THURSDAY, FEBRUARY 6, 1913.

SOUTH AMERICAN IMPRESSIONS.

South America: Observations and Impressions. By James Bryce. Pp. xxiv + 611 + maps. (London: Macmillan and Co., Ltd., 1912.) Price 8*s.* 6*d.* net.

H.B.M.'S Ambassador to the United States of America naturally enjoyed inestimable advantages wherever he went, although strictly as a private gentleman, on his well-earned holiday trip of four months, during which he visited Panama, Peru, Bolivia, Chile, Argentina, the Straits of Magellan, Uruguay and Brazil.

It is difficult to find in his book a subject of general interest which has not been but slightly touched, except the prospects for the development of industry and commerce, important topics fully written upon by others; the reader is therefore spared the usual statistical tables drawn up to prove what the particular writer wants to prove. The bulk of this most pleasantly written book is descriptive of the manifold impressions made upon the author by the seven republics. "It is nature that chiefly engages the traveller's mind in Peru and Bolivia, as it is economic development which interests him in Argentina and Uruguay. In Chile and Brazil he must be always thinking of both." Many books have been written on South American scenery since Humboldt gave us his "Aspects of Nature," but they mostly lose themselves in the detailed sojourn of a tropical forest, on the endless plains, the perils of the giant mountains, whilst few, if any, have managed to give, in a few terse sentences, the chief characteristics, natural and human, of the various countries. Our author has this gift, enhanced, no doubt, by his own extensive travels in many distant parts of the world, but at heart he is a loving observer of nature, who therefore dedicates his impressions to his friends of the English Alpine Club, and who also knows that it is the environment, in its wider sense, which makes not only the people, but also their States and their destinies.

Perhaps this is the most valuable practically and philosophically interesting contribution to the study of the social aspects of the South American continent. Its many republics, great and small, prosperous and others still somewhat lagging behind, as our author would put it with his intentional optimism—all have something in common found nowhere else in the world: a Latin stock, essentially Spanish or Portuguese, with an often considerable infusion of native blood, with French, not Anglo-German, culture. Yet there are already marked differences between almost any two of the various republics, some of which have become, others of which are beginning to develop into, true nations with decided national characteristics. Here it is the experienced statesman who reveals to us the causes at work, historical, geographical, sometimes accidental administrative contingencies, with their far-reaching results. The division of the continent between the Spaniards and Portuguese was due to an accident, the famous papal bull having fixed upon a meridian as the demarcation of future conquests which subsequently happened to run through a continent the existence of which was not even suspected. The Spaniards, entering through the back door, by Peru, occupied the north and west, and having extended across the Andes until they arrived at the Atlantic, had to subdivide their unwieldy territory into the viceroyalties of Peru and Buenos Aires. Brazil, the huge share of the Portuguese, was thus hemmed in towards the south and west, at least theoretically, since there are even now wide tracts of land almost unknown and claimed by two, or even three, of the adjacent republics.

There is the important problem of the relation between the white population and the aborigines, in Brazil also the negroes—relations altogether different from those prevailing in North America, because in Mexico, Central and South America there is no colour question. The intermixture between white and brown, continued since the conquest, is producing phenomena of the greatest physiological and ethnological interest. Here the mestizo deems himself a white, tries to live and think as a white, and is practically recognised as such by others. In the Argentine, Uruguay and South Brazil, where the natives have vanished long ago, the pure whites are, of course, increasing; in Peru and Bolivia, with the natives in the overwhelming majority, the process of mixture is so slow that it may take centuries before they form one race and leave no pure Indians remaining. It is an assumption that this aboriginal blood is not beneficial to the developing nations; the Chilean peasant to-day, who is at least half Indian, is not inferior to the Argentine peasant, who is almost pure white. The mestizos and whites are, for political and social purposes, practically one and that the ruling class, the Indians being passive and, in a political sense, outside the nation. Blood is, however, only one factor in the making of men. Environment and the influence of the reigning intellectual type count for more.

