THURSDAY, FEBRUARY 20, 1913.

IMMIGRATION AND ANTHROPOMETRY.

Changes in Bodily Form of Descendants of Immigrants. By Prof. Franz Boas. Pp. xii + 573. (New York: Columbia University Press; London: H. Frowde, 1912.) Price 7*s*. 6*d*. net.

IN the year 1908 Prof. Boas, at the request of the United States Immigration Commission, began an investigation into the physical characteristics of immigrants. The volume under review contains an elaborate tabulation of the anthropometric data obtained, together with an analysis of the conclusions drawn from them. One of the most remarkable of the facts brought to light is the changes undergone in head form by the descendants of Hebrews and Sicilians. The cranial index of the former when born in Europe appears to be about 83; it sinks to 81 among those born in America. Among the latter, on the other hand, the index rises with the change of birthplace from 78 to more than 80.

It has been suggested, as a mechanical explanation of the relative lengthening of the Hebrew skull in America, that in Europe the babies of this race when very young are wrapped up in swaddling clothes so tightly that they cannot move themselves, and kept lying on their backs; that thus there is constant pressure on the back of the skull when it is in its most plastic condition, with the result that it decreases in length but increases in breadth. In America much greater freedom is allowed to the child, and it can lie as it likes, sometimes on its back, sometimes on its side; consequently, with the removal of the conditions which produce an artificial shortening a longer skull is developed. Prof. Boas examines and dismisses this hypothesis. One of the principal objections to it is that if it applies to the Hebrews it should apply to the Sicilians and Bohemians, who also keep their babies tightly swathed, but the relative length of the skull among the children of Sicilian and Bohemian immigrants decreases instead of increasing.

It has also been argued that the results obtained are due to the fact that the types of immigrants of each nationality have been changing gradually, but an examination of the cranial indices of Hebrews who immigrated at different periods from 1880 to 1910 show that the index is constant throughout this period, and in addition to this the difference between those who arrived in any particular year and their descendants is the same as that shown by a similar comparison involving the whole series.

The reality of the results is confirmed by the fact that the changes noted are more marked among those children who were born more than ten years after their mothers had arrived in the United States than among those whose mothers had arrived more recently.

Although the numbers dealt with are not very large, it is difficult to suppose that the results are due merely to chance, nor can they be attributed to what might be called a statistical accident. There does not appear to be any ground for deciding whether they are due to the influence of a changed environment or to the selective elimination of certain types. Prof. Boas inclines to the former view and urges that the onus of proof rests on those who hold the latter. They will probably be inclined to disagree with him on this point.

E. H. J. S.

PROBLEMS OF THE COTTON PLANT.

The Cotton Plant in Egypt. Studies in Physiology and Genetics. By W. Lawrence Balls. Pp. xvi + 202. (London: Macmillan and Co., Ltd, 1912.) Price 5*s*. net. (Macmillan's Science Monographs.)

THERE can be no doubt of the freshness and originality of mind with which Mr. Balls has attacked a great diversity of problems in their application to the cotton plant. Some of these questions are genetic, some pathological, some physiological in the stricter sense, and most of them involve considerations of direct economic importance.

Starting with the intention of improving the Egyptian cotton crop, the author found himself led on from one problem to another, and to the solution of each he makes a real contribution, often approaching to the dignity of discovery. His analysis of growth-rate and of the many influences which affect it is an illuminating piece of work, full of novel suggestions, and a botanical physiologist, looking for a line of work, might with profit follow up any of the various threads which Mr. Balls lets drop in his course.

The same is true of that part of the book especially relating to genetics. The F_2 generation was often of a most complex type, and by the application of a graphic method of analysis apparatus is introduced which may probably assist in the unravelling of other similar cases. In his study of the heredity of seed-weight, new and interesting ground is broken. It is shown that a form with seed actually light is genetically endowed with the capacity to form heavy seed, but, owing to the smallness of the boll, the seed does not become heavy. The problem of interference between

factorial effects thus illustrated is one that, we are sure, awaits us in many comparable instances. Obviously, such interference might operate either by reducing the number of the seeds or by reducing their size; and in some plants, doubtless, the one effect will be found, and in other cases the other. The discussion of this and various other examples of complex results is unconventional and always fruitful.

The book is one which well illustrates the mental attitude of the investigator to whom problems appeal chiefly by virtue of their difficulty. Had Mr. Balls stuck to any one of the lines he has begun, no doubt he could have gone much further along it; but so soon as anything like a solution is in sight he would rather start another chase. This is not unfriendly criticism: for many who can follow there are few who can begin, and others will some day make something of the various beginnings here left unfinished. The real objection to this book is that it is in outward form at least a *book*. The only thread of coherence running through it is that the miscellaneous embryo treatises it contains were begotten in Mr. Balls's mind by the cotton plant. So, in the same way, the common fowl has been the point of departure for lucubrations on the origin of the mesoblast, on poultry-breeding for the table, on coccidiosis, on the food-value of cereals, &c., but though it may be good for a man to keep all these topics dancing through his own head, no real purpose is served by amalgamating them into one volume. It was to meet such cases that publication in journals was invented. W. B.

THE ENERGY SIDE OF NUTRITION.

Nutritional Physiology. By Prof. P. G. Stiles. Pp. 271. (Philadelphia and London: W. B. Saunders Co., 1912.) Price 6*s.* net.

ALTHOUGH Prof. Stiles's little book is entitled "Nutritional Physiology," it is really an elementary treatise on the whole realm of physiology, though special attention is directed to digestion, absorption, and metabolism. Its keynote is the word "energy," and the living body is regarded from the point of view of an energy-transformer. The work is dedicated to Prof. Graham Lusk, of New York, and his influence can be easily traced in the chapters which deal with metabolism.

It is not possible to regard the book as a mere addition to the already numerous primers of physiology; it is something beyond this, although it makes no pretensions to being anything profound. It can be read with profit by the junior student, and still more by the senior student, and even the professed physiologist. Old truths are often put in new ways, and so fresh light is shed upon familiar problems. The language is often quaint and original, and the numerous analogies selected for explaining physiological truths are apt and well selected. Take the following as an example:

"The regulating action of the liver and the muscles upon the carbohydrate distribution may be paralleled, in part at least, by an analogy. Let us compare the active tissues to a mill turned by the waters of a stream. The water supply to the mill is to be compared with the sugar supply to the cells, which derive their energy from it. A meal is to the body as a storm is to the mill-stream—it adds to the volume of the power-producing element. The dam by the mill is like the kidney in its relation to the accumulated store," and so the parable runs on; it is unnecessary to quote more of it here.

The book contains the inevitable chapter on alcohol; this is written in a moderate strain, and may, perhaps, be viewed with disfavour by the extreme teetotaller because it is not intemperate. As one reads it, one almost feels that its author was writing it because he had to, but was protesting all the time inwardly against the American law which excludes all physiological books from scholastic institutions which do not obey the tyrannical behests of the party in power.

W. D. H.

CHEMISTRY: PURE AND APPLIED.

(1) *Fatty Foods, their Practical Examination.* A Handbook for the Use of Analytical and Technical Chemists. By E. R. Bolton and C. Revis. Pp. xii+371. (London: J. and A. Churchill, 1913.) Price 10*s.* 6*d.* net.

(2) *Der Kautschuk.* Eine kolloidchemische Monographie. By Dr. R. Ditmar. Pp. viii+140. (Berlin: Julius Springer, 1912.) Price 6 marks.

(3) *Modern Inorganic Chemistry.* By Dr. J. W. Mellor. Pp. xx+871. (London: Longmans, Green and Co., 1912.) Price 7*s.* 6*d.*

(4) *A First Class-Book of Chemistry.* By E. Barrett and Dr. T. P. Nunn. Pp. iv+124. (London: A. and C. Black, 1912.) Price 1*s.* 6*d.*

(5) *Elementary Applied Chemistry.* By L. B. Allyn. Pp. xi+127. (Boston and London: Ginn and Co., n.d.) Price 3*s.*

(6) *Trattato di Chimico-Fisica.* Traduzione Italiana con note del Dott. M. Giua. By Prof. H. C. Jones. Pp xx+611. (Milano: Ulrico Hoepli, 1913.) Price 12 lire.

(1) THE analytical examination of edible fats and oils is increasing in importance and in difficulty day by day. At least sixteen natural oils must be taken into consideration, and, when mixtures of these are presented for examination,

the task of determining their nature and origin is one that is almost beyond the range of ordinary analytical methods. In addition to the natural oils and fats it is necessary now to take into account the artificial products obtained by reducing them by hydrogen in presence of nickel; although these are only rarely mentioned, their preparation has already become an extremely important industry, which has grown to maturity at a very rapid rate and almost unobserved by the general public.

The "Handbook" of Messrs. Bolton & Revis has the merit of dealing with the examination of oils and fats exclusively from the point of view of their utility as food products. They have therefore been able to treat this branch of the subject with great thoroughness in a book of very modest dimensions. As they have had many years of experience in carrying out the tests which they describe, their conclusions are entitled to be received with respect and regarded as authoritative. This statement applies not only to their selection of the tests which are most suitable, but also to the rejection of others which are less suitable or even seriously faulty; as they remark in the preface, "omission of a method may often be better evidence of the knowledge of it than its presentation." The book is well illustrated and attractively printed; its utility will not be diminished by the fact that it has not passed through the hands of a literary editor, and bears the impress of the laboratory rather than of the classroom or the study.

(2) Dr. Ditmar's monograph on rubber is characterised by the scientific character of its treatment of a technical subject. At the head of the preface the statement is set out that "The essence of a colloid is instability: for this reason life is linked to the colloidal state. Πάντα ῥεῖ." The view of Heraclitus that "Everything is in a state of flux" is particularly applicable to the colloidal state, and has much to do with the inherent quality of "perishing," which is so serious a limitation to the usefulness of rubber. The importance of this "perishing" is shown by the fact that the author, in his chapter on the "Regeneration of Rubber," gives a list of nearly 200 patents, nearly all of which have been taken out during the last ten years.

Attention is directed to the great importance of the coagulation processes as affecting the nature of the product. In the case of synthetic rubber the aim must be to secure a highly polymerised product: the polymerised isoprene of the Elberfeld works possesses these qualities, but the polymerised butadiene resembles glue and can only be used as a "blender" or adulterant. It is impossible in a brief notice to discuss the vast amount of valuable information that has been brought together in this monograph, but it may be commended without reservation to the attention of all those who are interested in rubber, either as a technical product or as material for the study of colloid chemistry.

(3) Dr. Mellor's "Modern Inorganic Chemistry" is one of the most original of the text-books that have been published in recent years. Its very originality will probably limit its usefulness as a text-book for beginners, who would probably be well advised to acquire the rudiments of their knowledge from some more conventional source. But for a student who has already acquired a sound knowledge of inorganic chemistry, and is wondering in what way he may best add to it, it would be difficult to suggest a volume more calculated to impart new ideas and increased information than Dr. Mellor's book. It would serve admirably as a text-book of inorganic chemistry to cover the gap between the requirements of an intermediate and final B.Sc. examination.

The *four* crystalline forms of sulphur have at last been able to secure equal recognition in a text-book, and in the course of two pages the modern views of the composition of steel are effectively summarised. Little monographs such as these, embodying the results of recent researches, are of frequent occurrence and cover a very wide range of topics. On the other hand, the historical aspects of chemistry receive full recognition, nearly every statement of importance being accompanied by the name of the author who first discovered the facts and the date of the discovery.

(4) It is a matter of interest to receive a text-book of chemistry bearing on its title-page the names of a science master and an "examiner in education." The book that they have compiled is as a whole very logical and satisfactory, and includes incidental references to several phenomena which can be described in simple terms, but which have not previously found their way into elementary text-books. Amongst these the distillation of petroleum, the manufacture of linoleum, and the liquid-air process for separating oxygen may be mentioned.

The authors appear to be unaware of the historical aspects of their subject. There is really no need to use such a term as "soda gas" when Black's name of "fixed air" is available as a description of the gas which does not introduce prematurely to the student a statement of the presence of carbon in it. The authors have also been obliged to confess the illogical character of their action in describing the gas as "carbon *di*oxide" in chapter xvi. when they are unable even to

attempt an explanation of the prefix until they reach chapter xxv.; even then they are not in a position to give any explanation which would be recognised as valid by any serious student of chemistry. Here again the lack of logical sequence might have been avoided by describing the gas as "carbonic anhydride"; even "carbonic acid gas" would be an improvement on "carbon dioxide" under the conditions imposed by the elementary character of the course.

(5) The American book on "Elementary Applied Chemistry" bears many signs of its country of origin, including a brief introduction written in the style of a "display advertisement." On the very first page of the book the student is required to make a note of his first chemical experiment as follows:

> Copy and sign the following statement: I hereby certify that a mixture called Tonsillitis Specific and examined by me contains
>
> Name
>
> Date

The mixture is one of sulphur and sugar, to be prepared *ad hoc* by the instructor. English readers may derive from this book considerable amusement and at the same time obtain a number of useful hints as to the possibility of introducing to youthful students the chief tests used in examining water, milk, baking-powder, &c.

(6) The Italian volume is a translation of the well-known American text-book, and will therefore not be likely to circulate in this country. It is well printed and is presented in an attractive form. T. M. L.

OUR BOOKSHELF.

The Theory of Evolution in the Light of Facts. By Karl Frank, S.J. With a chapter on Ant Guests and Termite Guests, by P. E. Wasmann. Translated from the German by C. T. Druery. Pp. xii+241. (London: Kegan Paul, Trench, Trübner and Co., Ltd., 1913.) Price 5*s.* net.

THE object of this book, as stated in its preface, is to substitute "pure postulates" for those which are referred to as "postulates of the theory of evolution," put forward by "many students of nature at the present day." As examples of these precious *pure postulates* we may cite the following: (*a*) The oldest known fossils represent the beginnings of life on the globe (p. 22). (*b*) The absence of *all* the intermediate forms between great groups indicates a "transformation and alteration of form rather than an actual higher evolution" (p. 76). (*c*) "We are not justified in bringing animals, like mammalia, birds, fishes and worms, into genetic connection with plants, like trees, ferns, and mosses" (p. 108). (This, we are told in the preface, is the *chief postulate*.) (*d*) Explanation of the origin of life is essential to any theory of evolution (pp. 83–108).

Starting from these "postulates," there is no difficulty in forecasting the author's conclusions. Indeed, but for the fact that some recent researches are referred to in order that they may be tortured into support of the author's views, we might imagine that we were reading one of the reviews of the "Origin of Species" written fifty years ago; and this idea would be confirmed as we come upon contemptuous and vituperative references to Darwin, Haeckel, and other men of science. Not having seen the German original of the book, we cannot say whether the inaccuracies, which abound in every part of it, are due to the author or the translator. Within the compass of a dozen lines we find "Quartiary," "Mussel Chalk," "Dyas (Perm.)=Permian Limestone and Old Red Sandstone," and "Algonkium=pre-Cambrian." Nor are we impressed, as we wade through misconceptions, misstatements, and misspellings, by the fact that the book bears the *Imprimatur+Johannes J. Glennon Archiepiscopus Sti. Ludovici.*

The Story of a Hare. By J. C. Tregarthen. Pp. xi+199+plates. (London: John Murray, 1912.) Price 6*s.* net.

IN this life-story of a hare the author has successfully combined narrative with instruction. Most books on natural history for general readers are too informative and lack the living feeling which always commands a wide appeal. This touch, which makes the whole world kin, is largely a thing of sympathy, and no book on the life of a wild animal can be successful without it. Mr. Tregarthen possesses that attribute and has therefore written a book which will be appreciated by all lovers of wild animals and observers of their habits. He describes the life of a hare from birth to death from the point of view of the animal itself, and amid the scenes of a century ago. We have thus an account of the hare's habits and its struggles for existence in an attractive setting. The author has insight as well as sympathy, and his book should interest many readers.

Les Progrès Récents de l'Astronomie. By Prof. Paul Stroobant. Pp. 173. (Brussels: Hayez, Rue de Louvain, 112, 1912.)

PROF. STROOBANT'S annual *résumé* of the advances made in astronomy during the previous year is becoming a work of increasing usefulness to the astronomical reader; a wide range of subjects is treated concisely and with a discerning appreciation of relative importance. As usual, the review of 1911 is not restricted to observations only, but includes the recent advances in theory, such, for example, as Miller's and Störmer's papers on the mechanics of the corona and Birkeland's suggestions as to the formation of sun-spots. Tables of new variable stars (148), minor planets (now totalling 732) and new spectroscopic binaries (94), and several fine plates, add considerably to the value of the work. W. E. R.

Heredity. By J. Arthur Thomson. Second edition. Pp. xvi+627. (London: John Murray, 1912.) Price 9*s.* net.

IN the present edition of his book, the original edition of which was reviewed in NATURE for August 20, 1908 (vol. lxxviii., p. 361), Prof. Thomson has included references to some of the new discoveries that have been made in the last five years in the branch of biology with which the volume is concerned.

