The larvæ of this sawfly, which was first noticed in numbers some years ago in the Lake district, have also been found at work in Wales, and more recently in Perthshire and Forfarshire. In breeding out adults from cocoons collected in spring, Dr. MacDougall obtained 165 females to one male. Hewitt had previously recorded two males to 298 females. To test this suggested parthenogenesis, seven newly issued virgin females were placed on May 26, 1910, on a young larch, which was potted and so confined that no other insect had access to it. By June 12 three were dead, and in a few days the remaining four had died. Although there was no reasonable doubt as to the sex, the dead

insects were dissected, and proved all to be females. Eggs had been freely laid, and through June the caterpillars which hatched from them fed greedily. Examination on July 3 showed two caterpillars on the soil of the pot, and these had spun their cocoons by July 7. On July 17, the soil was sifted from the pot, and altogether 47 cocoons and five dead caterpillars were found. The cocoons were kept over the winter in suitable conditions indoors. On April 21 three females issued, and by May 8 fourteen other adults—all female. In five other similar experiments with virgin females, eggs were freely laid and caterpillars hatched. One experiment gave no result. Dissection of the female adults showed ovaries with eighteen tubes to each, and at the moment of dissection 180 eggs. From cocoons collected in the open many parasites were also bred, *Mesoleius aulicus* being abundant. Dissection of *M. aulicus* females showed twenty tubes to each ovary, and at the moment of dissection 160 eggs. Out of 249 cocoons 171 of *Nematus ericksoni* issued, 62 Ichneumonid parasites, and 16 Tachinids of the species *Exorista*.—Prof. W. **Peddie**: The molecular theory of magnetism in solids. The theory was developed so as to apply to a single homogeneous arrangement of molecular magnets in any crystalline grouping. The results in the special cases of cubic and hexagonal arrangements were applied to the magnetic crystals magnetite and pyrrhotine. A possible application to the case of the earth's magnetism was also discussed.—G. P. **Seamon**: Note on torsional oscillations of magnesium wire. These experiments were a continuation of Peddie's own experiments on torsional oscillations, and gave similar results to those obtained with other kinds of metals.

PARIS.

Academy of Sciences, February 26.—M. Lippmann in the chair.—Maurice **Hamy**: The determination of the astronomical flexion of meridian circles.—A. **Haller**: The preparation of 1 : 5-diphenyl-2 : 2 : 4 : 4-tetramethyl-3-pentanone and 1-phenyl-2 : 2 : 4 : 4-tetramethyl-3-pentanone. The method of alkylating with sodium amide and methyl iodide has been applied to symmetrical dibenzylacetone and 1-phenyl-3-pentanone. The successive methylation of these two ketones has given the desired tetramethyl derivatives as the final products.—A. **Laveran**: Generalised infection of mice by *Leishmania donovani*. It has been shown experimentally that generalised infections can be caused in mice by *L. donovani*, and it is probably the same for the rat. It still remains to be proved if the small rodents can contribute to the propagation of the disease.—Paul **Sabatier** and A. **Mailhe**: A new method of catalytic preparation of the aldehydes, starting from the acids.—Pierre Puiseux was elected a member of the section of astronomy in the place of the late M. Radau.—Milan **Stefanik**: Observation of the total eclipse of the sun (April 28, 1911) at the island of Vavau.—Ch. **Maurain** and A. **Toussaint**: Study of the surfaces of aëroplanes with an electric carriage. The only accurate measurements made up to the present on the action of air on aëroplane surfaces have been carried out on small-scale models exposed to currents of air. The present experiments were carried out on full-sized planes, carried on an electrically driven carriage with a range of velocities up to 23 metres per second. A set of experimental results for two surfaces of different shapes is given.—M. **Guéritot**: An attempt at a method permitting the deduction of the ratio of the two specific heats of gases from a volume measurement.—G. **Charpy** and S. **Bonnerot**: The permeability of iron for hydrogen. That iron is permeable to hydrogen has been known since the researches of Saint Claire Deville and Troost, but no quantitative measurements have been made. The authors have measured the rate of passage of hydrogen through iron at temperatures ranging between 350° C. and 850° C.—P. **Langevin**: The comparison of gaseous and dissolved molecules. A reply to the criticism of M. Colson on the laws of dissociation of nitrogen peroxide in the gaseous state and in chloroform solution. It is shown that in concentrations sufficiently dilute, that is, in concentrations directly comparable with those in the gaseous conditions, the dissociation constant of nitrogen peroxide in chloroform solution is in good agreement with the law of mass action, allowance being made for the known difficulty in the colorimetric measurements.—Georges **Dupont**: The oxyhydrofuranes. The ketohydrofuranes give the oxyhydrofuranes by reduction with sodium and alcohol, although the reaction fails in some cases. The reduction could not be effected with zinc and potash or ammonia, with sodium amalgam or with hydrogen and platinum black.—C. **Picado**: The nutrition of the epiphytic Bromeliaceæ. These plants absorb not only mineral salts, but also proteid substances arising from the digestion of the vegetable and animal detritus retained in their leaves. They are the only plants which feed regularly on such detritus.—E. **Pinoy**: The preservation of wood. The wood is covered with a solution containing 5 per cent. of gelatin, 2 per cent. of potassium bichromate, and 0·5 per cent. of sodium fluoride, and exposed to light. Wood treated in this fashion is rendered completely indestructible by moulds.—Gabriel **Bertrand**: The extraordinary sensibility of *Aspergillus niger* towards manganese.—F. **d'Herelle**: The propagation in the Argentine Republic of the Mexican locust disease. Cultures of *Cocobacillus acridiorum* were used with great success to destroy the plague of locusts in the province of Santa-Fé, and the Argentine Government has decided to make use of this in all places attacked by these insects.