South America is the chief resource to which the overpeopled countries may look for their emigration, and to which the world at large may look

for augmenting its food supply. Political disorders and difficulty of access, which have given these republics a bad name, no longer apply to its temperate regions. The future of these States is assured so far as the gifts of nature can assure it. The world will always want what they produce. The reclaiming of the tropical parts and their future is not yet a practical question. Such and similar topics are dealt with in the last chapter, entitled "Some Reflections and Forecasts." Here once more it is the experienced statesman who takes his survey from a lofty point of vantage, and for obvious reasons we have now and then to read between the lines, in contrast with the interesting "South America To-day," by G. Clémenceau, the former Prime Minister of France, who, likewise on a rapid trip, lectured the Argentinos on their own social problems. Mr. Bryce's work, although not embellished with pictures, contains several large-scale maps, notably of the Panama Canal and the Straits of Magellan, to which hitherto little-described region is devoted a charming chapter from the historic and scenic points of view.

THE BEGINNING OF A NEW ERA IN MINERALOGY.

Untersuchungen über die Bildungsverhältnisse der ozeanischen Salzablagerungen insbesondere des Stassfurter Salzlagers. By J. H. van't Hoff and others. Herausgegeben von Prof. H. Precht und Prof. Ernst Cohen. Pp. xx + 374 + 8 plates. (Leipzig: Akademische Verlagsgesellschaft m.b.h., 1912.) Price 16 marks.

VAN'T HOFF'S researches on the formation of oceanic salt deposits were originally published in the *Sitzungsberichte* of the Royal Prussian Academy of Sciences. As this periodical is unfortunately inaccessible to the vast majority of scientific workers, the need for a re-publication of the whole series of papers (fifty-two in all) has been keenly felt for a considerable time. Although summaries of the work, or portions of it, have been published from time to time in various readily accessible scientific journals, and although van't Hoff himself published a very concise account of his work ("Zur Bildung der ozeanischen Salzablagerungen," 2 vols., 1905 and 1909, Vieweg und Sohn), those acquainted at first hand with the researches in question have realised that nothing short of a re-publication *in extenso* of the whole series could give that detailed and intimate acquaintance which is necessary for the advance of science. We therefore owe Profs. Cohen and Precht and the Akademische Verlagsgesellschaft in Leipzig a deep debt of gratitude for the publication of this splendid volume.

As all the world knows to-day, van't Hoff's work on the oceanic salt deposits deals in the main with a systematic study of the conditions affecting the formation, decomposition, and co-existence of all the single and double salts, and all the various combinations of these which can appear in the system Na–K–Mg–Ca–Cl–SO_4–H_2O. Borates are also considered and dealt with in a number of interesting papers.

Owing to the enormous labour and time involved, van't Hoff confined his attention in the main to working out the isotherms at 25° and 83°. But the gap between these temperatures was, at any rate as regards the appearance and disappearance of the chief minerals, very largely bridged over by many determinations of vapour-pressures and transition-points. So much so that van't Hoff was enabled to construct what he called a "geological thermometer"; that is to say, he could state at what temperatures various minerals or groups of minerals had in long past ages been deposited. The thirty-sixth paper of the series gives an account of the temperature-limits determining the coexistence, between 25° and 83°, of the various groups of minerals (parageneses). These paragenetic tables might indeed be regarded as the crowning glory of the whole series of researches.

The remark has been sometimes made that van't Hoff's work on the oceanic salt deposits cannot be regarded as equal to his earlier achievements in point of originality and genius. Such remarks arise from that striving after sensationalism and notoriety which is apt to infect science, just as it has infected and corrupted many other departments of life at the present day. In originality of design and method, grandeur of scope and conception, and intellectual power and insight in development, van't Hoff's work on the oceanic salt deposits bears the stamp of sovereign genius. Like every other work of genius, it has had and will have far-reaching results. Not only is it a model for all time of how problems in inorganic chemistry and its technical applications should be studied, but it points the way towards the creation of the mineralogy and geology of the future. Already the Verband für die wissenschaftliche Erforschung der deutschen Kalisalzlagerstätten and the Geophysical Laboratory of the Carnegie Institution at Washington are actively following in van't Hoff's footsteps, so that on the one hand the particular problem he attacked is being completed in its details, whilst on the other the new experimental mineralogy of the future is making rapid progress.