An Elementary Historical Geography of the British Isles. By M. S. Elliott. Pp. x+172. (London: A. and C. Black, 1913.) Price 1*s.* 6*d.*

THIS little book shows very convincingly how profoundly the geography of a country can influence its history; and it serves to demonstrate also the necessity of a good knowledge of geography for teachers of history. The volume may be recommended as suitable for supplementary reading for boys and girls in secondary schools who are studying history or geography. The book is well illustrated and contains numerous helpful maps.

The Interpretation of Radium. By F. Soddy. Third edition. Pp. xvi+284. (London: John Murray, 1912.) Price 6*s.* net.

THE general characters of this work were given in the review of the first edition which appeared in the issue of NATURE of May 27, 1909 (vol. lxxx., p. 368). In the present issue Mr. Soddy has included the latest and most complete data available, and those new discoveries for which there is trustworthy evidence. A new final chapter upon the thorium and actinium series has been added.

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.]*

Iceberg Melting.

I HAVE pleasure in sending you a photograph of the iceberg around which we obtained the isothermal lines published in NATURE of December 12, 1912. I did not make an instrumental survey of this berg, but it was larger than the average of those met with in the Strait of Belle Isle. We sighted more than 200 bergs during our trip, and made traces of many of them. Invariably the temperature rose on the approach to a berg. Sometimes a small fall of temperature resulted abeam of the berg, but the rise of temperature was the one characteristic effect. The two other photographs [not reproduced] I send you illustrate the fantastic shapes seen in ice. I wish it were possible to furnish in some way an idea of the wonderful colouring, but I am totally unable to do so.

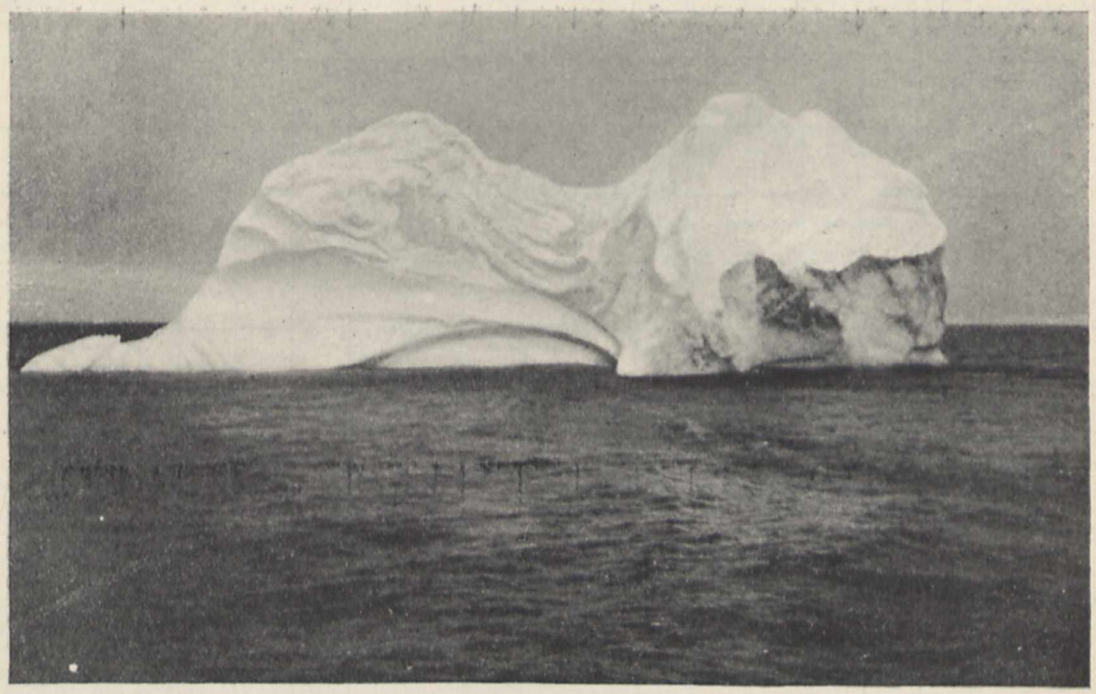

FIG. 1.—Iceberg used for the purpose of studying the isothermal lines published in the issue of NATURE for December 12, 1912.

In the "swimming moose" you can see the dangerous overhanging ridge, which is caused by the underwater melting and the lapping of the warmer water waves against the ice. This ridge is always found in bergs which have not recently turned over. In the records which Mr. King was able to get for me in 1910, besides the rise of temperature, a fall of temperature was obtained, when the ship approached the various icebergs, with the exception of one. These bergs were all floating in the main arctic current off the eastern coast of Labrador. In the light of my recent work I feel sure that the drop in temperature was due to the influence of the cold current in which the iceberg was floating. These cold currents exist in the main arctic current, whether ice is present or not, but the effect of the presence of the ice is to elevate the temperature slightly.

To assist in illustration of my meaning reference must be made to the microthermogram taken on the Allan Line R.M.S. *Victorian* last June. This record, which is a direct trace from the chart on the instrument, is through the ice track at a depth of 18 ft. by the Cape Race route. After passing the "Cold Wall" the arctic current drops in temperature regularly as the ship proceeds westward. The small variations up and down are partly due to icebergs passed at distances of six to eight miles, and partly due to colder currents. The lowest temperature recorded here was reached nearest the Newfoundland coast, but the effect of ice can be seen well marked by the sharp peak of temperature, which I have shaded. Just here we

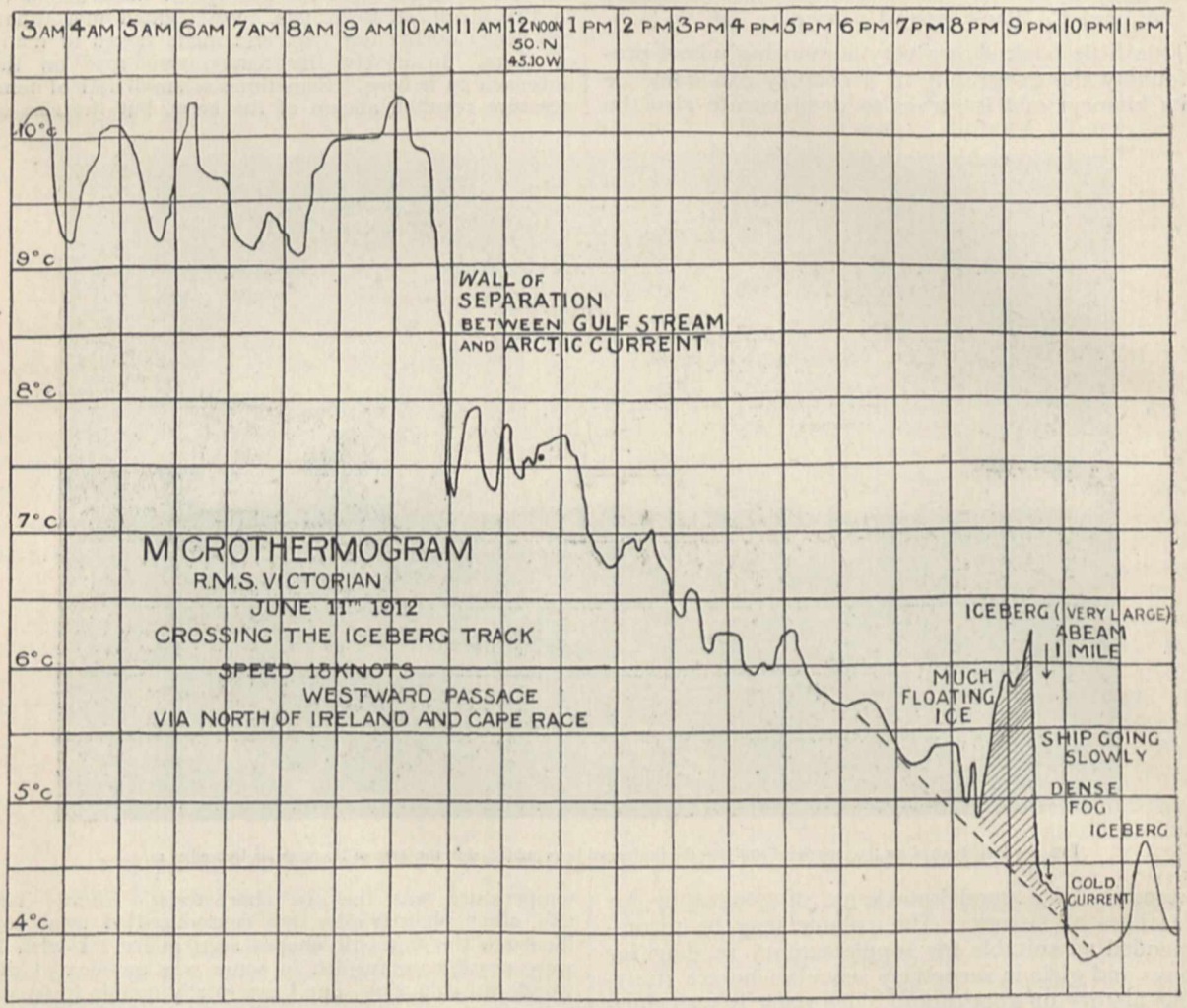

FIG. 2.

passed most of the ice closely, and were obliged to proceed slowly in heavy fog at times. This colder and swifter arctic current carried with it the greater proportion of the ice, but it is well known that this colder current exists whether accompanied by ice or not.

The great drop in temperature just before coming abeam of our largest berg was not due to the iceberg itself, but to the influence of the cold current. The effect of the ice is to hold the temperature abnormally high. The dotted line on the diagram represents how the temperature would probably have gone had no ice been present.

It would depend which way we approached this berg whether a drop in temperature would result. The temperature rises rapidly, whichever way we approach it. I have many other traces illustrating the same thing, and for this reason I was forced to abandon the idea that an iceberg sensibly cools the water in which it is floating. I was also unable to find by calculation that an iceberg could appreciably influence the sea-water on account of its slow rate of melting.

It is very illusive to depend on laboratory tank experiments to illustrate sea-water circulation: the conditions at sea are very different. I was very much surprised not to find, during my experiments last summer, more conclusive evidence of sea-water dilution due to the melting icebergs. A large number of conductivity tests were made of sea-water, and these are described in my Canadian Government Report. The following may be of interest; the readings were made at 26° C.:—

Table of Conductivities of Sea-water taken in July (1912).

Close to grounded berg, Cape Bauld Neld	0·05007
Strait of Belle Isle, eastern end	0·04827
Ten miles east of Belle Isle	0·04850
Close abeam large berg...	0·04787
One mile north of same berg	0·04806
Close abeam same berg	0·04827
Six miles from same berg	0·04768
Seventy yards to leeward of a berg	0·04787
Forty yards to windward of same berg ...	0·04787
One hundred yards to leeward of a berg ...	0·04806

The numbers may perhaps indicate a slight effect, but nothing like what I expected. My conductivity tests of the sea-water brought back by Mr. King from Hudson's Strait in 1910 gave a value of 0·0480 at 25° C. Correcting for temperature this observation serves to connect the sea-water entering the Strait of Belle Isle with that in Hudson's Strait. Eastward from Belle Isle Strait the conductivity rises rapidly for 180 miles, after which it becomes uniform up to 450 miles. The greatest arctic current sweeps down close to the Labrador shore, and in through the Strait of Belle Isle, where the resultant flow is westward. The following measurements of the conductivity through the ice track by the Belle Isle route were obtained last October on the *Empress of Britain*. The values were all measured at a uniform temperature of 25° C.

Abeam of Belle Isle	0·04865
Forty miles east of Belle Isle	0·04986
Eighty miles east of Belle Isle	0·05047
One hundred and sixty miles	0·05150
Two hundred miles	0·05235
Two hundred and sixty miles	0·05257
Four hundred miles	0·05211
Four hundred and fifty	0·05257

It is evident that the great arctic current is of a lower order of salinity, and that its course may be traced along our eastern coast.

In the early spring when the water is cold the Newfoundland fishermen will find the cod in the vicinity of the icebergs, and will always obtain their catch there. Perhaps this is an indication of the warming influence of the bergs, for the cod will not live in very cold water.

Next summer I shall continue my observations more particularly with reference to the influence of land on the temperature of the sea. I hope before long to be able to publish here some typical microthermograms showing this effect. H. T. BARNES.

McGill University, January 27.

Atmospheric Potential.

UNDER the above heading Mr. Evan McLennan refers in NATURE, February 13, p. 647, to supposed puzzles in atmospheric electricity. That certain difficulties exist no one can deny, but Mr. McLennan's difficulties might, I think, be removed by consultation of existing text-books. The vertical current which he thinks should exist in the atmosphere does exist, and methods of measuring it with more or less accuracy have been in operation for some years. Mr. C. T. R. Wilson devised an apparatus for its direct measurement, and his experiments, made in good weather near ground level, gave a mean value of about 2×10^{-16} amperes per sq. cm. A mean value of the same order, but slightly larger, has been deduced at Potsdam from continuous observations of the electric conductivity of the atmosphere and the potential gradient. To get an electrical current through a vertical conductor it is necessary to bring its upper end to the potential of the surrounding atmosphere. "St. Elmo's fire" is a well-known natural phenomenon. Currents can be obtained through a wire attached to a kite, but the experiment at times may be dangerous. Mr. McLennan seems to suppose that the potential in the free atmosphere increases uniformly with the height. Observations, however, have shown that the normal rate of increase of potential per unit of height diminishes as the height increases and becomes small at the height of a few kilometres. A mountain, it should be remembered, is part of the earth, and shares its potential; if steep it has a large effect on the shape of the equipotential surfaces in adjacent space. Dr. Simpson, in the letter referred to by Mr. McLennan, mentions the real poser, viz. why in spite of the vertical current the earth retains its negative charge in fine weather. C. CHREE.

The Ascent of the Italian Balloon "Albatross," August 12, 1909.

IN NATURE of August 19, 1909, a note appeared stating that in an ascent from Turin the Italian balloon *Albatross*, manned by Lieut. Mina and Signor Piacenza, had reached a height of 38,715 ft., which is greater by about 3000 ft. than any authenticated record for a manned balloon ascent. A communication has recently been received from Prof. Palazzo, director of the Italian Meteorological Office, in which he states that the aëronauts Mina and Piacenza were not provided with the necessary instruments for measuring the height which they reached, and that M. Mina, in the *Rivista Tecnica d'Aeronautica* of 1910, modified his earlier estimate and sought to prove that the balloon had reached a height of 9240 m. (30,300 ft.). Owing to the absence of a proper record of pressure and temperature, however, even that value is uncertain. W. N. SHAW.

Meteorological Office, South Kensington, London, S.W., February 12.

Induced Cell-reproduction in the Protozoa.

THE discovery of the fact that the products of cell death can cause cell-division in lymphocytes and other cells of the human body has given rise to a strong suspicion that these substances may be necessary for any form of cell-reproduction to occur. It has been already demonstrated by Fantham and Ross that *Amoeba coli* can be caused to divide through many generations by means of auxetics, and Drs. Ross and Cropper have shown that induced cell-reproduction will occur in the ova of *Ascaris megalocephala* if the eggs are mixed with a solution containing auxetics and incubated. It is important, therefore, for confirmation to come from other sources. Some time ago I was fortunate enough to discover a new variety of Polytoma, differing considerably from *P. uvella* in many respects, but chiefly in the fact that the new variety formed spores in the late autumn, which did not develop until the following spring. A full account of the new organism is in course of preparation for publication.

These winter resting spores seemed to me to be extremely suitable objects for testing the action of auxetics. Some preliminary experiments were accordingly made to see whether increase of temperature would cause development. Spores were placed under suitable conditions in the incubator, and kept at a temperature of 25° C. for periods varying from one to three weeks. On careful examination it was found, however, that no change had taken place.

A solution was then prepared containing 2 c.c. of a 4 per cent. solution of theobromine, 0·4 c.c. of a 5 per cent. solution of sodium bicarbonate, and 0·5 c.c. of a 1 per cent. solution of atropine sulphate, and the mixture diluted to 10 c.c. with water. Water containing large quantities of the spores was then mixed with an equal volume of this solution, and the mixture was incubated at 25° C. On examination at the end of forty-eight hours about 5 per cent. of the spores were found to show indications of division, while controls containing no auxetics showed no change. I then worked with a concentrated extract of sheep's suprarenal gland, augmented by the addition of 0·5 c.c. of a 1 per cent. solution of cadaverine

to 10 c.c. of the extract. Incubation of spores with this mixture gave unmistakable evidence of division at the end of eight hours, and in forty-eight hours the products had separated, and were lying free within the sac wall. At a later period they acquired flagella, and several sacs discharged their contents, which appeared quite normal in all respects.

The fact that auxetics will cause the full development of these spores is important, and raises the question as to whether their presence may not be necessary under natural conditions, as it seems fairly evident that pond-water must contain auxetics, derived from the organic matter present, and it is quite possible that it may also contain augmentors in the shape of some of the alkaloids of putrefaction. Much work, however, remains to be done in this direction before the question can be regarded as definitely settled. From the available evidence, however, it seems to be clearly demonstrated that the products of cytolysis do cause cell-reproduction, and, that being so, it is very probable that it is absolutely necessary for a cell to absorb these auxetics before any reproduction is possible.

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The Lion in Sinhalese Art.