BOOKS RECEIVED.

Bad Reichenhall als klimatischer Kurort. By Drs. B. Alexander and E. Alt. Pp. 64+iv tables. (München: Otto Gmelin.)

Grundlinien der Pflanzen-morphologie im Lichte der Palaeontologie. By Prof. H. Potonié. Zweite Auflage. Pp. vii+259. (Jena: G. Fischer.) 7 marks.

Markose. By Prof. Max Verworn. Pp. iii+37. (Jena: G. Fischer.) 1 mark.

Observations on the West of England Mining Region. By J. H. Collins. Pp. xxiv+683+xviii plates. (Plymouth: Printed by W. Brendon and Son, Ltd.)

A Manual of Veterinary Physiology. By Major-General F. Smith, C.B., C.M.G. Pp. xii+808. (London: Baillière, Tindall and Cox.) 18*s*. net.

Theoretische Astronomie. By Prof. W. Klinkerfues. Neubearbeitung by Prof. H. Buchholz. Pp. xxxviii+1070. (Braunschweig: F. Vieweg & Sohn.) 50 marks.

Byways in British Archæology. By W. Johnson. Pp. xii+529. (Cambridge: University Press.) 10*s*. 6*d*. net.

Thoughts on Ultimate Problems. By F. W. Frankland. Fifth and revised edition. Pp. xv+133. (London: D. Nutt.) 1*s*. 6*d*. net.

Annals of the Royal Botanic Garden, Calcutta. Vol. xii., part i.: Asiatic Palms—Lepidocaryeae. Part ii.: The Species of Daemonorops. By Dr. O. Beccari. 2 vols. Vol. i., Letterpress. Pp. vii+237. Vol. ii., Plates. Pp. vii+109 plates. (Calcutta:

Printed at the Bengal Secretariat Press.) 39 rupees = 2*l.* 18*s.*

Storage Batteries. The Chemistry and Physics of the Lead Accumulator. By Dr. H. W. Morse. Pp. 266. (London: Macmillan and Co., Ltd.) 6*s.* 6*d.* net.