The present volume of collected researches will

remain for all time one of the great classics of science, a source of perpetual delight and inspiration to all true philosophers. He who drinks at such fountains can never grow old, for the clear waters that flow therefrom are the true elixir of the human spirit. F. G. DONNAN.

PHYSICAL AND CHEMICAL CONSTANTS.

Tables Annuelles de Constantes et Données Numériques de Chimie, de Physique et de Technologie. Vol. i., année 1910. Pp. xxxix + 727. (Paris: Gauthier - Villars; Leipzig: Akademische Verlagsgesellschaft m.b.h.; London: J. and A. Churchill; Chicago: University of Chicago Press.) Price 24*s.* net (cloth); 21*s.* 6*d.* net (paper).

THIS somewhat ponderous volume is the first of a series of the same character it is proposed to publish annually. It comprises a compendium of those constants of physics, chemistry and technology which result from researches published during the year 1910. The volume would appear to bear to Science Abstracts and the Abstracts published by the Chemical Society about the same relation as a dictionary to an encyclopædia. It is compiled under the auspices of an international committee, on which Dr. Wilsmore is the British representative, aided by a number of collaborators and abstractors, the general secretary of the committee and editor-in-chief being Dr. C. Marie, of Paris.

To review and criticise such a work is not easy, and it would be manifestly unfair to treat the volume like a book of tables, looking in it for information on definite subjects and commending or blaming according as one found or did not find what was required. We have some doubt, however, whether any considerable number of workers will be willing to purchase some large book of constants, such as the well-known "Landolt and Börnstein," or the late Mr. Castell-Evans's Chemical-Physical Tables, and use the present publication as an appendix to the same.

The volume is printed on good paper, but a good deal of space seems to have been wasted, making the book extremely bulky. On the whole, it seems fairly easy to ascertain from it whether, during the year it covers, any additions were made to our knowledge in any of the branches dealt with. Pure chemistry, and in particular organic chemistry, occupies a large share of the 727 pages composing it, and it is probably to the chemist rather than to the physicist that it will be of most use. Like most other books of tables, it is quite uncritical in character, and we doubt the utility of a bare statement, such as, for example, that found on p. 227: "Cuivre pur—variation de la résistance en pour cent à 20° = 0·3938," with no details as to the state of the metal or why the constant quoted differs so widely from the accepted value; but, nevertheless, we think that on the whole the work of the abstractors seems to have been conscientiously done.

The English of the book savours in places of an old-fashioned French exercise book; the English translations of French terms used have a look in some instances of having been dug out of a dictionary of the Early Victorian period. Throughout the indexes and in some other places German, English, French, and Italian equivalents are given for titles, etc., but in the body of the work the language used is generally French. Better indexes to the present volume than those which are given are needed, and are promised in the 1911 issue. J. A. HARKER.

TWO BOOKS ON NAVIGATION.

(1) *Nautical Astronomy.* By W. P. Symonds. Pp. 130. (London: J. D. Potter, 1912.) Price 6*s.*

(2) *The "Newest" Navigation Altitude and Azimuth Tables for Facilitating the Determination of Lines of Position and Geographical Position at Sea.* Second edition. By Lieut. R. de Aquino. Pp. xlix + 176 + v* + 36*. (London: J. D. Potter, 1912.) Price 10*s.* 6*d.* net.