IN the notice of the new "Guide to the Collections of the Colombo Museum," which appeared in NATURE of January 9 (p. 523), the point was raised as to the source of the concept of the lion which occurs so frequently in Sinhalese art.

The lion has never been native of Ceylon, and the association of the symbol with the Sinhalese race may be traced back so far as B.C. 543, when a band of adventurers from northern India, led by Wijayo, landed in Ceylon. According to the *Mahawansa*, Wijayo's father was the offspring of a lion, and was called Sihabahu, or Sinhabahu (lit. "lion arm"). This legend is based upon the fact that the grandfather of Wijayo was probably an outlaw named Siha or Sinha ("lion"). Hence the name Sihala or Sinhala was given to Wijayo's kingdom, and the newly established race became known as the Sinhalese. In this way the lion became the national emblem, and, together with the sun, is depicted on the royal banner. Nevertheless, there is no Sinhalese heraldry, as the term is understood in Europe.

The lion was regarded as a symbol of royalty by the Sinhalese, hence the word *sinhāsena* (lit. "lion seat") was applied to the throne. In the Colombo Museum there is a stone lion standing about 5 ft. high, upon which was placed the throne of the kings when the seat of Government was at Polonnaruwa.

A monograph on the Sinhalese banners is shortly to be issued from the Colombo Museum, when the significance of the lion will be fully discussed.

JOSEPH PEARSON.

Colombo Museum, Ceylon, January 30.

THE BRITISH ANTARCTIC EXPEDITION.

(1) TRIBUTE TO THE DEAD EXPLORERS.

FULLER information and reflection on the disaster which overtook Captain R. F. Scott and his four companions in the Antarctic have served to intensify the national senses of bereavement at their end and of pride at the manner in which it was encountered, and both senses have been given full expression. St. Paul's Cathedral was filled, and might have been filled again, on Friday last, when a memorial service was held. The King was present, and there also attended Queen Alexandra, the Prime Minister, and other members of the Government, representatives of the Opposition, of foreign Powers, of the Royal Geographical Society, of the Royal Society, and of many other bodies and institutions which were directly interested in the expedition, or with which its lost members were associated. Memorial services have also taken place at Portsmouth and Devonport dockyards and elsewhere. Expressions of regret have been received from many Colonial and foreign Governments and societies, and tributes of deep sympathy and appreciation have been paid to the memory of the dead by other workers in the polar fields—Dr. Nansen, Admiral Peary, Captain Amundsen, Dr. Charcot, Sir E. H. Shackleton, and others.

Prompt steps have been taken to fulfil the last wish of Scott, that those dependent on his companions and himself should not be allowed to want. On the part of the Government, it is stated that Captain Scott and Petty Officer Evans will be regarded as having lost their lives in action, and the pension due to their widows will consequently be enhanced. Further assistance, covering the necessities of the dependants of the other lost travellers, may be expected to be forthcoming from the public funds. The committee of the Antarctic Exploration Fund, of which Sir Edgar Speyer is chairman, is taking measures to the same end, and is also concerned to clear off the very heavy debt remaining upon the expedition, towards which Scott himself had pledged personal property, and which includes the recoupment of some of the survivors who have forgone part of the payment due to them. The question of the proper publication of the scientific results of the expedition is also involved. If the expedition had ended in success unshadowed by disaster, and if the leader had himself returned, means would have been open, which now are closed, for the discharge of these liabilities; the loss of his lectures, for example, must have a serious financial bearing on the whole position of affairs. In addition to the action of the Government and of the committee, a public subscription fund has been opened by the Lord Mayor of London; two London newspapers (*The Daily Telegraph* and *The Daily Chronicle*) have adopted a similar course, and collections are also being made under various official or unofficial auspices in various centres in the provinces and colonies. It may be added that, at the moment of writing, the Mansion House Fund has not been augmented with the rapidity characteristic of occasions of deep national feeling; it may well be that the public waits to learn what measures will be taken by the Government; but these cannot in the nature of the case be taken immediately, and there is ample scope for the proper use of whatever moneys may in the meantime be subscribed.

In addition to the above connections in which money is needed, a specified object of the Mansion House Fund and of some others is the provision of a national memorial to the dead. From such an object none can conceivably dissent; a generation which has recently criticised those preceding it for neglecting to set up a proper memorial to Captain James Cook could scarcely face the chance of incurring similar criticism in the case of Captain Scott; but the question of the form which should be taken by a national memorial is wide, and always involves much discussion and invokes many opinions. In all the present circumstances, however, much respect and consideration are due to a suggestion which emanates from Lord Curzon, who, as president of the Royal Geographical Society, addressed a letter to the Press on Saturday last, summarising the whole position as, but more fully than, it has been summarised above. In his concluding paragraphs he discusses the question of the form of a national memorial to Scott and his companions. "A national monument in a public place," "a memorial in our great metropolitan cathedral," are the suggestions which would come first to the minds of most men, but Lord Curzon qualifies them with the counter-suggestion that "the available sites for public monuments in London are few; nor does our artistic genius invariably find its best expression in masses of marble or bronze." Many would agree with this view, and might feel that some measure of more practical utility, such as the endowment of future scientific research in the Antarctic or Arctic region, would be a more fitting memorial to those who gave their lives in the advancement of that particular department of research.

Lord Curzon's suggestion, however, made on behalf of the Royal Geographical Society, is for the erection of a Scott Memorial Hall on a portion of the ground belonging to Lowther Lodge, which has recently been acquired by the society as the headquarters where it will very shortly be established. The society has hitherto held its large meetings in the theatre at Burlington Gardens; but since the Lowther property was acquired the ultimate provision of a hall of its own has been in mind. The disaster to Scott is an incident not only in national history, not only in the history of exploration, but in the history of the society itself; it befalls to synchronise with two other important incidents, the establishment of the society in new quarters and the broadening of the basis of its membership; on such grounds there is reason for a hope that the proposal for a hall specially devoted to lectures on geographical science and exploration should be fulfilled more speedily than in the normal course it would probably be, and should be identified with Scott's name; and it may well be suggested that the establishment of such a hall would be a most fitting form of national memorial, combining at once the public function fulfilled by statuary and the scientific function of a foundation for the advancement of geographical research. A national memorial of such form could be entrusted to no more fitting keeping than that of the society which is the representative of the nation in the promulgation of geographical discovery, and has been so closely associated with the British Antarctic Expedition itself.

The scientific importance of the expedition, to which brief reference was made last week on the basis of the information which had been brought from the expedition last year, is immensely enhanced by the further results which Commander E. R. G. Evans has now summarised. First, it is a duty to pay one further tribute to the personal devotion to their scientific duties of Scott and his dead companions, for not only does it appear that through all the dreadful stress of the return march from the pole, down to March 12 (1912), when the thermometer was broken, they maintained meteorological observations, but it is reported also that they carried with them to the end a collection of geological specimens, a dead weight which they must often have been tempted to jettison; many would have done so, and none would have blamed the act. Commander Evans lays stress on the geological results of the expedition at large; and the main points of these results are referred to below. Investigations of the physical conditions of the ice were continued; these, together with meteorological, magnetic, gravity, and atmospheric electrical observations occupied Mr. C. S. Wright, while Mr. E. W. Nelson carried on hydrographic work; Mr. Cherry Garrard dealt with the preparation of skins of zoological specimens, and Mr. Lillie with marine biological collections. A new line of soundings is mentioned, extending from Banks Peninsula to 60° S., 170° W., and thence to 73° S., and an abrupt shoal, with only 158 fathoms' depth above it, is recorded in the middle of Ross Sea.

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(2) Geological Results.

The dispatch from Commander Evans published on February 15 deals especially with the geological results of the expedition; they were collected by the southern party under Captain Scott, by the northern party under Lieutenant Campbell—who was accompanied by Mr. Raymond Priestly as geologist—by the western party under Mr. Griffith Taylor, and by Mr. Priestly during the ascent of Mount Erebus in December, 1912. It is clear that each party secured most interesting and valuable information. All the parties have been working in areas that had been previously traversed by members of the National Antarctic Expedition, or by that under Sir Ernest Shackleton. It had been hoped that one party would have visited King Edward VII. Land, and have discovered the structure of the lands to the east of the Ross Sea, which were quite unknown until reached by Nansen's companion Johansen, who was serving with Amundsen. The abandonment of this project enabled the energies of the whole of Captain Scott's staff to be devoted to the further study of South Victoria Land.

Commander Evans's despatch is written in popular language, and the results cannot be judged until the receipt of a more technical statement. The difficulty of interpreting the cablegram is increased by some obvious verbal errors; thus the statement that in the volcanic series at Cape Adare "there was found an agglomerate of erratic bearing, many of the boulders being striated by ice action," is unintelligible. If it means that the old rocks there include a conglomerate of ice-scratched boulders, the discovery would be of much interest, especially if its age can be determined; it may mean that the volcanic rocks include an agglomerate, and that there is also a glacial boulder bed.

Commander Evans reports that the southern party brought back 35 lb. of geological specimens, which were apparently all collected from the Beardmore Glacier. The report published shows that this material confirms the conclusions based on the specimens collected by Sir Ernest Shackleton. His party observed seven seams of coal in

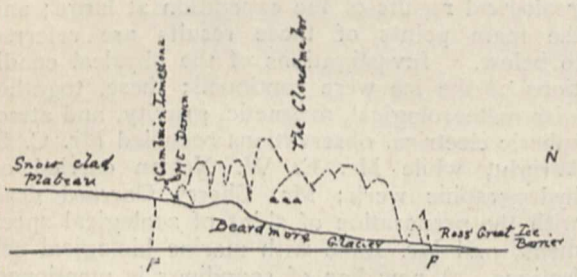

FIG. 1.—F, Faults bounding the mountain Horst. *x*, Coal seams in beacon sandstone. *a a a*, Limestone breccia with Archeocyathus, Ethmophyllum, Solenopora, etc.

the cliffs at the head of the Beardmore Glacier: one seam was 7 ft. thick, and four were each 3 ft. thick. The coal contained 69 per cent. of fixed carbon, and the sample tested was non-coking. The seams occur in the Beacon Sandstone, and the plant remains indicate that the age of this formation is either Upper Palæozoic or early Mesozoic. The fossil plants obtained by Dr. Wilson appear to be in better preservation, and it is therefore interesting to find that they confirm the age assigned to the Beacon Sandstone by Prof. David and Mr. Priestly. The other fossils obtained by the southern party are described as "corals of a primitive form, typical of the early Palæozoic Age." The Cambrian fossils obtained from the same locality by Shackleton include a coral allied to Ethmophyllum, and specimens of Archæocyathus, Coscinocyathus, Solenopora, as well as sponge spicules and traces of Radiolaria. The accompanying section (Fig. 1) from the report by Priestly and David shows the relative positions of the Cambrian and coal-bearing formations. The specimens of Cambrian limestones obtained by the southern party will probably yield important additions to the small Cambrian fauna collected by Sir E. Shackleton.

The northern and western parties have both been at work in areas of which preliminary surveys have been made by the two previous expeditions, and they will no doubt add materially to knowledge of the area. The recovery of Prof. David's collection from Depot Island will probably enable him to fill in further details to his work.

Mr. Griffith Taylor, of the Australian Meteorological Service, who was geologist to the western party, has examined a coal seam in the Beacon Sandstone near Granite Harbour, while Mr. Priestly has studied the same formation near Mount Melbourne, and there obtained some large stems of fossil wood. These new plant remains should enable the age of the Beacon Sandstone to be more definitely established. Prof. David describes the formation as similar to the "Trias-Jura" of Tasmania, but he regards the evidence as only adequate to assign it to the Gondwana Formation; and it may therefore be as early as the Carboniferous or as late as the Jurassic.

The detailed survey by Mr. Priestly and Mr. Taylor will no doubt be found to yield more new information to the geology of South Victoria Land than is implied by the dispatch. Their work, for example, will probably settle the question at issue between the two former expeditions as to whether any of the granites are intrusive into the Beacon Sandstone.

It is also announced that the volcano rocks of "Rock Island," clearly a misprint for Ross Island, have been discovered to be older than was thought.

Mr. Priestly during the first season collected a series of rocks from the Cape Adare district, which was previously known from the collection made by the Southern Cross Expedition, and described by Dr. Prior. Mr. Priestly also ascended Mount Erebus by a different route from that followed by Prof. David; the lip of the crater was found to be 10,000 feet high, and the sledges were hauled to the level of 9500 feet. The volcano was in "mild eruption," and Mr. Gran was nearly suffocated by its fumes.

Mr. Griffith Taylor has measured the flow of the Mackay Glacier, and found that its rate is 80 ft. a month, a much lower speed than that of some Greenland glaciers, and less than that estimated for the Ross Barrier. With so competent a physiographer as Mr. Taylor, valuable contributions to the glacial geology of the area may be confidently expected.

Commander Evans's report directs attention to the interesting problem of former changes in the Antarctic climate. As the rich fauna living in the Ross Sea includes simple corals and sponges, the fossils from the Cambrian limestones do not prove any considerable change in the temperature of the Antarctic seas. The fossil plants and coal seams give stronger evidence than the fauna of climatic change. It is interesting to know that the Antarctic shared in the variations of climate proved for the Arctic regions by their well-known plant beds; but the extent and nature of the climatic change indicated by the Arctic fossil plants is still problematical.

EXPERIMENTAL STUDIES IN AËRODYNAMICS.[1]

M. EIFFEL has contributed much to the experimental study of aërodynamics and aëronautics, and his experiments at the Eiffel Tower some years ago upon air resistance at high velocities will be recalled as establishing the truth of the squared law for velocities up to 40 metres a second. His subsequent researches at his laboratory in the Champ de Mars will be familiar to all students of the subject, and more particularly to those concerned with the more practical aspects of aërodynamics as pertaining to the design of aëroplanes. In this paper he describes some recent researches, and also the apparatus and equipment at his new laboratory in the Rue Boileau, Auteuil, which the writer has had the opportunity of inspecting, thanks to the courtesy of M. Eiffel and of M. Rith, his able collaborator.

This laboratory was designed on a more extensive scale than that of the Champ de Mars, for the wind tunnel in the latter only allowed velocities of 18 metres a second. As the speed of aëroplanes considerably exceeds this, it was deemed advisable to construct new apparatus to obtain velocities more nearly those attained in actual flight. The large wind tunnel in this laboratory consists of a tube provided with a fan, the tube being made on the Venturi pattern, and in that part corresponding to the "throat" is situated the room containing the delicate registering apparatus, in which the attendants can watch and work the tests upon aërofoils of large size suspended in the current (Fig. 1). The current traverses this room, the outlet and inlet being on opposite sides. The cone collector has diameters of 4 and 2 metres with a length of 3·30 metres, and the diffuser (or discharge end of the tube) has a length of 9 metres and ends with a fan 4 metres in diameter (Fig. 2). With this large tunnel velocities of 2 to 32 metres per second are obtained.

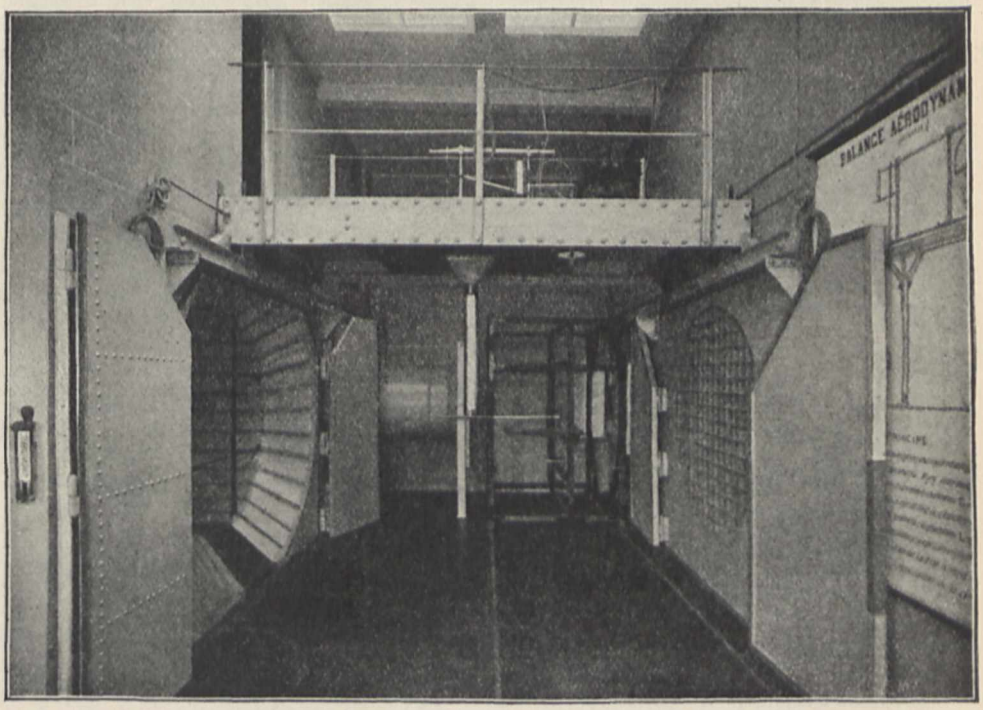

FIG. 1.—Dynamometer room through which the current of air passes from right to left (Auteuil laboratory).