The Composition of Matter and the Evolution of Mind. By D. Taylor. Pp. 176. (London: Walter Scott Publishing Company, Ltd.) 3*s.* 6*d.*

Probleme der Physiologischen und Pathologischen Chemie. By Prof. O. von Fürth. i. Band—Gewebschemie. (Leipzig: F. C. W. Vogel.) 16 marks.

The Mineral Kingdom. By Dr. R. Brauns. Translated, with additions, by L. J. Spencer. Parts 17, 18, 19, 20. (Esslingen: J. F. Schreiber; London: Williams and Norgate.) 2*s.* net each.

Laubfall und Lauberneuerung in den Tropen. By G. Volkens. Pp. 142. (Berlin: Gebrüder Borntraeger.) 2.80 marks.

Notions Fondamentales d'Analyse Qualitative. By Prof. V. Thomas and D. Gauthier. Pp. viii+331. (Paris: Gauthier-Villars.) 10 francs.

Zoologische Jahrbücher. Supplement 15—Festschrift zum Sechzigsten Geburtstage des Herrn Geheimen Hofrats Prof. Dr. Johann Wilhelm Spengel in Giessen. Edited by A. Brauer and others. 3 vols. Pp. viii+609+plates, 863+plates, 572+plates. (Jena: G. Fischer.) 75 marks, 100 marks, and 50 marks.

Gardens in their Seasons. By C. Von Wyss. Pp. 64. (London: A. and C. Black.) 1*s.* 6*d.*

Biological Fact and the Structure of Society (the Herbert Spencer Lecture). By W. Bateson, F.R.S. Pp. 34. (Oxford: Clarendon Press.) 1*s.* net.

Scientific Memoirs by Officers of the Medical and Sanitary Departments of the Government of India:—Investigations into the Jail Dietaries of the United Provinces. By Prof. D. McCay. Pp. 200. (Calcutta: Superintendent Government Printing.) 1.12.0 rupees, or 3*s.*

The Rational Arithmetic for Rural Schools. By G. Ricks. Scholar's Books. First and Second Years' Courses. Each pp. 48. (London: Macmillan and Co., Ltd.) Each 3*d.*

DIARY OF SOCIETIES.

THURSDAY, MARCH 14.

ROYAL SOCIETY, at 4.30.—On a New Method of Examining Normal and Diseased Tissues by means of *intra vitam* Staining: Prof. E. Goldmann.—The Effects of Ultra-Violet Rays upon the Eye: Dr. E. K. Martin.—On the Presence of Radium in some Carcinomatous Tumours: Dr. W. S. Lazarus-Barlow.—An Improved Method for Opsonic Index Estimations involving the Separation of Red and White Human Blood Corpuscles: C. Russ.—The Electrical Conductivity of Bacteria, and the Rate of Inhibition of Bacteria by Electric Currents: Prof. W. M. Thornton.—A Critical Study of Experimental Fever: E. C. Hort and W. J. Penfold.—Certain Results of Drying Non-Sporing Bacteria in a Charcoal Liquid Air Vacuum: S. G. Shattock and L. S. Dudgeon.

ROYAL SOCIETY OF ARTS, at 4.30.—The Indian Census for 1911: E. A. Gait.

MATHEMATICAL SOCIETY, at 5.30.—The Cubic Surface as a Degenerate Quartic: G. T. Bennett.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.

CONCRETE INSTITUTE, at 8.—The Design of High Dams: R. Ryves.

FRIDAY, MARCH 15.

ROYAL INSTITUTION, at 9.—The Origin of Radium: F. Soddy, F.R.S.

INSTITUTION OF MECHANICAL ENGINEERS, at 8.—The Diesel Oil Engine, and its Industrial Importance particularly for Great Britain: Dr. Rudolf Diesel.

INSTITUTION OF CIVIL ENGINEERS, at 8.—The Heat Value of Fuels: A. E. Gladwyn.

SATURDAY, MARCH 16.

ROYAL INSTITUTION, at 3.—Molecular Physics: Sir J. J. Thomson, F.R.S.

MONDAY, MARCH 18.