(1) NAUTICAL astronomy is simply the application of spherical trigonometry to the problem of ascertaining the latitude and longitude at sea by observations of the heavenly bodies; as also the errors of the compass. To a student acquainted with spherical trigonometry it is only necessary to give the figure showing the data available, and the result required, to enable him to make the necessary calculation. Mr. Symonds gives the figures and also some trigonometrical formulæ, as do all other books, or nearly all others, which treat of navigation and nautical astronomy, but his figures are badly drawn, especially Fig. 2 on p. 8.

It is in the practical application for obtaining the data required for calculating a ship's position that Mr. Symonds fails:—(1) No stress is laid on the importance of obtaining the latitude and longitude simultaneously. This can always be done by star observations at twilight, in the morning and evening, when the horizon is sufficiently clear and the stars are plainly visible. It can often be done in the daytime when either Venus or Jupiter passes the meridian between sunrise and 9 a.m., or between 3 p.m. and sunset. (2) No stress is laid on the refraction of the sea horizon, which can only be eliminated by taking

observations on both sides. In the case of properly selected stars at twilight, morning and evening, this error can always be corrected; and in obtaining the latitude at noon, by the sun's meridian altitude, it can also be eliminated if the sun is high enough to allow its altitude to be obtained by the north as well as the south horizon.

If observations of one heavenly body are alone obtained, the precise position of a vessel is always open to doubt, as an allowance has to be made for the change in the ship's position, for the time elapsed between the observations for latitude and longitude. This necessitates an allowance for tide and current, which is always uncertain.

(2) Lieut. Radler de Aquino's work is simply an amplification of a problem which has been taught in some navigational schools for more than sixty years and was propounded originally by Captain Thomas H. Sumner, a United States shipmaster, in 1837, as properly stated in a footnote on page ix. of the introduction to this work. It is based simply on the fact that if a line be drawn from the centre of the earth to any heavenly body, at the point where that line cuts the earth's circumference the altitude of that heavenly body will be 90°. If a radius of the earth be taken 10° from the first line and a circle be described on the earth's surface, at every part of that circle the altitude of that heavenly body will be 80°, &c. When, therefore, an altitude of a heavenly body is taken, the observer is on a circle on the earth's surface at every point of which the altitude will be exactly equal to the altitude he has observed, and his position on that circle will be where the true bearing of the heavenly object cuts the circle.

The circles on the earth's surface have such a large radius that they can be treated for short distances as straight lines, by assuming the tangent to the circle to be a line of position on which a ship is situated.

In the days of sailing ships, or of auxiliary powered steamers, these lines of position were used chiefly to obtain the latitude and longitude, as, by observing the altitudes of two or more heavenly bodies suitably situated, as near right angles to each other as practicable, two or more lines of position were obtained at the same time, and the observer's position was in the spot where these lines cut each other.

In these days of full-powered steamers the position line can be made use of to make any particular point on a coast, for if the line of position runs towards the coast a vessel has only to steam along it to arrive at the point on the coast which it cuts. This is not new, but is only practicable in ships of the present day.

In Lieut. Radler de Aquino's book some tables are given by which the problem can be solved without working out the spherical triangle upon which the problem is based, but as the spherical triangle can be worked in about five minutes, there is no particular advantage to an officer in throwing over the system which he *must* understand and be familiar with to be a good navigator, to take up another system in its place, and to crowd the limited space available in ships with works that are not absolutely necessary, more especially as little or no time is saved by doing so.

OUR BOOKSHELF.

Notes on Chemical Research. An Account of Certain Conditions which Apply to Original Investigations. By W. P. Dreaper. Pp. x+68. Price 2*s*. 6*d*. net.

MR. DREAPER is the editor of *The Chemical World*, and his "notes" first appeared in that vigorous young journal. They were well worth reprinting; for, although they have the unsystematic character which the title seems to admit, they are informed both by wisdom and enthusiasm and cannot fail to stimulate the young workers to whom they are addressed.