Parallel with this tube, and passing through the same instrument or measuring room, is another, 1 metre in diameter, by which velocities of 40 metres per second (89 miles per hour) can be obtained. The registering apparatus is carried upon a chariot running on rails, and may be moved from one tube to the other, as desired, across the instrument room. So much for the design of this laboratory, at present the largest of its kind in existence, and very complete in all that pertains to experimental aërodynamics.

The first tests made at the Auteuil laboratory and described in the paper before us were upon model aëroplanes to determine, if possible, the laws of similitude between an aëroplane and its model. For this purpose an *exact* model, constructed to a scale of 1 to 14·5, was made of the aëroplane used by Col. Bouttieaux and M. Meudon, of the military aëronautical laboratory at Chalais-Meudon, for experimental purposes and equipped with registering apparatus. By pressing a button the pilot, Lieut. Saunier, when flying on an absolutely calm day, could register photographically the following data:—(1) the kinetic thrust of the propeller, or head resistance, usually called "drift"; (2) the speed of the propeller; (3) the velocity of the aëroplane relative to still air; (4) the angle of attack or angle made by the chord of the aërofoils with the line of flight.

The model of this aëroplane was subjected to tests in the laboratory at velocities about the same as those of the actual flight, and curves were drawn giving the values of lift and drift for different angles of attack. When these resistances, horizontal and vertical, are compared for the aëroplane and its model, they are found to

[1] "Les nouvelles recherches expérimentales sur la Résistance de l'Air et l'Aviation faites aux laboratoires du Champ de Mars et d'Auteuil." Par M. G. Eiffel. Extrait des Mémoires de la Société des Ingénieurs Civils de France. (Bulletin de Juillet, 1912.)

lie on the same curve, taking account, of course, of the scale of the model. All the values of the vertical components for the aëroplane fall exactly upon the curve for the model, and five out of seven for the horizontal components likewise, the other two showing but slight difference. The paper contains other results obtained in this new laboratory from which much may be expected in the future.

In his paper[2] M. Gandillot makes frequent calls upon the experimental results obtained by M. Eiffel to support the mathematical analysis he gives of the action of bodies moving through the air and the thrust of aëroplane propellers. He considers the air as an elastic medium in which disturbances are propagated according to well-known laws. The mass of air acted upon by a plane surface moving through it may be calculated by these considerations, and the deductions are supported by M. Eiffel's results. Thus a plane surface moving at a constant velocity at a known gradient acts upon a mass of air greater than the volume swept through, as is shown by the fact that the force necessary to move the plane is greater than would be accounted for by displacement. In the light of the experiments of M. Eiffel on propellers in a current of air, the discussion of the action of propellers during flight is interesting, especially the law connecting speed of flight with angular velocity of propeller. This mathematical summary is a valuable work taken in connection with the researches at the Champ de Mars and Auteuil. R. S. B.

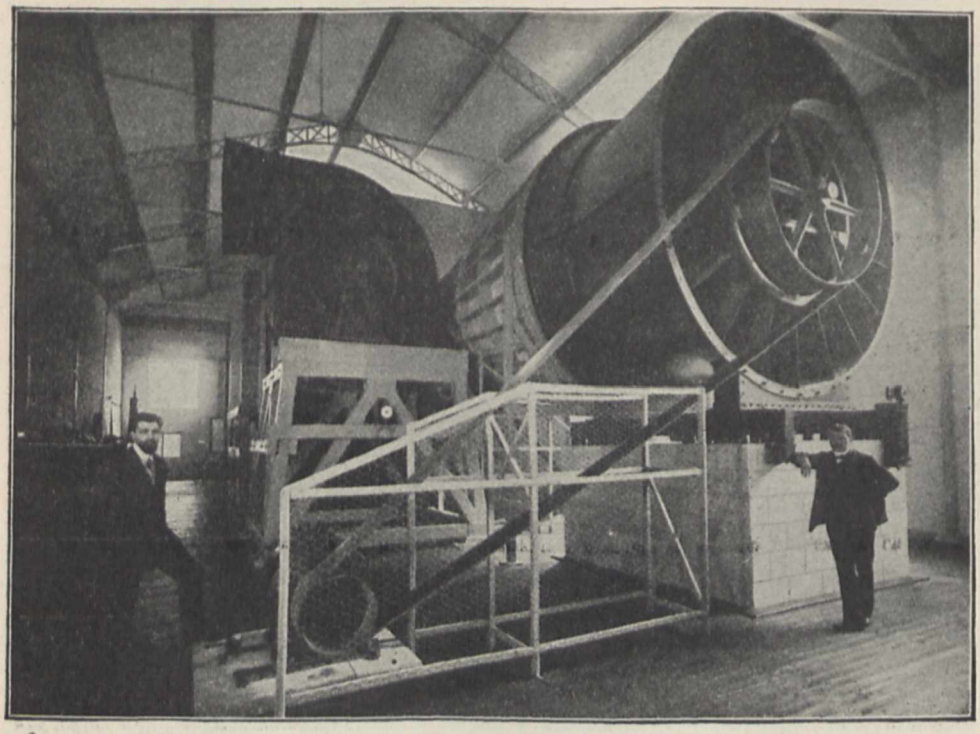

FIG. 2.—Discharge end of the Venturi tube (Auteil laboratory)..

[2] "Abrégé sur l'Hélice et la Résistance de l'Air." Par Maurice Gandillot. (Paris: Gauthier-Villars.)

THE WHEAT SUPPLY OF GREAT BRITAIN.

THE recent announcement by Mr. R. H. Rew that this country produces about one-half of its own food lends interest to the volumes of statistics periodically issued by the Board of Agriculture, setting forth the respective amounts of agricultural produce raised at home and imported from abroad, and the home production of agricultural produce. Even those who professed to be experts in the matter were not prepared to find that so much of our food was home-grown. There is no doubt that the wheat statistics had been responsible for the misconception. Only about one-fifth of our wheat is supplied by the British farmer, the rest all coming from abroad. It had been too hastily assumed that the other imports of food supplies worked out in the same proportion.

In the latest figures published in the Journal of the Board of Agriculture (No. 6, 1912), it is shown that the home crop amounted to more than 8 million quarters for the previous season (1911–12). Although this is far below the 10 million quarters raised in 1885, it is, nevertheless, the highest crop obtained for many years, a highly satisfactory result on which agriculturists are much to be congratulated. The total imported was roughly 27½ million quarters, which came most from India, next from Canada, followed by the United States, Argentina and Australia, and least (among the principal countries) from Russia. One of the most remarkable developments has been the Indian supply. So recently as 1908–9 India came rather a bad fourth on the list of wheat-supplying countries, Canada third, and the Argentine and the United States respectively first and second. But the Indian export made a big jump up in 1909–10, and a further one in 1910–11, and it maintained this new high level in 1911–12.

So much admirable work has been done at Pusa on the production of Indian wheats for the British market, and so much interest has been aroused among the more progressive cultivators, that we may confidently expect India to maintain a high position among wheat-producing countries.

Canada is, however, running India very close, and the staff of the Ottawa Experimental Farm is actively engaged in studying wheat production, in raising new varieties suited to the different regions, and in devising new methods of management or cultivatio. likely to increase the yield. It is satisfactory, also, to find that Australia has considerably increased her shipments of wheat and sent more than in any previous year; the yields for some of the States would seem to indicate even further possibilities of increase.

GEORGE MATTHEY, F.R.S.

THE death of Mr. George Matthey, F.R.S., on February 14, in his eighty-eighth year, removes one who whilst actively engaged in commercial work was at the same time keenly interested in scientific progress.

During the early years of his life Mr. Matthey's time was devoted not only to developing and extending the business in Hatton Garden, but also to a most careful study of platinum and its associated metals, and he devised methods by which these metals could be separated quantitatively from each other on a large scale. These methods were described by him in the Proceedings of the Royal Society for 1879 (vol. xxviii., p. 463).

In 1870 an international metric commission met in Paris. Its object was the construction and verification of a new and uniform series of standards, and upon it served such masters of metallurgical and chemical arts as Deville, Debray, and Stas. Certain members of the commission undertook the work of purifying the platinum and iridium of which the new standards were to be composed.

After much labour had been expended, the alloy consisting of platinum with 10 per cent. of iridium was produced, but on analysis it was found to be impure. At this stage Mr. Matthey was invited by the French Minister of War, at the instigation of several important official bodies, to prepare the necessary quantity of alloy. He at once undertook the work of making the large quantities of platinum and iridium in the highest state of purity, and finally cast the ingots of the alloy in Paris. These ingots were submitted to the most rigid analysis, and proved to be exactly of the composition required.

Mr. Matthey was then invited to construct the bars of the somewhat peculiar cross-section which had been already decided upon. The writer well remembers Mr. Matthey telling him that his friends besought him to have nothing to do with the construction of the bars; he was not, however, a man to be daunted by a difficulty of this sort, and he went into the City and bought a second-hand lathe, and set one of his skilled workmen to produce the bars of the desired cross-section. The bars fulfilled all the conditions that were laid down. Copies of them were supplied to all the larger countries of the world, and they now constitute the standards upon which the metric system rests. Mr. Matthey was appointed a member of the Legion of Honour, and in 1879 he was elected a fellow of the Royal Society.

Notwithstanding the absorbing character of business affairs and inroads on his leisure necessitated by his deep interest in scientific progress, Mr. Matthey found time to interest himself in educational matters; he played a very active part in the foundation of the City and Guilds Colleges for the advancement of technical education at Finsbury and South Kensington, and served for many years on the executive governing body of those institutions. His wide knowledge of affairs and his keen judgment of men played no small part in determining the signal success of these two colleges from their very inception. The very complete scheme of technical education with which London is provided is in a large measure due to the enthusiastic efforts of Mr. Matthey in association with two other prominent members of the Goldsmiths' Company, Sir Walter S. Prideaux and the late Sir Frederick Abel.

Mr. Matthey for a very prolonged period served as a warden of the Goldsmiths' Company, where his counsel and advice were of the greatest assistance on questions relating to assaying and the precious metals. Almost all who work at scientific research are under a deep debt of gratitude to Mr. Matthey and his firm for unvarying kindness in helping them out of many difficulties by placing the resources of their works so freely at their disposal.

Those who had the privilege of counting Mr. Matthey as a friend realise that they have lost a truly delightful companion, remarkable not only for the wide breadth of his sympathies, but also for his genial temperament and abhorrence of all that savoured of sham. C. T. H.

NOTES.

MR. DAVID HOOPER, curator of the Industrial Section, Indian Museum, Calcutta, has been appointed economic botanist to the Botanical Survey of India.

THE Rev. A. H. Cooke, author of an important work on molluscs ("Cambridge Natural History Series"), has succeeded Mr. R. Bullen Newton in the presidency of the Malacological Society of London.

THE Toronto correspondent of *The Times* states that the Dominion Government will grant Mr. Stefansson the sum of 15,000*l.* towards his expedition into unexplored territory north of the Canadian mainland. Mr. Stefansson will take with him Canadian students with scientific knowledge, and the expedition will be directly under the Canadian Geological Survey. He expects to be absent three winters and four summers.

DR. W. J. G. LAND, assistant professor of botany at Chicago University, has recently spent four months in investigations in Australia and the Samoan Islands. Two of these months were occupied in the collection and study of plants in the island of Tutuila, where the remarkable growth and variety of the ferns attracted special attention. Dr. Land also made observations in and around the crater of Kilauea in the Hawaiian Islands.

THE Geographical Society of Philadelphia has hitherto been accustomed to present its Elisha Kent Kane gold medal to explorers only. This year, however, it has made an innovation by bestowing that honour, the highest in its gift, on a distinguished geologist, Prof. W. M. Davis, of Harvard. The presentation immediately preceded a lecture by Prof. Davis on human response to geographical environment. This was the first of a series of memorial lectures to Angelo Heilprin.

ON Tuesday next, February 25, Prof. H. H. Turner will begin a course of three lectures at the Royal Institution on the movements of the stars, and on Thursday, March 6, Mr. W. B. Hardy will deliver the first of two lectures on surface energy. The Friday evening discourse on February 28 will be delivered by the Hon. R. J. Strutt on active nitrogen, and on March 7 by Mr. C. T. R. Wilson on the photography of the paths of particles ejected from atoms.

THE Paris correspondent of *The Times* reports that preparations are being made for the dispatch of an official French expedition to Franz Josef Land under M. Jules de Payer, son of the Austrian Captain de Payer, who commanded the Austrian expedition that discovered Franz Josef Land in 1873. The object of the expedition is to explore the little-known north-eastern portion of Franz Josef Land. A base will be established in the archipelago formed by Zichy Land, Liv, Eva, Adelaide, and Hvidtenland Islands. M. de Payer proposes to pass the winter at the base in scientific observations and in preparation for summer work, when a varied programme of scientific investigation will be executed by means of two aëroplanes and a boat fitted with auxiliary power.

A BEQUEST of 100*l*. was left to the Linnean Society by the late Sir Joseph Hooker. The council of the society desires that the bequest should form the nucleus of a fund to be raised for the endowment of a Sir Joseph Hooker lecture, to be delivered every second, third, or fourth year, and to be published by the society. The proposal meets with the warm approval of Lady Hooker. A total sum of not less than 600*l*. should be obtained for this purpose, and the council confidently appeals to the fellows of the Linnean Society and others to contribute. Cheques should be drawn in favour of the "Hooker Lecture Fund," and sent to the general secretary of the Linnean Society, Burlington House, London, W.

THE Board of Trade and the principal Atlantic steamship lines are to cooperate in carrying out during the present year the recommendations of the Merchant Shipping Advisory Committee in its report on life-saving at sea as to stationing an ice observation vessel to the north of the steamship routes across the North Atlantic. Following the advice of a conference summoned by the Board of Trade to consider the best means of giving effect to this recommendation, it is proposed this spring to station a vessel off the east coast of North America to the north of the steamship routes to watch the break up of the ice and to report its movement. The *Scotia*, formerly employed on the Scottish Antarctic expedition, has been chartered, and it is anticipated that she will be ready to leave about the end of this month. The vessel is being fitted with a Marconi wireless installation of long range to keep in touch with the wireless stations in Newfoundland and Labrador. The cost of the expedition will be shared between the Government and the principal Atlantic steamship lines. There will be three scientific observers on the vessel, and as she will be from time to time stationary, it is expected they will make oceanographical and meteorological observations of general scientific interest, as well as of direct value to the work in hand.

THE Herbert Spencer lecture at Oxford was delivered on February 14 by Prof. D'Arcy Thompson. He began by paying a warm tribute to the memory of Spencer, laying stress on the widespread nature of his influence—an influence that had more effect upon contemporary thought than even that of Kant in a former generation. With no education in literature or art, and without advantages of style, he was yet "a gallant soldier in the cause of intellectual freedom." Passing on to the special subject of his lecture, viz. "Aristotle as a Biologist," Prof. Thompson drew a graphic picture of the natural surroundings of Aristotle during his two years' residence at Mitylene —the period to which, in the opinion of the lecturer, the bulk of his work in natural history is to be attributed. Many reasons of weight were given in favour of the view that in the fauna, and especially the marine fauna, of Lesbos and the neighbouring seas and islands, Aristotle found the chief material for his anatomical researches. This was important in relation to the fact that it limited the date of his chief philosophical works to a time subsequent to the writing of his treatises on biology. Plato "saw as in a vision," but Aristotle was neither artist nor poet, nor, it was to be suspected, a profound mathematician. But he was a naturalist born and bred, and, above all, a student of life itself. His biological instincts and training unmistakably influenced his philosophy. This was apparent alike in his politics, his psychology, and his ethics. In all these his treatment was scientific. Making full use of the comparative method, he yet stopped short of a complete historical conception of evolution.

THE widespread belief in the sanctity of the fig-tree, which, as the *pipal* (*Ficus religiosa*), is venerated in India, is illustrated by the account contributed to the January issue of *Man* on the cult of the tree by the A-Kikuyu of East Africa. The exact species of this tree has not been as yet determined, but Mr. W. H. Beech describes it as the medium by which prayers ascend to Ngai, the tribal deity. As is the case with its Indian congeners, the wood is used to make the fire-drill, and the identity of observances connected with the tree seems to suggest a fusion of Indian with East African culture.

WE have received from Capt. Stanley Flower a revised list of the zoological gardens and menageries of the world, published apparently at Cairo. The total number is 168.

VOL. iv., No. 2, of *Meddelelser fra Kommissionen for Havundersøgelser, serie: Fisheri*, is devoted to an account by Dr. J. Schmidt of the early ("preleptocephaline") larval stages of congers and certain other eels. It is claimed that this is the first definite identification of some of the earliest stages of the species in question, and therefore the first trustworthy clue to the particular kinds of murænoids which spawn in the Mediterranean. All the larvæ have pectoral fins, even in cases where these disappear in the adult. They may be divided into two groups, according to the absence or presence of swellings in the intestine, and the even distribution or collection into groups of the pigment cells. To the first group belong *Conger vulgaris*, *C. mystax*, and *Muraena helena*, and to the second *Nettastoma melanurum*, three species of Ophichthys, and a new form, described as *Leptocephalus telescopicus*. The three species of Ophichthys and the Leptocephalus spawn in winter, instead of, like the rest, in summer.