ROYAL SOCIETY OF ARTS, at 8—Materials and Methods of Decorative Painting: Noel Heaton.

TUESDAY, MARCH 19.

ROYAL INSTITUTION, at 3.—Ancient Britain: Dr. T. Rice Holmes.

ROYAL ANTHROPOLOGICAL INSTITUTE, at 8.15.—The Study of Primitive Music: Dr. C. S. Myers.

ROYAL STATISTICAL SOCIETY, at 5.—The Financial Systems of Germany: Percy Ashley.

INSTITUTION OF CIVIL ENGINEERS, at 8.—The Main Drainage of Glasgow: A. B. McDonald and G. M. Taylor.—The Construction of the Glasgow Main Drainage Works: W. C. Easton.—Glasgow Main Drainage: The Mechanical Equipment of the Western Works and of the Kinning Park Pumping Station: D. H. Morton.

ZOOLOGICAL SOCIETY, at 8.30.—Lantern Exhibition of Studies of Wild Animals in Africa and North America: I. A. Radclyffe Dugmore.—Observations on some Alcyonaria from Singapore, with a brief Discussion on the Classification of the Family Nephthyidæ E. W. Shann.—A List of Moths of the Family Pyralidæ collected by Felix B. Pratt and Charles B. Pratt in Dutch New Guinea in 1909-10, with Descriptions of New Species: G. H. Kenrick.—Some Early Fossil Cirripedes of the Genus *Scalpellum*: T. H. Withers.

ILLUMINATING ENGINEERING SOCIETY, at 8.—Lighting of Printing Works and Offices: F. W. Goodenough and J. Eck.

WEDNESDAY, MARCH 20.

ROYAL SOCIETY OF ARTS, at 8.—The Work of the Marine Biological Association: F. Martin Duncan.

ROYAL METEOROLOGICAL SOCIETY, at 7.30.—The Connection between Hydrographical and Meteorological Phenomena: Prof. Otto Pettersson.

ENTOMOLOGICAL SOCIETY, at 8.

ROYAL MICROSCOPICAL SOCIETY, at 8.—Fairy flies and their Hosts: Fredk. Enock.

THURSDAY, MARCH 21.

ROYAL SOCIETY, at 4.30.—*Probable Papers:* On the Self-induction of Electric Currents in a thin Anchor-ring: Lord Rayleigh, O.M., F.R.S.—The After-luminosity of Electric Discharges in Hydrogen Observed by Hertz: Hon. R. J. Strutt, F.R.S.—On the Changes in the Dimensions of a Steel Wire when Twisted, and on the Pressure of Distortional Waves in Steel: Prof. J. H. Poynting, F.R.S.—The Critical Constants and Orthobaric Densities of Xenon: H. S. Patterson, R. S. Cripps, and R. Whytlaw-Gray.—Experimental Work on a New Standard of Light: W. A. Harwood and J. E. Petavel, F.R.S.—On the Distribution of the Scattered Röntgen Radiation: J. A. Crowther.—The Passage of Homogeneous Röntgen Rays through Gases: E. A. Owen.—Fluorescent Röntgen Radiation from Elements of High Atomic Weight: J. C. Chapman.—The Nature of the γ Rays excited by β Rays: J. A. Gray.

ROYAL INSTITUTION, at 3.—Seasonal Dimorphism in Butterflies: Dr. F. A. Dixey, F.R.S.

INSTITUTION OF MINING AND METALLURGY, at 8.—Annual Meeting.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—*Discussion:* The Causes Preventing the More General Use of Electricity for Domestic Purposes: Opener, S. Z. de Ferranti, President.

FRIDAY, MARCH 22.

ROYAL INSTITUTION, at 9.—The North Sea and Its Fisheries: Prof. D'Arcy W. Thompson, C.B.

PHYSICAL SOCIETY, at 5.

SATURDAY, MARCH 23.

ROYAL INSTITUTION, at 3.—Molecular Physics: Sir J. J. Thomson, F.R.S.

CONTENTS.