Mr. Dreaper's main thesis is that the researcher "must give special attention to the theoretical side of his science, and train his mind to discover in the recorded work of others the conditions which have led to success." In delivering this opinion he has in view researchers both in "pure" and "applied" science. Indeed, one of the most interesting points in the book is the author's oft-expressed conviction that under modern conditions the dividing line between these two kinds of inquiry has become and will continue to become less marked. It has become necessary for the practical man to keep closely in touch with theory and for the worker in pure science to have some knowledge of industrial experience which is apt—owing to the large scale of the phenomena—to throw important light upon theoretical questions.

This view is excellently illustrated by numerous examples drawn from the present state of pure and applied chemistry. For the rest, it must suffice to add that Mr. Dreaper presents in an attractive and non-technical way a sound philosophy of scientific inquiry. T. P. N.

Elektrobiologie. Die Lehre von den elektrischen Vorgängen im Organismus auf moderner Grundlage dargestellt. By Prof. J. Bernstein. Pp. ix+215. (Braunschweig: F. Vieweg und Sohn, 1912.) Price 6 marks.

PROF. BERNSTEIN'S "Electrobiology" is a particularly fascinating presentation of the electrical phenomena of animal and plant tissues, coloured from beginning to end by the observations and ideas of its author.

The earlier chapters, dealing with historical matter and with the electrical properties of muscle, nerve, &c., lead up to his "membrane theory"

of these phenomena. This postulates, for each fibre (or cell), a semi-permeable investment enclosing a fluid of higher ionic concentration than that outside it, and so represents each tissue element plus its immediate environment as a concentration cell.

From this point of view are first discussed currents of injury and of activity—the former attributed to outward diffusion of the cell (fibre) contents ("pre-existence" in a new dress), the latter to excitatory alteration in the permeability of the "membrane." Electrotonic and thermal currents, the discharge of electric organs, and the law of electrical excitation are dealt with from the same point of view.

Nor is this all. "Electrobiology" is extended beyond the above, more obviously electrical, events. In addition, the activity of secreting and of absorbing surfaces, karyomitosis, cell-life in general, are presented as electrokinetic phenomena.

Prof. Bernstein's clearness and conciseness have enabled him to condense a wealth of detail into small compass with singular freedom from confusion. His presentation is impressive and interesting throughout, and it is to be hoped that a work so peculiarly attractive to pre-graduate as well as to post-graduate students of physiology will find its way to early translation. W. L. S.

A Vertebrate Fauna of the Malay Peninsula from the Isthmus of Kra to Singapore, including the Adjacent Islands. Edited by H. C. Robinson. Reptilia and Batrachia. By George A. Boulenger. Pp. xiii + 294. (London: Taylor and Francis, 1912.) Price 15*s*.

THIS is the first instalment of a vertebrate fauna of the Malay Peninsula of which the Federated Malay States Government has authorised the publication. The plan of the work is that of Blanford's "Fauna of British India," to which it may be regarded as supplementary. References to literature, especially in the case of species common to both fauna, have been made as short as possible, though a fairly full synonymy has been given for all forms which do not occur outside Malayan limits.

The descriptions throughout are based on the collections in the British Museum, supplemented in some few cases by specimens in the Selangor, Perak, and Singapore Museums.

Who's Who in Science: International, 1913. Edited by H. H. Stephenson. Pp. xvi + 572. (London: J. and A. Churchill). Price 8*s*. net.

SEVERAL improvements have been made in the 1913 issue of this useful work of reference. A frontispiece giving portraits of certain eminent men of science who died during 1912 has been included, a new section on scientific societies and their publications has been added, and biographies of distinguished workers in psychology and geography are given for the first time. Altogether the editor has provided men of science with a handy directory which should help to introduce them to fellow-workers in various parts of the world.

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.*]

Breath Figures.