DR. S. KUSANO has published (Journal of the College of Agriculture, University of Tokyo, iv., No. 3) an account of the life-history and cytology of a new species of Olpidium, which is of great interest with reference to the affinities of the Chytridiales, an extremely lowly group of fungi. The most remarkable feature in the life-cycle of this new form is that some of the swimming reproductive cells (zoospores) regularly copulate in pairs to form a zygote. In discussing the difficult question of the affinities of this remarkable group of organisms, the author inclines to the view that their origin must be sought in the Flagellata or the Mycetozoa rather than in the primitive green algæ; this confirms the conclusion arrived at independently by Němec (see note in NATURE, vol. lxxxix., p. 539).

MISS ANNIE D. BETTS contributes to the current number (December, 1912) of *The Journal of Economic Biology* an extremely interesting account of the fungi of the beehive, having by her investigations added considerably to the knowledge of this subject. The results are based on work done on the combs of stocks which died during the years 1910 to 1912 of the Isle of Wight bee disease. Twelve fungi are described, of which two are apparently confined to beehives, others adapted to hive-life but not confined to this habitat, while others again are commonly or occasionally present but not specially adapted to life in the hive. Some of the fungi belonging to the last category (Penicillium, Aspergillus, and other "moulds") are ubiquitous, but in other cases the fungus spores must be carried from hive to hive by the bees themselves. None of the fungi described appear to be pathogenic, though the presence of much mould in a stock is, if not a cause, at any rate a sign of unhealthy conditions, indicating either that the hive is not weather-proof or that the colony is weak.

THE mysterious sounds known under the general name of brontides, but locally as barisâl guns, mist-poeffeurs, &c., have for some months past been very noticeable in the south-west of Haiti. In this island the sound is called the *gouffre*. According to Mr. J. Scherer (Bull. of the Seis. Soc. of America, vol. ii., pp. 230–232), it is most frequently heard in the range of La Selle. On its northern side, this range is bounded by a steep cliff, formed by displacements along a fault that is believed to be still growing. The sounds appear to come from the base of this cliff, and, as they are the same as those which accompany noticeable earthquakes (the Haitians apply the name of *gouffre* to both), it is suggested that they are caused by small adjustments of the crust along the fault. The *gouffre* is also heard in the north-western part of the island, at Port-de-Paix and Limonade.

IN view of the approaching return of the drift-ice season, the meteorological chart of the North Atlantic for February, issued by the Deutsche Seewarte, contains an interesting summary of the prevalence of ice in that ocean during 1912. The Meteorological Office charts also contain much useful information on the same subject, with table showing the extreme limits of icebergs and field ice in 1901–12, and diagram of phenomenal drifts during a long series of years. Last year the drift was one of the most remarkable ever known; little ice was sighted prior to the middle of February, but by the end of March a general and rapid spread was observed. By the end of May the drift reached about 38½° N., and in June its southern limit had extended almost to 37° N. The positions laid down on the charts refer to the general drift; isolated bergs were met with much further south. In fact, the Meteorological Office diagram shows that ice may be observed almost anywhere in mid-ocean north of 30° N. With reference to the rate at which icebergs may travel, the Seewarte quotes an interesting case. On April 29, in 41° 25′ N., 41° 43′ W., the ss. *Clio* passed a berg supposed to be that with which the *Titanic* collided on April 14, and which therefore had travelled 380 nautical miles, E.¼S., in fifteen days. One end of the berg was broken off, probably owing to impact with a vessel, and the water round about it was strewn with wreckage, such as chairs, towels, and other articles.

IN the *Revue générale des Sciences* for January 15 Mr. R. de Baillehache, one of the members of the French Commission on Units, directs attention to the advantages of the metre-kilogramme-second system for practical as well as scientific purposes. In view of the legislation on the subject foreshadowed by the French Minister of Commerce and Industry in August last, he draws up a scheme of definitions and suggests several new names for the units which up to the present have not had special names assigned to them. For the unit of capacity the litre is retained and the cubic metre becomes the kilolitre. The unit of force—the cop (Copernicus)—communicates an acceleration of one metre per second to a mass of one kilogramme. The unit of pressure—the tor (Torricelli)—is one cop per square metre, and is equal to ten baries. The unit of heat is the kilogramme degree of water at 15° C. The electrical units are the present ohm, volt, and ampere.

THE December, 1912, number of *Terrestrial Magnetism* contains an account, by Dr. G. E. Hale, of the attempts which have been made at Mount Wilson Solar Observatory to detect the Zeeman effect due to the magnetic field at the sun's surface. An objective of 1 ft. diameter and 60 ft. focal length forms an image of the sun on the slit of the 75-ft. spectrograph, which to prevent temperature disturbances is mounted in a vertical shaft in the ground. Photographs of the region near the sodium lines in the third order spectrum were taken, and a neat polarising arrangement allowed either the red or the violet edge of a broadened line to be photographed. The plates on measurement showed evidence of a positive displacement of the lines in the northern and a negative in the southern hemisphere of the sun, the magnitudes reaching their maxima at about 50° north or south latitude. Further observations are being made with the view of fixing the magnitudes of the displacements more accurately.

WITH reference to Mr. R. M. Deeley's letter on retinal shadows in NATURE of January 30, we have received other letters bearing upon the point. Mr. H. H. Bemrose thinks, probably correctly, that they are the same as Purkinje's figures. Mr. C. Welborne Piper once saw similar branching lines after experimenting with powerful sources of light. In his case they were coloured red against a background of an approximately complementary colour, whilst with the other eye green vessels were seen against a red background. Purkinje's figures are most easily seen with lateral illumination of the dark-adapted eye. Shadows of the retinal vessels are then thrown upon the sentient layer of the retina, the rods and cones. Mr. Piper's observation is of considerable interest. Black print has frequently been seen to look red when viewed in bright illumination. This is undoubtedly due to coloration of the light by blood during transmission through the lateral wall of the eyeball. Birkhoff, however, has shown that erythropsia or red vision may occur after gazing at a brightly illuminated surface for ten to fifteen minutes when all lateral light is excluded. Rivers holds that erythropsia in general is due to blood, the conditions under which it is observed being such as more or less to eliminate the normal red adaptation of the retina. The transient appearances noticed by our correspondents may be regarded as Purkinje's figures seen in unfavourable circumstances owing to the general diffusion of the illumination.

THE February issue of *The Chemical World* contains a reprint of a hitherto unpublished letter from Sir Humphry Davy to Prof. W. T. Brande, who in 1813 succeeded him as professor of chemistry in the Royal Institution. Written from Idria, it contains a description of a visit to a quicksilver mine containing veins of cinnabar up to a foot in thickness. Davy also records the occurrence, in the great salt mine at Halstadt, of a blue variety of salt; as this blue colour is now attributed to the action of radium emanation, it is not surprising to read the statement: "I have been again searching in vain for the cause of this extraordinary colour." Both mines, occurring in bituminous schist, contained dangerous quantities of inflammable air, and gave to Davy the opportunity of introducing his safety lamp. The letter, with two others, is now in the possession of Sir William Tilden.

SOME interesting views as to osmosis in soils are developed by Dr. C. J. Lynde and Mr. F. W. Bates in two papers published in *The Journal of Physical Chemistry* (vol. xvi., pp. 758–781). Experiments are brought forward to show that a clay soil acts as a semi-permeable membrane, and that by virtue of the osmotic pressure of the solutions of salts in the soil transference of water can be effected. The efficiency of a soil column as a semi-permeable membrane increases with its depth, comparatively long columns being necessary to produce the same effects as a perfect semi-permeable membrance. The view that an osmotic movement of water occurs in soils would explain an increased supply of water brought through the subsoil to the surface in the summer months, when the plants actually need more water, and the beneficial results of soil mulching and certain practices in dry farming.

THE January issue of the Journal of the Chemical Society contains an important paper by Mr. T. R. Merton on the photography of absorption spectra. A method has been adopted which resembles those recently devised by Dr. Houstoun, of Glasgow, the chief feature of which is that the actual "extinction-coefficients" are measured instead of merely the thickness of solution required to blot out a particular spectrum line in a photograph. By using this method it has been found possible to determine the actual form of the extinction-curves, and in particular the shape of the single absorption band in the visible spectrum of cobalt nitrate (Proc. Chem. Soc., January 23, 1913). It appears that the curve showing the width of spectrum absorbed is of a simple mathematical form, its distribution about the central axis of the band being identical with that of the well-known probability curve. The axis of the band is, however, not vertical, *i.e.* the wave-length of maximum absorption changes slightly with the concentration of the solution. It is suggested that the anomalous form of many extinction-curves is due to the superposition of several curves of the above simple form.

RED Book No. 177 of the British Fire Prevention Committee contains a report on a system of extinguishing petrol fires which has given very satisfactory results. The system comprises either a permanent installation, wheeled fire appliances, or small extinguishers, as the case may be, from which certain chemicals are forced, the extinguishing effect being obtained by the combination of two liquids which produce a thick foam which gradually spreads over the surface of the burning petrol, thereby excluding air and extinguishing the fire. According to the report, two petrol fires of considerable area and severity were creditably dealt with, as well as numerous smaller fires, and the extinguishers were also effective on celluloid fires. The system is one which claims the attention of those concerned in the ever-increasing hazards of petrol, used particularly

for transport purposes. Copies of the report may be obtained from the assistant secretary, British Fire Prevention Committee, 8 Waterloo Place, S.W.

WE have received a copy of an address delivered by Prof. C. Neuberg before the members of the German Zentralstelle für Balneologie, at Schwerin, in September last, entitled "Beziehungen des Lebens zum Licht" (Berlin, Allgemeine Medizinische Verlagsanstalt, pp. 63, price 1.50 marks). This address contains a valuable summary of recent work on the influence of light on living organisms, both from the chemical and biological aspects; in this field Prof. Neuberg has himself been an active worker, and some of the views he develops, regarding the influence of sunlight on health and disease, will be read with considerable interest.

AN illustrated article in *Engineering* for February 14 gives an account of the large Humphrey gas pumps installed at Chingford. There are five sets in all; the first two were started on January 18 and 19, and the third a week ago; the remaining sets will no doubt be at work before the official opening of the Chingford Reservoir by his Majesty the King on March 15 next. No accurate tests have been made as yet, but it is already sufficiently obvious that the guaranteed output is being very substantially exceeded. So carefully have the designs of the pumps been worked out that the only detail altered, as the result of seeing them at work, has been the substitution on certain valve-spindles of a solid nut instead of the split one originally provided. It has required considerable courage to accept a contract, under very stringent penalties, for pumps of this type, 7 ft. in diameter, and developing each between 200 and 300 h.p., on the basis of the experience gained of an experimental pump having an output equivalent to about 35 h.p only. The results so far have entirely justified Mr. Humphrey's confidence in the capabilities of his remarkable contribution to the progress of mechanical engineering.

OUR ASTRONOMICAL COLUMN.

VARIATION OF LATITUDE: THE KIMURA TERM.—After applying all known corrections to the results obtained by the International Latitude Service, there remains a periodic term, known as the Kimura term, for which many explanations have been suggested. Dr. F. E. Ross now suggests that this term is not real, but is due to our lack of knowledge concerning the method of treating the results. He points out that any one of the suggested explanations is efficient, but argues that there is no need for them, for any periodic error in the system of mean declinations adopted would produce a so-called Kimura term. (*Astronomische Nachrichten*, No. 4630.)

WESTPHAL'S COMET.—Having investigated, by Pontécoulant's method, the perturbations of Westphal's comet (1852iv) for the period 1852–1914, Herr M. Viljev publishes a set of elements and a number of search-ephemerides in No. 4621 of the *Astronomische Nachrichten*. As the time of perihelion passage is still uncertain, he gives a number of ephemerides, extending to March 12, which cover the period ±240 days on either side of the computed epoch; the period of the comet is 61·5554 years, and it last passed perihelion on October 12, 1852.

THE OPACITY OF THE ATMOSPHERE IN 1912.—An article in No. 63 of the *Gazette astronomique* directs attention to the general opacity presented by the sky on cloudless nights during the late spring, the summer, and the autumn of 1912. M. de Roy found sixth-magnitude stars invisible to the naked eye, even on moonless nights and at the zenith, while other observers in many parts of the world found a lack of transparency, noticeable in observations of the sun and stars and in the unusual paleness of the blue of the sky. A suggested explanation of the phenomenon is that volcanic eruptions, more especially the one which took place in the Alaskan peninsula and Aleutian archipelago in June, polluted the atmosphere with fine dust, and so reduced its transparency.

A ZOOLOGICAL GARDEN FOR EDINBURGH.

THE council of the Zoological Society of Scotland, in pursuance of its project of raising the necessary funds for the purchase and laying out of the estate of Corstorphine Hill House as a zoological garden and park, as announced in NATURE of January 30, has issued a prospectus giving a brief account of the development of the modern zoological garden of the type the society wishes to establish, together with some suggestions regarding the benefits of such an institution to education, science, and art, and a full description of the site selected for the purpose. The prospectus is illustrated with scenes depicting enclosures and ranges in the New York Zoological Park and in Carl Hagenbeck's menagerie at Stellingen, which, with modifications, will serve as models for the kind of accommodation it is proposed to adopt for the animals in Edinburgh. Finally, there are many beautiful views of the grounds of the above-mentioned estate, which not only testify to the wisdom of the council in its choice of a situation, but suggest that, given the necessary funds for the purchase of stock and the upkeep of the collection, Scotland will be able to claim that it has at least the most picturesque zoological garden in Europe.

The scheme for the establishment of the garden was in some danger, at the time of our recent note on the subject, owing to the approaching expiry of the society's option for the purchase of this fine site, and the doubt whether a sufficiently large amount would be subscribed within the brief period remaining. This danger has been averted by the action of the Edinburgh Town Council, which has agreed to purchase the site, of which the society will have the entire use and control in return for an annual payment of 4 per cent. on the price, the society having the right to redeem the site from the corporation within fifteen years. The society is already assured, by gift and loan, of a large and representative collection of animals, and it is the intention of the council to have a number of them installed and the garden open to the public by the beginning of July, 1913, though operations involving much disturbance of the ground will be deferred until the winter months. Funds are urgently needed, both for the future development of the garden and for the redemption of the site, and donations should be intimated to the honorary treasurer, Mr. T. B. Whitson, C.A., 21 Rutland Street, Edinburgh.

NAVIGATION AT THE ROYAL TECHNICAL COLLEGE, GLASGOW.

THE steady diminution in the supply of officers for the mercantile marine, which has been going on for the past few years, is becoming a serious problem to shipowners. The average number of certificates as second mate granted annually by the Board of Trade has fallen from 1132 to 746, or 34 per cent., during the last fifteen years, and as a considerable wastage in the number of candidates takes place during the compulsory period of qualifying sea service between the granting of this initial certificate and that of master, it follows that there is a corresponding reduction in the number of officers qualified to fill the higher ratings on board ship.

The governors of the Royal Technical College, Glasgow, being impressed with the desirability of providing improved facilities for instruction in nautical subjects, established in 1910, with the financial assistance of the City Educational Endowments Board, a School of Navigation.

The instruction offered has been eagerly taken advantage of during the two years' existence of the school, but mostly by students out of their apprenticeship stage. It has, however, been felt all along that a development on the lines of practical as well as theoretical training was necessary. At present parents who send their sons into the mercantile marine deprive them of opportunities of higher education that in universities and technical colleges are offered to youths who enter other professions.