LORD RAYLEIGH, in NATURE, December 19, 1912, has again returned to the subject of breath figures, and his criticisms of my work on that subject call for some remarks. Lord Rayleigh holds that clean glass will give a uniform deposit of dew when breathed on, and will look black, to use his expression, and show the colours of thin plates when properly lighted. I, on the other hand, think that the character of the deposit is generally determined by the impurities on the surface of the glass, because the appearance of the deposit depends very much on the treatment the surface may have previously received. I came to this conclusion because there seems to be no way of finding out what the deposit is like on clean glass, as we have no means of knowing whether the surface is clean or not.

My reason for supposing that the black deposit formed on the track over which a blowpipe flame had previously passed was due to impurities deposited on the cold surface by the hot gases, is that we know that under these conditions fine dust and possibly some gases must be deposited on the glass, and it is this impurity which, I think, gives the black deposit. Lord Rayleigh, on the other hand, supposes that this black condensation is due to the cleansing effect of the heat. If this be the case, then heat, apart from the flame, ought to give the same result. In my letter in NATURE of June 15, 1911, it is shown that it does not. This experiment was repeated recently, using higher temperatures. The result was no change on testing with the breath; the plate still gave the white deposit. A part of the plate was then passed over the flame, and, though not heated above what could be comfortably handled, it gave the black deposit. The black deposit in this case does not seem to be due to heat, but to some effect of the hot gases which will be referred to later.

On reading Lord Rayleigh's paper I was greatly interested in his happy idea of breaking a piece of glass and testing the broken surfaces before they got contaminated by any impurity. The solution of the question of the nature of the deposit on clean glass seemed at hand, but on further inquiry it became elusive, as we shall see. Following Lord Rayleigh's example, very thick plate-glass was first experimented with. When observing the condensation, in place of breathing on the glass, the plate, with the newly broken edge upwards, was pressed into pounded ice. By causing the condensation to take place in this way we get plenty of time for observing what is taking place. The surface was watched, while the condensation was forming, by means of a strong magnifying lens. My tests of the newly broken surfaces were slightly different from Lord Rayleigh's. He got both kinds of condensation—both black and white—while in my tests scarcely any white was observed. Practically all the surfaces gave a black condensation; they acted as Lord Rayleigh thinks clean glass will act.

Other kinds of glass were also tested. The finest results were obtained with the glass of a common black bottle. The deposit in this glass gave very fine colours, the black background showing them up brilliantly.

Having arrived at the conclusion that practically

all the newly broken surfaces of glass gave the black condensation, the next question which called for consideration was: What is the condition of a freshly broken surface of glass? While what was now a new surface was still in the interior of the solid it would be in equilibrium with its surroundings; but would it be in equilibrium with its new surroundings? That is: Is a newly broken surface of glass in the same condition as glass as we know it? To get an answer to this question a number of samples of different kinds of glass were broken and placed on a sheet of glass and covered with a glass shade. All the samples were placed with their test surfaces facing downwards to prevent any dust settling on them. When these were examined two days later it was found they had entirely changed; almost no black or iridescent colours could now be seen; nearly all the surfaces gave the white deposit.

It is not necessary to wait so long as two days to find this change in the broken surfaces of glass. If broken one day and examined the next the change is quite evident, and so surprising did this seem that I had to make a fresh break of the same piece to compare the new with the old before I was satisfied that the observation was correct. From this it will be seen that it is possible to say whether or not a piece of glass has been newly broken. The time necessary for this change to take place has not been determined, but probably depends upon the kind of glass used; possibly also the temperature and humidity of the air may have some effect. Wetting the surface causes the change to take place more quickly.

From the foregoing it would appear that the tests made with newly broken surfaces of glass give an uncertain answer as to the nature of the deposit on clean glass. If we look on a newly broken surface as clean glass, then the deposit is black. But if we wait until this surface has acquired its equilibrium in its new surroundings—that is, in the condition in which glass as we know it always is—then the deposit is white, and so far as these tests go the verdict tends to the latter conclusion.