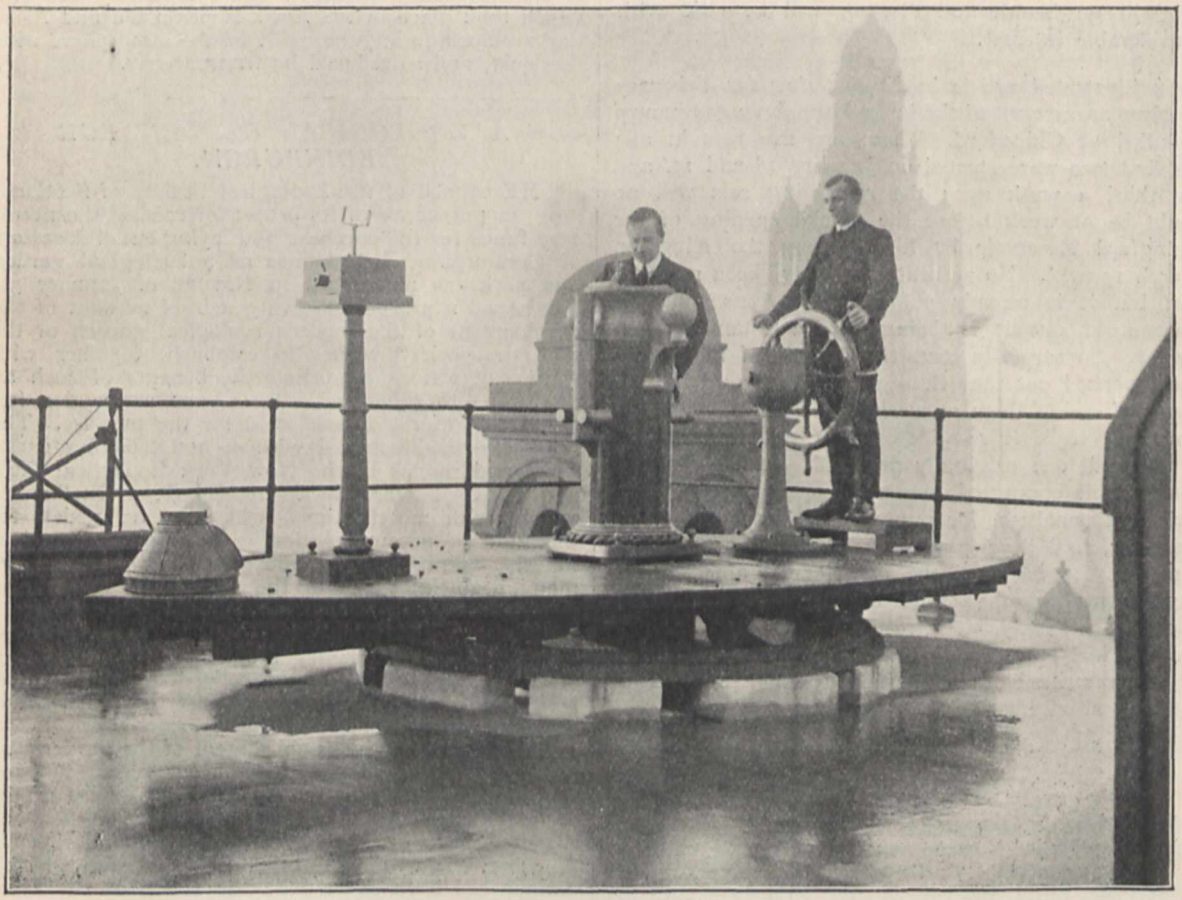

FIG. 1.—Deviascope (Royal Technical College, Glasgow).

This state of affairs has been brought about by the disappearance of the sailing ship and by the reluctance of shipowners to carry apprentices in steamers. It is partly due also to the fact that the requirements for the essential certificates of competency have within recent years been made more exacting, and the subjects increased, so that candidates who would have been capable of passing the old tests find the higher standard now demanded a serious obstacle. Further, the great increase in shipping tonnage has created a large demand for qualified officers, there being only some 30,000 to man our mercantile marine fleet of some 9000 vessels, figures which go to show that the navigator's profession is by no means an overcrowded one.

In order, therefore, to coordinate theory and practice, the governors have arranged to provide a two years' course of training as marine cadets for lads who have just left school and have reached the stage of the Scotch intermediate leaving certificate.

The winter session will be devoted by the cadets to the more theoretical side of their subjects, whilst attending the classes in the college. The summer will be spent afloat on board the seagoing training steamer *Vivid*, a vessel of 550 tons, which has now been acquired from the Admiralty. The ship will be commissioned in April each year, and, having bunker capacity for a steaming radius of 3000 miles, she will be capable of making extended voyages. Dormitory, dressing and bathroom accommodation is being pro-

vided for fifty cadets, who, in addition to performing the ordinary routine work of the ship, will be instructed in the duties of the navigator and seaman as required on board a first-class modern ship. Strict discipline is to be maintained on board, and the cadets will be at all times under the supervision and guidance of the instructors. The addition of the *Vivid* to the equipment of the school provides opportunities for the practical testing of the theoretical work of the lecture-room under actual seagoing conditions, and the vessel, in fact, furnishes the laboratory which in every other department of applied science has long been considered an essential adjunct to efficient instruction.

In framing the scheme of instruction, the governors of the college have kept in view the fact that owing to increased competition and the consequent necessity of saving every mile of distance and minute of time, the ingenuity of the shipbuilder, engineer, and man of science has provided the modern navigator with instruments of precision undreamt of in the earlier days of steam navigation—instruments the proper use of which demands a sound knowledge of the principles underlying their construction and a careful training in their manipulation.

The course of training has the support of the leading shipping firms, as it is recognised that the cadets who have gone through the full course will be of immediate value on board ship, instead of, as at present, wasting at least the first year of their apprenticeship picking up the elements of their profession in a haphazard fashion.

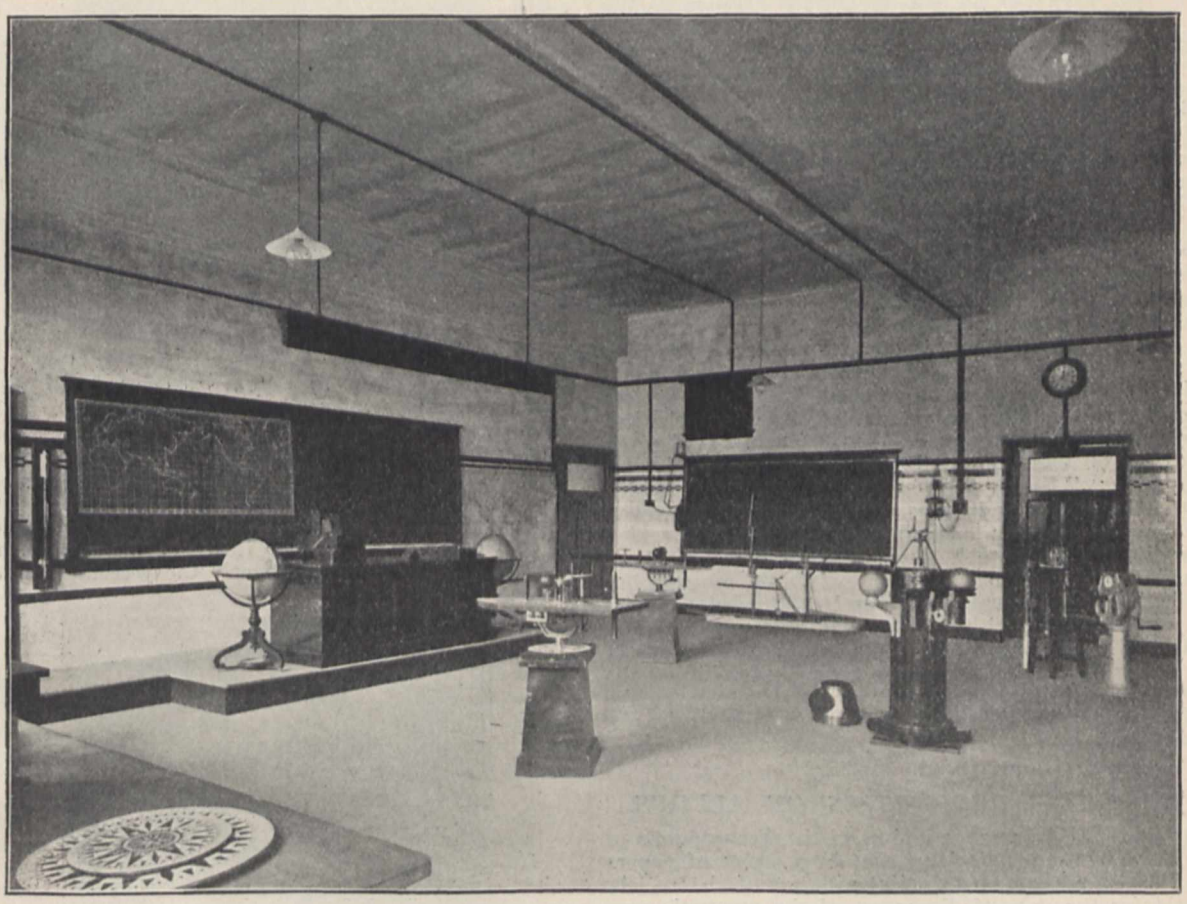

FIG. 2.—Navigation laboratory of the Royal Technical College, Glasgow.

BIOLOGICAL WORK IN INDIA.

ALTHOUGH the mosquito-destroying capacity of the small cyprinoid fishes known to the Spanish inhabitants of Barbadoes as *milliones* appears to have been considerably overestimated, naturalists in India are convinced that many of the smaller fresh-water fishes of that country play an important *rôle* in this respect. Experiments have been carried on for the last few years by officials of the Indian Museum with the view of procuring exact details on the subject, and the result is a report, published by order of the Trustees, on "Indian Fish of Proved Utility as Mosquito-destroyers," drawn up by Capt. R. B. S. Sewell and Mr. B. L. Chandhuri, in which eleven species are scheduled with such descriptions and illustrations as render their identification easy. What, if any, practical results ensue from the investigation remain to be seen.

An issue of the Entomological Series of the Memoirs of the Department of Agriculture (vol. ii., No. 9), forming the second part of life-histories of Indian insects, records the results of investigations carried on at Pusa on the early stages of two species of Rhynchota and eight of Coleoptera. The memoir is illustrated with coloured plates, and, as mentioned in the preface, Mr. D. Nowrogee, to whom the investigation was entrusted, is to be congratulated on the manner in which he has carried out a difficult task.

Beautifully executed illustrations in colour are likewise a feature of a second article on insects

injuriously affecting casuarina trees in Madras, by Mr. V. S. Iyer, forming Forest Bulletin No. 11. The worst offender seems to be the caterpillar of the moth *Arbela tetraonis*, but the fat grubs of a longicorn beetle are likewise harmful.

No. 10 of the serial just quoted is devoted to an account, by Mr. R. S. Hole, of the great outbreak of bark-boring beetle-larvæ in the coniferous forests of the Simla district between 1907 and 1911. Five species were involved in this very serious attack.

From among several articles in vol. vii., part ii., of the Records of the Indian Museum, attention may be concentrated on one by Dr. N. Annandale on the Indian fresh-water soft tortoises, or mud-turtles, of the family Trionychidæ. The author recognises one species and two subspecies which were not included by Mr. Boulenger in the volume on reptiles in the "Fauna of British India," namely, Anderson's *Trionyx nigricans*, from Chittagong, which has hitherto been insufficiently described, and two local races of the widely spread *Emyda granosa*. Nor is this all, for Dr. Annandale resuscitates Gray's genus Dogania for *Trionyx subplana*, on the ground that in the upper shell of this species the entire series of costal plates is separated by mural bones, instead of the last pair meeting in the middle line.

In Records of the Indian Museum, vol. vii., part iii., Mr. J. R. Henderson describes a new tortoise from the Cochin district of southern India, under the name of *Geoëmyda sylvatica*, Geoëmyda being used as equivalent to Nicoria.

Eri or endi silk, the product of the caterpillar of a large Assamese moth, of which the technical name does not appear to be mentioned, forms the subject of the first number of vol. iv. of the Entomological Series of the Memoirs of the Department of Agriculture of India. According to the authors, Messrs. H. Maxwell-Lefroy and C. C. Ghosh, this silk, which from its nature cannot be reeled, is spun and woven in Assam into an exceedingly durable cloth, which readily takes vegetable dyes. Experiments have been undertaken at Pusa with the view of ascertaining whether the cultivation cannot be extended to other parts of India, with results that appear promising. As the cocoons are not damaged by the moths in making their exit, there is no necessity for killing the latter, which renders the silk acceptable to sects like the Jains, who object to taking life in any circumstances. R. L.

MAGNETIC PROPERTIES OF ALLOYS.

VOL. VIII., parts 1 and 2, of the Transactions of the Faraday Society contain a series of papers which were read at a special meeting of the society held for the general discussion of the magnetic properties of alloys. The papers naturally fall into two groups, viz. those dealing with ferrous and with non-ferrous alloys respectively.

The iron-carbon and iron-silicon alloys form the subject of an exhaustive paper by Dr. Gumlich, which is of considerable importance in connection with transformer working. He finds that the presence of large amounts of silicon result in the metal, even when quickly cooled, exhibiting a pearlitic structure rather than containing the injurious solid solution of carbon in iron. With prolonged annealing even the pearlite is decomposed into ferrite and temper-carbon. A silicon content of 3 to 4 per cent. is necessary for this effect, so that the good magnetic properties of thin sheet-metal containing less than this amount of silicon must have another origin. Figs. 1 and 2 show an alloy with 4·5 per cent. silicon and 0·29 per cent. carbon. Fig. 1 is with the metal in the untreated condition, and Fig. 2 after annealing at 975° C. The annealing has resulted in the pearlitic structure giving place to enclosures of temper-carbon, and the coercive force has been reduced from 1·26 to 0·65 C.G.S. units. A paper by Messrs. Colvert-Glauert and Hilpert, on the magnetic properties of nickel steels, describes a series of tests the results of which are at variance with the view that the peculiar magnetic properties of these alloys are due to the nickel retarding the

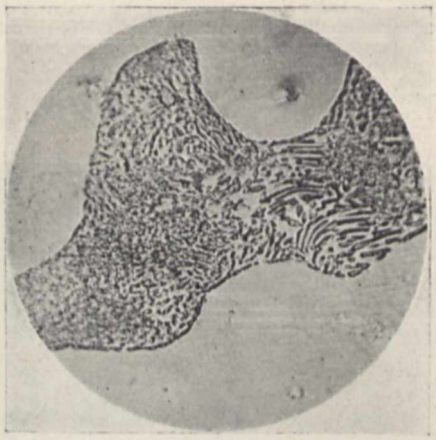

FIG. 1.—4·5 per cent. silicon-iron alloy (untreated).

change from γ-iron to α-iron. They find all their nickel-iron alloys when quenched at 1200° C. to be strongly magnetic, and they have come to the conclusion that at that high temperature a strongly magnetic compound is formed which persists through all subsequent thermal treatments.

Prof. Wedekind's paper on the magnetic properties of compounds in relation to their stoichiometric composition summarises very clearly the present state of

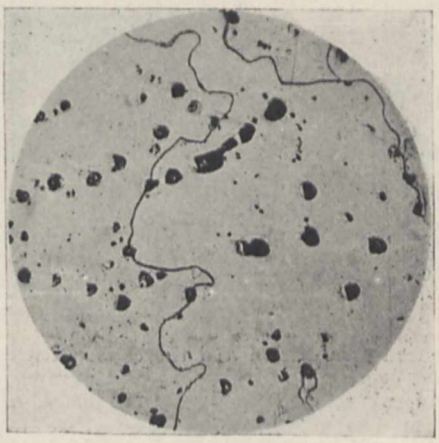

FIG. 2.—4·5 per cent. silicon-iron alloy (annealed).

knowledge on this important subject. It is found that simple compounds of ferromagnetic metals are throughout essentially more feebly magnetic than are the metals themselves, so far as they represent one particular degree of valency. Simple compounds of the latent-magnetic metals (manganese, chromium, vanadium, and (?) titanium) are generally more strongly magnetic than the metals, and some of the compounds exhibit residual magnetism. The maxi-

mum magnetisation is determined by the stoichiometric composition, especially where several compounds of the same components exist. Manganese, for example, has a maximum in the trivalent condition with such elements as can themselves be trivalent.

Several papers deal with the Heusler alloys. Dr. Ross describes a series of magnetic investigations from which it is concluded that the magnetism of these alloys is associated with the occurrence of solid solutions having the intermetallic compound Cu_3Al as one constituent, and probably Mn_3Al as the other. The theory is supported by evidence gathered from examination of the microstructure and from cooling curves. Drs. Knowlton and Clifford, in their paper, also appear to favour the hypothesis of a series of solid solutions as best suiting their magnetic results, but Drs. Heusler and Take still adhere to their belief in a series of ternary magnetic compounds of the general formula $Cu_xMn_yAl_z$, where x and y can have any of the values 1, 2, . . ., and $x+y=3z$. It seems now to be certain that these Heusler alloys—despite their very small hysteresis loss under certain conditions of thermal treatment, &c.—do not give promise of practical applications in electrical measuring instruments. Their extreme variability, their hardness, and their brittleness are strongly against all commercial applications.

THE ASSOCIATION OF TECHNICAL INSTITUTIONS.

THE twentieth annual general meeting of the association was held in Birmingham on January 31, when Mr. J. H. Reynolds, of Manchester, the new president, delivered his presidential address, in the course of which he discussed the progress of elementary education since the Act of 1870, and contrasted the abundant provision of the present day with the meagreness which prevailed anterior to the Act. He detailed the causes which operated to prevent the realisation of the full fruits of the great Imperial and local expenditure incurred in the establishment and maintenance of elementary education with special reference to the early age of leaving school, and to the absence of proper measures for securing the continued attendance of the children upon suitably designed courses of instruction and training in evening schools during the years of adolescence. He urged the abolition of half-time and the extension of the school age until fourteen, unconditionally throughout the urban and rural areas of the kingdom, and discussed the demand made that the curriculum of the elementary school should be confined to "the three R's," maintaining that there should be made the fullest possible provision for the education and training of the worker's child for his future life as a producer and as a citizen. He further directed attention to the poor physical condition of many thousands of children in the public elementary schools, and appealed for smaller classes and better trained teachers. He dwelt upon the importance of this question of elementary education, since until it is well considered and effectually provided, secondary education cannot be adequately established, and any technical education and training of real value directly concerned with a livelihood and based upon scientific principles are impossible.

Education is one, and indivisible, and if there is to be a satisfactory superstructure the foundations must be carefully laid, and the whole scheme made organically complete from the elementary school to the university.