Coming now to the experiments made with glass tubes, in which the influence of the impurities of the flame is eliminated, I found no difficulty in repeating Lord Rayleigh's experiments. In these tests I used a number of different kinds of glass, and all of them, after heating, gave the black deposit, but they varied greatly; some gave black but no colours, whilst others gave good colours. The glass used for ordinary test-tubes gave the best results. Something of this may possibly be due to the composition of the glass. All easily fusible glasses are more soluble in water than the others, and we may presume have a greater affinity for it. In making these experiments it was noticed that little or no effect was produced unless the glass was heated high enough to cause the bunsen flame to be coloured with the sodium of the glass, showing that the glass was undergoing some change.

The test with the tubes having shown that after being heated high enough they gave the black deposit, sheet-glass was again put under investigation to see if higher temperatures would not make it also give the black deposit. In the previous tests it was not found possible to heat the glass very highly; owing to their size and to the want of uniformity in the heating, the plates generally burst in pieces before a high temperature was attained. Thin strips of glass of from $\frac{1}{4}$ to $\frac{1}{8}$ of an inch broad were now used. These were placed on a piece of sheet-iron, about 1 inch broad, and placed over a bunsen flame. With the higher temperature now obtained it was found possible to change the glass and cause it to give the black deposit, but very little colour. As there might be some hesitation in accepting this result, the method of heating was changed. The strip of glass was put inside a tube, and was thus thoroughly protected from contact with the bunsen gases. Strips of glass were heated in iron, brass, and glass tubes, which had been previously highly heated to cleanse them. Under these conditions the highly heated sheet-glass gave the black deposit, but very little colour.

What interpretation are we to put on these tests? One might at first sight say that the heat had cleansed the surfaces of the tubes and sheet-glass, and that purified surfaces gave the black deposit. The observation that the glass had to be heated to a temperature high enough to cause a change to take place in it first raised my suspicions as to the correctness of the above conclusion, so an examination of the surface of the glass was made. Using in the first place the strips of sheet-glass, as observations are more easily made on them than on the less optically perfect glass of the tubes, the first question was: Is the glass clean after being highly heated? It proved to be far from it. If a small piece of wood the thickness of a match be covered with a piece of the polishing cloth and a small surface of the glass be rubbed with it, it will be seen that along the boundary of the rubbed part there is a deposit of dust, rubbed off the plate. This deposit is not seen when a clean part of the plate is rubbed in the same manner; further, with proper lighting and a black background it will be seen that the rubbed part is blacker than the surrounding glass. This observation is much aided if a strong magnifying glass be used. Attention was now directed to the condition of the surfaces in the tubes. Rubbing with a small pad showed that their surfaces also were covered with fine dust. It may also be mentioned that plates that had previously been passed over a bunsen flame or a blowpipe jet could be seen by the same test to be covered with dust.

The question may be asked: Where does this fine dust come from in the tube experiments? The simplest explanation seems to be that it is due to some change produced in the glass by the high temperature. The effect of the heat, therefore, does not seem to be entirely a cleansing one. Of course, it is quite possible that the dust may not be the only cause of the black deposit; the surface of the glass may have been changed in some way by the heat, causing it to form the black deposit. This supposition does not seem to be at all unlikely, as the surface has in all probability been changed by the heat, and if it has been changed it is not likely to be now in a state of equilibrium. Plates and tubes which had been heated were therefore put aside and protected from dust to see if they changed with time like the broken glass. All of them changed more or less towards the white deposit. Sheet-glass was back in two or three days to its usual white deposit. The tubes were slower in changing.

In conclusion, I wish to reply to the two last paragraphs in Lord Rayleigh's article, wherein he describes some experiments in which his experience differs from mine. In the first he says that with an alcohol flame and blowpipe he got the black deposit, while in my tests I only got slight indications. The reason for this difference is very simple. In the previous part of my paper describing this experiment there are noted the effects of the bunsen flame, then those of the alcohol flame; the effects of the two flames are next compared, and, as stated, the alcohol gave very slight results. Lord Rayleigh in his tests used a blowpipe with his alcohol flame, and naturally got a much greater effect.