Out of a child population between the ages of thirteen and seventeen amounting to upwards of 1,800,000, there were only 325,117 enrolled in evening schools. Measures should be enacted requiring all employers to give facilities for the continued education of their employees between the ages of fourteen and seventeen; until that age was reached the child should remain the ward of the schoolmaster.

The Act of 1902 unified under one responsible authority all forms of education, and for the first time in the history of English education gave the means for the provision of a properly organised system of secondary education. The operations of the Technical Instruction Act of 1889 had awakened a new and serious interest in education, derived from the fact that the ill-prepared educational condition of the students made it impossible to impart successfully any satisfactory training in science or technology.

Under the provisions of the Education Act of 1902 numerous old endowed schools all over the country which had become effete for want of effective public control, and of the means to meet the demands of modern requirements, have been revivified, and large numbers of new secondary schools, well staffed and equipped, have been provided. The great drawback to their efficiency is to be found in the short school life, extending to not more than two years and nine months, contrasting unfavourably with the school life of the German gymnasium and the *Ober-Real-Schule*, extending to nine years, and ending in a leaving examination, admitting without further test to any technical high school or university in Germany. Measures should be taken to ensure a satisfactory length of school life in English secondary schools, concluding with a school-leaving examination giving admission at once to any institution for higher learning.

We have further so to systematise our secondary education that in going from one large urban or other centre to another the scholar will be sure to find a school of similar standing to that he has left. It is to the improvement of the product of the elementary school and in the extension of the school age until fourteen, to a large increase in the number of secondary schools and in the extension of the length of the school life therein, so as to approximate to that of the German and Swiss secondary schools, that we must look for the future growth and efficiency of technical institutions.

Having regard to English conditions these institutions have done an immense service in the past in providing the means of continued education and training for the great mass of the youths engaged in our trades and industries, and English manufacturing industry owes much of its pre-eminence, especially the engineering industries, to the work and influence of these evening schools. In this connection the work of the Department of Science and Art and of the City and Guilds of London Institute has been of high importance and value.

The opportunity of further instruction and training of this character in day classes is much to be desired.

It is satisfactory to note that many of the more important firms, especially in the engineering and chemical industries, are encouraging the admission of a much better type of educated and trained man into their works, and are offering facilities and inducements based on training age and attainments. As industries grow in respect of the number and varied equipment of the men employed, and in the extent and complexity of the production, a higher type of man is required, characterised by a better general education, more expert knowledge and practical ability. It is realised that "the day of the trained man has come; that of the untrained man is past."

A new science has come into being, namely "the

science of industrial management," demanding special qualities and the amplest training, the aim being to secure "a large increase in the wage-earning capacity of the workman," and "a still larger decrease in the labour cost of his product." But not only is it necessary to consider the efficiency of the workman as such, but thought must be given to his life as a citizen; in short, not only economic but ethical considerations must have place, since industry demands the humanising influence of the most cultivated intelligence to ensure its complete success. In the words of Prof. Smithells: "Professions and business vocations are more and more becoming learned callings, each developing a special body of knowledge, which requires for its full mastery and effective use an intellectual training of what may be called the university standard."

The demand for this in respect of the great engineering and chemical industries has long been recognised and met in Germany. Hence the importance given to chemical and physical science, and the lavish provision made for its teaching in nearly all her great universities, and to engineering in her technical high schools, of which, if the Polytechnikum at Zurich be included, there are now twelve with upwards of 13,000 day students taking full four-year courses, nearly all of them as a condition of entrance demanding from engineering students at least one year's experience in a works, and no admission except to duly accredited students from a gymnasium or school of equal standing. These schools are all—*vide* Dr. Nicolson's recent report—largely increasing their engineering equipment, so as to bring it up to the latest advance in engineering science and equipment, and with a view to further investigation and experiment in the service of the industries. Having regard to this equipment, to the spirit of investigation and research, and to the large body of highly educated students, we cannot be surprised at the position Germany now takes in the world of applied chemistry and engineering.

It is further stated upon high authority that the exceptional expenditure on new plant and buildings at eight German technical high schools, including that of Zurich, during the last five years has been 785,000*l*. If Englishmen mean to maintain their great industrial position they must follow in the steps of Germany, since in many important spheres of engineering practice she even now takes the lead. It would be an interesting inquiry, perhaps somewhat disquieting in its results, to learn how many German patents are at this moment being worked in this country under licence.

During the last few years there has been a definite movement on the part of certain of our large technical institutions towards a closer connection with the universities within their own area, of which there are now thirteen in England and Wales, compared with three teaching and self-examining universities prior to 1880, marking an immense progress in the organisation of higher education within a generation. Of such institutions may be named Manchester, Bristol, Glasgow, Edinburgh, Belfast, and certain of the London technical institutions. Students in each of these institutions fulfilling the required conditions are now eligible for the degrees of their respective local universities to which they are attached. It is to be observed also that the ancient universities of Oxford and Cambridge have now strong technological departments, which help to put English institutions, though still far behind as a whole, in a much more favourable light than would at first appear on a comparison with Germany.

In this connection it is convenient to note the wisdom and liberality of the policy of the Royal Commissioners for the Exhibition of 1851, whose scheme of science scholarships has been so fruitful in result, in the establishment in 1911 of the scheme of industrial bursaries to enable graduates of certain defined institutions to enter upon industrial work at the close of their ordinary university course, thus enabling those men whose qualifications fitted them well to take part in the application of science in the industries, but who were often diverted to less suitable employment by the necessity of earning a livelihood, to be relieved from constraint in their choice of occupation, and to enter into positions more suitable to their training and abilities. Eighteen bursaries were awarded, the payments ranging from 35*l*. to 100*l*. per annum, varying according to salary and circumstances.

It is gratifying to note the great progress which has been achieved in scientific and technical education during even the last twenty years, the more sympathetic attitude of employers in the important industries, the increased liberal support, still far from the amount the circumstances demand, of the Imperial Government, and generally the growing appreciation by the public of the value and necessity of the best possible education in due degree for all the children of the nation.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

BIRMINGHAM.—At the annual meeting of the Court of Governors, Prof. G. Barling was elected Vice-Chancellor of the University to fill the vacancy caused by the death of Alderman C. G. Beale. It is understood that in consequence of his election to this position, Prof. Barling will resign the chair of surgery, which he has held since the foundation of the University. He recently resigned his post of dean of the faculty of medicine, which he had held for six years, being succeeded by Prof. Peter Thompson.

The council, having received an offer from the Board of Agriculture of a grant-in-aid, to be expended in carrying on a research department in agricultural zoology, has appointed Prof. F. W. Gamble, F.R.S., as director of the new department. An assistant director is to be appointed, who will devote his whole time to the duties, under the supervision of Prof. Gamble. It is understood that the department will specialise in helminthology.

CAMBRIDGE.—Prof. H. F. Newall has conveyed to the Vice-Chancellor, on behalf of a donor who desires to be anonymous, an offer to the University of an endowment for the professorship of astrophysics. In the course of his letter, Prof. Newall remarks:—"The transfer of the Solar Physics Observatory to Cambridge introduces into the University a new study. The fresh opportunities and obligations which it opens up can better be met by fresh endowments sufficient to secure permanently the services of a professor of astrophysics (who would also be responsible for solar physics) than by any measure that involves the diversion of the services of the Plumian professor from the development of dynamical astronomy and from the training of men in that department of knowledge. If such a permanent professorship of astrophysics be established, it is desirable that its emoluments should be sufficient to attract really able men, and to raise it to a high rank among university posts." This statement of the position of the subject was placed before the anonymous benefactor, who has empowered Prof. Newall to convey the following offer to the Vice-Chancellor:—"Should the University concur in the views you have expressed to me, I am

prepared on the occurrence of the first vacancy in the chair of astrophysics to contribute a sum of ten thousand pounds towards the permanent endowment of the chair, provided that the University is willing to undertake to supplement this sum by such further endowment either of principal or of income as will raise the emoluments of the chair thenceforward to 800*l*. a year."

Mr. C. Hankins, forester to Earl Cadogan, has been appointed adviser in forestry. He will be under the supervision of the reader in forestry, under whose responsibility all working plans and proposals of a general nature will be issued.

OXFORD.—The proposal to allocate a site in the University Park for the erection of an engineering laboratory has been dropped, it being understood that a suitable piece of ground will be available for this purpose without encroaching on the open space which adds so greatly to the amenities of Oxford.

MR. W. JAMES THOMAS, of Ynyshir, has increased his gift of 10,000 guineas to the University College of South Wales and Monmouthshire to 12,750*l*. in order to cover the full cost of erecting a medical school.

A LEADING article in *The Chemical World* on the Oxford University Laboratory directs attention to the remarkable developments that are in progress in the teaching of chemistry in the Universities of Oxford and Cambridge. Since the institution of the new *régime* at Cambridge, four years ago, 150 original communications have been published from the chemical laboratory of that University, a record that is probably unequalled by any laboratory in this country or elsewhere. In the same period the number of graduate and post-graduate students in the laboratories has more than doubled. There can be little doubt that similar developments are to be anticipated at Oxford, following the recent election of Prof. W. H. Perkin to the chair of chemistry.

THE governing body of the University of Wisconsin has decided, says *Science*, to ask the State legislature, now in session, for 200,000*l*., to be granted in sums of 50,000*l*. a year for four years, in order to provide and equip further accommodation for men students. The continuance of the present appropriation of 60,000*l*. a year for the construction and equipping of academic buildings will also be requested. For the further development of university extension work, an increase of 5000*l*. a year is desired. Owing to the reduction in the assessed valuation of personal property, resulting from the adoption of the income tax in Wisconsin, the University's fund for current expenses has this year fallen below the amount anticipated. The governors, therefore, have requested that the sum of 18,500*l*. be appropriated to make up this year's decrease, that 35,000*l*. be provided for next year's decrease, and 45,000*l*. for the following year's decrease.

VERY important developments are now taking place in the Royal (Dick) Veterinary College in Edinburgh. Not the least important is the removal from the present limited quarters to what will in a year or two be a fine addition to the many colleges which adorn the city. To make room for the new buildings, some quaint cottages of a bygone epoch will have to be removed. These are in what is known as Summerhall Square, which lies to the east of the East Meadows in the southern part of Edinburgh. The main frontage of the buildings will face west, and in the rear the clinical department will be housed in buildings quite distinct from those devoted to teaching and administration. The various laboratories and class-rooms will be equipped with the best modern appliances for the study of the diseases and treatment of domestic animals. Another important development is the establishment of a degree in veterinary science in the University of Edinburgh. The regulations require the student to attend certain of the more purely scientific courses in the University, but the more technical part of the training is given in the Royal Veterinary College. Though no nearer to the University than the present college building, the new buildings will be much more conveniently situated, and the practical affiliation of the two institutions will be more thoroughly effected. It is expected that the new college will be ready for use in October, 1914.

ON February 13 a brilliant University function was held in the Library Hall of Edinburgh University, when Sir William Turner's portrait was presented by the subscribers to the University. Mr. A. J. Balfour, M.P., the Chancellor of the University, presided, and received the portrait from Sir Robert Findlay, M.P., who presented it in the name of the many subscribers. Sir Robert Findlay, himself an old pupil of Sir William's, spoke of the sixty years' service which Sir William had rendered to the University, first as assistant to Prof. Goodsir, then as professor of anatomy, and finally as principal of the University. As Sir Robert made the presentation, the curtain was drawn aside and revealed a striking and happy portraiture of the veteran principal, by the hand of Sir James Guthrie, president of the Royal Scottish Academy. Mr. Balfour, in his remarks, dwelt on the remarkable developments which had taken place during the last fifty years in university life in Edinburgh. In making their University keep up with modern needs, Sir William Turner was the man who above all others had taken the greatest share in this development. He combined in an unusual way the qualities of a great teacher and a great administrator. Lord Provost Inches having expressed the high appreciation which the Corporation had for Sir William, whom a few years since they had enrolled as a burgess of their city, Sir William Turner, after thanking his many friends and old students for their great kindness, gave some interesting reminiscences of the early days in which he began his life in Edinburgh. Although he could not claim Edinburgh as his birthplace, he was sure no one could love the old city better than he did, or could have a higher regard for its historic associations and its peculiar and indefinable charm. The ceremony they had been engaged in would remain in his mind, during the brief period that he might look to for a continuance of life, as a mark of confidence and esteem from his colleagues, students, and friends.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, February 13.—Sir Archibald Geikie, K.C.B., president, in the chair.—Prof. R. A. **Sampson**: A Cassegrain reflector with corrected field. The purpose of this memoir is to discover an appliance which shall correct in a practical manner the faults of the field of a Cassegrain telescope while leaving unimpaired its characteristic features of great focal length, convenient position of the observer and achromatism. It is shown in agreement with the investigation of Schwarzschild that two mirrors alone cannot correct the field without introducing impracticable curves or sacrificing the general design. A system of lenses is investigated which shall effect the purpose. Three lenses is the least number which can satisfy the two conditions of achromatism.

Achromatism for all colours is preserved completely by making all the lenses of the same glass. The first of these lenses is a meniscus silvered at the back, and besides adjusting the achromatism of the other two, serves to reverse the direction of the ray. The other two form a pair of nearly equal but opposite focal lengths and intercept the outcoming beam. By a proper distribution of curvatures between their faces they introduce correcting aberrations. The resulting field is completely corrected for colour, spherical aberration, coma, and curvature of the field.—Prof. H. E. **Armstrong** and Dr. J. V. **Eyre**: Studies of the processes operative in solutions. XXV., The influence of non-electrolytes on solubility. The nature of the processes of dissolution and precipitation.—E. E. **Walker**: Studies of the processes operative in solutions. XXVI., The disturbance of the equilibrium in solutions of fructose by salts and by non-electrolytes. —J. **Chadwick** and A. S. **Russell**: The excitation of γ rays by the α rays of ionium and radiothorism. The work on the excitation of γ rays by α rays, shown first by Chadwick in the case of the α rays of radium C, has been extended to ionium. A preparation of ionium and thorium equal in α-ray activity to 3 mgr. of radium, after purification from all radio-active bodies which emit β and γ rays, was found to emit a small but easily detectable amount of γ radiation. This radiation is shown to be excited by the α rays, either in the ionium itself, or in the thorium with which it is mixed. It s a mixture of three types of radiation differing widely in penetrating power.—Prof. W. E. **Dalby**: Load-extension diagrams taken with the optical load-extension indicator. In this paper further experiments with the indicator are described. The optical load-extension indicator itself was fully described and illustrated in a paper read on March 7, 1912. Load-extension diagrams obtained from phosphor-bronze, gun-metal, and brass are shown, together with photomicrographs taken from the specimens tested. The chemical analyses of the metals are given in each case. The effect of annealing brass rod is brought out by comparing the load-extension diagrams of an annealed and an unannealed specimen and by making a similar comparison of the corresponding photomicrographs of the structure of the material. The physical effect of annealing is to produce a state in which the load-extension curve approaches the shape given by copper, and bears little resemblance to the curve obtained from the same material in an unannealed state.

Zoological Society, February 4.—Sir John Rose Bradford, K.C.M.G., F.R.S., vice-president, in the chair. —Dr. F. E. **Beddard**: The anatomy and systematic arrangement of the Cestoidea. The paper dealt with a number of new species of Ichthyotænia and Ophidotænia obtained from the gut of serpents that had died in the gardens.—H. G. **Plimmer**: Report on the deaths which occurred in the society's gardens during the past year, together with a list of the blood parasites found during the same period. An examination had been made of the blood of every animal that had died, with the result that parasites had been discovered in 140 cases, and in eighty of these for the first time. —H. L. **Hawkins**: The anterior ambulacrum of *Echinocardium cordatum* and the origin of compound plates in the Echinoidea. A new method was described of exposing sutures in recent Echinoids suitable for photographic purposes, the process combining staining with etching, and the description of the complex plating of ambulacrum III. in *E. cordatum*. The origin of ambulacrum "plate-crushing," founded on a brief survey of the phenomenon in all groups of Echinoids, was discussed. Mechanical growth-pressure was regarded as the cause, with the growth of tubercles (Lambert's hypothesis) as a secondary and merely modifying agent.—G. P. **Farran**: Plankton from Christmas Island, Indian Ocean. II., Copepoda of the genera Oithona and Paroithona. This collection, made in 1908 by Sir John Murray and Dr. C. W. Andrews, contained eleven species of Oithona and one of Paroithona, or rather more than half the known species, the total number of known species of Oithona being eighteen and of Paroithona two. This indicated the great richness in species of collections made in tropical waters. Seven of the species of Oithona and the one Paroithona appeared to be new to science.

Linnean Society, February 6.—Prof. E. B. Poulton, F.R.S., president, in the chair.—A. W. **Sutton**: Results of crosses between a wild pea from Palestine, presumably *Pisum humile*, Boiss and Noé, and cultivated forms.—Miss **Bancroft**: The structure of *Rhexoxylon africanum*. A fossil stem described by Dr. A. W. Rogers as probably coming from the Karroo rocks of Cape Colony, indicates affinities with the Medulloseæ of later Palæozoic age.—Dr. R. **Verity**: Revision of the Linnean types of Palæarctic Rhopalocera.

Mathematical Society, February 13.—Prof. A. E. H. Love, president, in the chair.—T. C. **Lewis**: Figures in n-dimensional space analogous to orthocentric tetrahedra.—J. E. **Littlewood**: A property of the ζ-function. —G. H. **Hardy**: The summability of a Fourier's series. —G. H. **Hardy** and J. E. **Littlewood**: Trigonometrical series which converge nowhere or almost nowhere.—H. **Bohr**: A theorem concerning power series.—P. J. **Heawood**: A graphical demonstration of the fundamental properties of quadratic residues.—J. B. **Holt**: The irreducibility of Legendre's polynomials (third paper).—W. H. **Young**: The mode of oscillation of a Fourier series and its allied series.—H. T. H. **Piaggio**: Some non-primary perpetuant syzygies of the second kind.

MANCHESTER.

Literary and Philosophical Society, February 4.—Prof. F. E. Weiss, president, in the chair.—D. **Thoday**: A capillary eudiometric apparatus for analysing small volumes of air. Results of experiments relating to the exchange of gases between plants and the atmosphere.—W. B. **Brierley**: The structure and life-history of *Sphaeria lemaneae*. The author traced the origin and development of the vegetative and reproductive organs of *Sphaeria lemaneae*, a fungus inhabiting sexual filaments of Lemanea. The relations obtaining between the host and parasite were elucidated, and the morphological structure and cytology of the fungus shown to be in general agreement with previous knowledge of Pyrenomycetous fungi. The accepted systematic position of *Sphaeria lemaneae* was questioned.

PARIS.

Academy of Sciences, February 10.—M. F. Guyon in the chair.—Pierre **Duhem**: Two fundamental inequalities of thermodynamics.—Paul **Sabatier** and M. **Murat**: The direct addition of hydrogen to the phenylacetic esters: the preparation of *cyclo*hexylacetic acid. This reaction requires a large excess of hydrogen in presence of a very active nickel, maintained at 180° C. The yield is quantitative, no loss occurring through secondary reactions. The properties of *cyclo*hexylacetic acid and of five of its esters are described.—Charles **Depéret**: Observations on the Pliocene and Quaternary geological history of the gulf and isthmus of Corinth.—Hugo de **Vries** was elected a correspondant of the academy in the section of botany, in the place of M. Schwendener, elected foreign associate.—Mlle. S. **Tillinger**: The determination of the growth of functions defined by a Taylor's

series.—J. Le **Roux**: The determination of the harmonic functions.—Th. De **Donder**: A theorem of Jacobi.—Henri **Villat**: The determination of problems of hydrodynamics relating to the resistance of fluids.—M. **Gernez**: Construction and use of maps for orthodromic navigation on planes tangent to the poles.—L. **Crussard**: The deformation of waves in gases and on finite interferences.—Carl **Störmer**: An important problem in cosmical physics.—Albert **Turpain**: Recording the Hertzian time signals. The possibility of recording directly and determining to a hundredth of a second the Eiffel Tower time signals. A description of the results obtained by a photographic recorder, by means of which the beats of a chronometer and the wireless time signals are registered on the same sheet.—Edm. van **Aubel**: The latent heat of vaporisation of metals. Utilising the experimental data of Wehnelt and Musceleanu for the latent heats of vaporisation of mercury, cadmium, zinc, and bismuth, Trouton's law is shown to hold for these metals, the constant varying only between 19·36 and 20·2.—A. **Guillet** and M. **Aubert**: Electric losses in the system plane-sphere-atmospheric air. The coefficient of asymmetry and its measurement.—V. **Crémieu**: A new idiostatic voltmeter. The voltmeter is claimed to be very sensitive, not damaged by excessive voltages, and not so fragile as the gold-leaf electroscope.—Jean **Becquerel**, L. **Matout**, and Mlle. W. **Wright**: Hall's phenomenon in antimony. The Hall effect for antimony increases as the temperature of the metal is lowered, and depends on the position of the axes of the crystal in the magnetic field. The electromotive force is not always proportional to the strength of the magnetic field.—William **Duane** and Otto **Scheuer**: The decomposition of water by the α rays. At −183° C. the hydrogen and oxygen evolved are in molecular proportion; in the liquid state the hydrogen is in excess, some hydrogen peroxide being also formed. When steam is decomposed by the α rays hydrogen is also in excess.—Daniel **Berthelot** and Henry **Gaudechon**: The inversion of saccharose by the ultra-violet rays. A criticism of recent work by other workers in this subject.—Marcel **Godchot** and Félix **Taboury**: The catalytic hydrogenation of camphorone; some new *cyclo*pentane hydrocarbons. Camphorone, treated with hydrogen and reduced nickel at 130° C., gives quantitatively dihydrocamphorone. At 280° C. the product is methyl-1-*iso*-propyl-3-*cyclo*pentane.—A. **Duffour**: An interesting case of dimorphism. Benzylvanillic alcohol crystallises in monoclinic or triclinic crystals, according to its method of preparation. The triclinic modification is stable at the melting point.—Robert **Mirande**: The presence of callose in the membrane of some marine Algæ.—C. M. **Bret**: The existence in western Africa of two stable forms of *Hevea brasiliensis* presenting a different aptitude in the production of latex. The two forms can be distinguished by the anatomical study of the base of the petiolules, the most vigorous plant being the poorest in latex.—H. **Bierry** and Mlle. Lucie **Fandard**: Adrenaline and glycemia. The mechanism which governs hyperglycemia and glycosuria is not so simple as has been hitherto supposed. Part of the free sugar in excess in the blood can go more or less rapidly into combination without being lost to the organism, the surplus only passing into the urine.—R. **Anthony** and L. **Gain**: The development of the skeleton of the posterior extremity of the penguin.—Armand **Dehorne**: New researches on maturation mitosis in *Sabellaria spinulosa*.—André **Mayer** and Georges **Schaeffer**: The composition of the tissues in non-volatile fatty acids and in cholesterol and the possible existence of a "lipocytic constant."—Ém. **Bourquelot**, H. **Hérissey**, and M. **Bridel**: The biological synthesis of the glucosides of alcohols (α-glucosides) with the aid of α-glucosidase. The destruction of the α-glucosidase in strongly alcoholic medium.—Fernand **Meunier**: The frequent asymmetry of the elytra in Blattidæ of the Coal Measures of Commentry (Allier), and the phylogeny of the groups.—Jules **Welsch**: The primary dunes of Gascony, and an explanation of their formation.

BOOKS RECEIVED.

Vergleichende Physiologie wirbelloser Tiere. By Prof. H. Jordan. Erster Band. Pp. xxii+738. (Jena: G. Fischer.) 24 marks.

One Hundred Simple and Exact Mathematical Proofs that the Valencies of Carbon are Unequal. By H. Collins. Pp. 109. (London: Morton and Burt, Ltd.)

Les Atomes. By Prof. J. Perrin. Pp. xvi+296. (Paris: F. Alcan.) 3.50 francs.

The Observer's Handbook for 1913. Pp. 72. (Toronto: Royal Astronomical Society of Canada.)

Annuario Publicado pelo Observatorio Nacional do Rio de Janeiro. Para o Anno de 1913. Anno xxix. Pp. vii+349+plate. (Rio de Janeiro.)

The Honey-Star. By T. Edwardes. Pp. viii+344. (London: Hutchinson and Co.) 6*s*.

The Bradshaw Lecture on the Biology of Tumours. by Dr. C. M. Moullin. Pp. 39. (London: H. K. Lewis.) 2*s*. net.

Our Vanishing Wild Life: its Extermination and Preservation. By Dr. W. T. Hornaday. Pp. xv+411. (New York: Charles Scribner's Sons.) 1.50 dollars.

Trees in Winter: their Study, Planting, Care, and Identification. By Drs. A. F. Blakeslee and C. D. Jarvis. Pp. 446. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd.) 8*s*. 6*d*. net.

"Red Books" of the British Fire Prevention Committee. No. 176, Fire Tests with Celluloid Substitutes. The Committee's Report. Pp. 31. (London: British Fire Prevention Committee.)

The Fate of Empires: being an Inquiry into the Stability of Civilisation. By Dr. A. J. Hubbard. Pp. xx+220. (London: Longmans and Co.) 6*s*. 6*d*. net.

Luftelektrizität. By Dr. K. Kähler. Pp. 151. (Berlin and Leipzig: G. J. Goschen.) 90 pfennigs.

Health through Diet. By K. G. Haig, with the advice and assistance of Dr. A. Haig. Pp. x+227. (London: Methuen and Co., Ltd.) 3*s*. 6*d*. net.

Diptera Danica: Genera and Species of Flies hitherto Found in Denmark. By W. Lundbeck. Part iv., Dolichopodidæ. Pp. 415. (Copenhagen: G. E. C. Gad; London: W. Wesley and Son.)

Das Wissen der Gegenwart in Mathematik und Naturwissenschaft. By E. Picard. German translation by F. and L. Lindemann. Pp. iv+292. (Leipzig and Berlin: B. G. Teubner.) 6 marks.

British Birds' Nests: How, Where, and When to Find and Identify Them. By R. Kearton. Revised and enlarged edition. Pp. xii+520+plates. (London: Cassell and Co., Ltd.) 14*s*. net.

The Cambridge Manuals of Science and Literature: The Physical Basis of Music. By Dr. A. Wood. Pp. 163. The Story of a Loaf of Bread. By Prof. T. B. Wood. Pp. vi+140. The Modern Warship. By E. L. Attwood. Pp. 146. The Earth: its Shape, Size, Weight, and Spin. By Prof. J. H. Poynting. Pp. 141. The Atmosphere. By A. J. Berry. Pp. 146. (Cambridge University Press.) Each 1*s*. net.

Handwörterbuch der Naturwissenschaften. By E. Korschelt and others. Lief 35–37. (Jena: G. Fischer.) 2.50 marks each Lief.

La Théorie du Rayonnement et les Quanta. Rapports et Discussions de la Réunion tenue à Bruxelles, du 30 Octobre au 3 Novembre, 1911, sous les auspices de M. E. Solvay. Publiés par P. Langevin and M. de Broglie. Pp. iii+461. (Paris: Gauthier-Villars.) 15 francs.

Meddelanden från Statens Skogsförsöksanstalt. Häftet 9, 1912. Pp. iii+269+xxxviii. (Stockholm: Centraltryckeriet.) 2.25 kronor.

Iron and Steel. By O. F. Hudson. With a section on Corrosion by Dr. G. D. Bengough. Pp. x+173. (London: Constable and Co., Ltd.) 6*s*. net.

Catalogue of the Lepidoptera Phalænæ in the British Museum. Vol. xii., Catalogue of the Noctuidæ in the Collection of the British Museum. By Sir G. F. Hampson. Pp. xiii+626. (London: Longmans and Co., and others.) 17*s*. 6*d*.

Dent's Practical Notebooks of Regional Geography. By Dr. H. Piggott and R. J. Finch. Book i., The Americas. Pp. 64. (London: J. M. Dent and Sons, Ltd.) 6*d*. net.

Memoirs of the Department of Agriculture in India. Bacteriological Series. Vol. i., No. 1, November. Studies in Bacteriological Analysis of Indian Soils. No. 1, 1910–11. By C. M. Hutchinson. Pp. 65. (Calcutta: Thacker, Spink and Co.; London: Thacker and Co.) 2.8 rupees.

Memoirs of the Geological Survey. England and Wales. Records of London Wells. By G. Barrow and L. J. Wills. Pp. iv+215+iii plates. (London: H.M.S.O.; E. Stanford, Ltd.) 4*s*. 6*d*.

Le Celluloïd et ses Succédanés. By W. Main. Pp. 163. (Paris: Gauthier-Villars.) 2.50 francs.

Leitfaden der Deszendenztheorie. By Dr. L. Plate. Pp. 55. (Jena: G. Fischer.) 1.60 marks.

DIARY OF SOCIETIES.

THURSDAY, FEBRUARY 20.

ROYAL SOCIETY, at 4.30.—Studies on Enzyme Action. XIX. Urease, a Selective Enzyme. II. Observations on Accelerative and Inhibitive Agents: Prof. H. E. Armstrong, M. S. Benjamin, and E. Horton.—Nervous Rhythm arising from Rivalry of Antagonistic Reflexes; Reflex Stepping as Outcome of Double Reciprocal Innervation: Prof. C. S. Sherrington.—The Libration of Ions and the Oxygen Tension of Tissues during Activity (Preliminary Communication): Dr. H. E. Roaf.—Contributions to the Biochemistry of Growth. The Glycogen Content of the Liver of Rats Bearing Malignant Growths: W. Cramer and J. Lochhead.—Changes in the Glomeruli and Tubules of the Kidney accompanying Activity: Prof. T. G. Brodie and J. J. Mackenzie.

INSTITUTION OF MINING AND METALLURGY, at 8.—The Copper Queen Mines and Works, Arizona, U.S.A. (1) Historical Sketch: J. Douglas. (2) Geology of the Bisbee Ore Deposits: A. Notman. (3) The Power Plant at Bisbee, Arizona; (4) The Power Plant at Douglas, Arizona: C. Legrand. (5) Reduction Works at Douglas, Arizona: G. B. Lee.—Copper Smelting Methods at Bogoslowsk, Perm, Russia: R. Davey.

LINNEAN SOCIETY, at 8.—The Anatomy of the Larva of *Phryganea stricta*: R. H. Deakin.—Views of Spartina Vegetation (lantern-slides): Dr. Otto Stapf.—A Seven-winged Fruit of Sycamore: W. B. Turrill.—The Genera Radamæa, Benth., and Nesogenes, A. DC: W. Hemsley.—Marine Algæ collected by Mr. C. Crossland, Part II.: Prof. R. J. Harvey Gibson and Miss Margery Knight.

FRIDAY, FEBRUARY 21.

ROYAL INSTITUTION, at 9.—Horticultural Investigations at the Woburn Experimental Fruit Farm: Spencer U. Pickering.

SATURDAY, FEBRUARY 22.

ROYAL INSTITUTION, at 3.—The Properties and Constitution of the Atom: Sir J. J. Thomson, O.M.

ESSEX FIELD CLUB (at the Essex Museum, Stratford), at 6.—*Chonoziphius moorei*, a New Species of Fossil Ziphioid Whale, from Walton-Naze: A. Bell.—The Legendary Folk-lore of Amulets, Charms, and Mascots: E. Lovett.

MONDAY, FEBRUARY 24.

ROYAL GEOGRAPHICAL SOCIETY, at 8.30.

ROYAL SOCIETY OF ARTS, at 8.—The Art of Miniature Painting: C. Davenport.

INSTITUTE OF ACTUARIES, at 5.—"House Purchase" Companies: The "Bond Investment" Sections of the 1909 Act and Some Actuarial Features of the Business returned thereunder: C. H. Maltby.

TUESDAY, FEBRUARY 25.

ROYAL INSTITUTION, at 3.—The Movements of the Stars. (1) The Nebular Hypothesis: Prof. H. H. Turner.

ROYAL SOCIETY OF ARTS, at 4.30.—Openings for Educated Women in Canada: Ella C. Sykes.

INSTITUTION OF CIVIL ENGINEERS, at 8.—The Erection of the Boucanne River Viaduct, Canada: P. L. Pratley.

WEDNESDAY, FEBRUARY 26.

GEOLOGICAL SOCIETY, at 8.—The Geology of Bardsey Island (Carnarvonshire): Dr. C. A. Matley. (With an Appendix on the Petrography, by Dr. J. S. Flett.)—The Loch Awe Syncline (Argyllshire): E. B. Bailey.

AERONAUTICAL SOCIETY, at 8.30.—Military Aviation: Major F. H. Sykes.

ROYAL SOCIETY OF ARTS, at 8.—The Education and Employment of the Blind: H. J. Wilson.

THURSDAY, FEBRUARY 27.

ROYAL SOCIETY, at 4.30.—*Probable Papers*: The Thermal Properties of Carbonic Acid at Low Temperatures: C. F. Jenkin and D. R. Pye.—Re-reductions of Dover Tidal Observations, 1883–1884: E. Roberts.

CONCRETE INSTITUTE, at 7.30.—Economy in the Design of Reinforced Concrete: J. A. Davenport.

SOCIETY OF DYERS AND COLOURISTS, at 8.—Starch and Decomposition Products: Dr. M. Hamburg.—A Method for the Testing of Malt Extracts: R. J. May.—The Valuation of Malt Products: W. P. Dreaper.—A Contribution to the Methods of Testing Malt Extracts: Dr. A. Herz.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—Fourth Kelvin Lecture—The Ohm, the Ampere, the Volt, A Memory of Fifty Years (1862–1912): Dr. R. T. Glazebrook.

FRIDAY, FEBRUARY 28.

ROYAL INSTITUTION, at 9.—Active Nitrogen: Hon. R. J. Strutt.

PHYSICAL SOCIETY, at 5.

SATURDAY, MARCH 1.

ROYAL INSTITUTION, at 3.—The Properties and Constitution of the Atom: Sir J. J. Thomson, O.M.

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Editorial and Publishing Offices:
MACMILLAN & CO., LTD.,
ST. MARTIN'S STREET, LONDON, W.C.

Advertisements and business letters to be addressed to the Publishers.

Editorial Communications to the Editor.
Telegraphic Address: PHUSIS, LONDON.
Telephone Number: GERRARD 8830.