In the last paragraph Lord Rayleigh says our

experiences differ as to the visibility of objects seen through a dewed plate. There are two reasons for this. One is that the test objects were quite different. His was a gas flame, while mine was a landscape, an object much more easily rendered invisible than a flame. The second reason for our difference is that he dewed his plate by breathing on it, and I can quite imagine it would be difficult to get sufficient obscurity by that process. I, on the other hand, dewed mine by cooling the back of the plate with a piece of ice, by means of which any amount of deposit may be obtained. I have lately tried a test object similar to Lord Rayleigh's, using an incandescent gas light. By continuing the cooling and condensation long enough, it was found possible gradually to diminish the visibility of the mantle until it all vanished and only an irregular bright, undefined centre of light remained. JOHN AITKEN.

Ardenlea, Falkirk, January.

An Electrical Phenomenon.

THE form of high-resistance Bell telephone receiver which of recent years has been evolved for use in some systems of wireless telegraphy, gives us an extraordinarily sensitive means of detecting variable electric currents of a very minute description.

Using one of these instruments, made by Mr. H. W. Sullivan, which is wound with so many turns of very fine wire that it has a resistance of 5000 ohms, I have found at my residence, 40 Chester Square, a somewhat surprising state of things.

Holding one terminal of the telephone in one's hand so as to connect the electrostatic capacity of one's body, and applying the other terminal, which one must be careful not to touch, to any metallic object of considerable size in the house, one immediately hears in the telephone a singing noise. The larger the metallic object and the higher up it is in the house, the louder the sound. The sound is also made louder if one's own electrostatic capacity is increased by contact with another person or with a metallic sheeting. The metal of all the fireplaces gives the sound most distinctly, as does also an iron bedstead on the third floor, which stands on glass castors free from contact with the wall. The sound can be obtained even from the brass stair-carpet rods only about 3 ft. long, particularly towards the top of the house, and it can also be got from the gilt of picture frames. All the curtain-poles give it loudly.

The position of the object from which the sound is obtained does not appear to matter, excepting that, as mentioned, the higher up in the house the louder is the sound.

There seems to be no question that the cause is some form of electrical induction, or wave, from the electricity supply, which is direct current, from the Westminster Company. That this is so is evidenced by the fact that an exactly similar note can be obtained from the supply mains. The sound appears to be due to a ripple superimposed on the continuous current by the commutators of the dynamos, and at times the beat of the fast-running engines, such as do, in fact, supply the current at certain hours, can distinctly be heard. Furthermore, the phenomenon described above ceases the moment the supply is cut off at the house by opening the double-pole main switch.

It should be mentioned that on the top of the house there is an aërial, consisting of a piece of wire-netting 20 ft. by 4 ft. in area, supported on four insulators about 10 ft. above the roof, with a wire coming down from this outside the house and entering a room on the ground floor, the whole being destined for use as a wireless receiving station. It is possible that this aërial may have some influence, but the fact that putting it to earth or leaving it insulated does not seem to have the slightest effect upon the results obtained seems rather to point to an opposite conclusion.

It should, however, be mentioned that with the telephone receiver connected between the wire leading to the aërial and the water-pipe, the singing noise is still very distinctly audible, even after the main double-pole switch is opened, which points to there being a field of force operating on the aërial either from the street mains or from the electric wiring in the neighbouring houses.

Similar experiments at this office, which is also supplied by the Westminster Company, give a very high-pitched but rather faint whistling sound when the telephone is applied either to the water- or the gas-pipe, while the metal of the fireplaces also gives a similar sound, but so very faintly that it is barely discernible. This sound, too, is no doubt due to the high-speed commutators of the turbo-generators which supply this portion of the Westminster system.

A. A. CAMPBELL SWINTON.

66 Victoria Street, Westminster, S.W.,
February 4.

Luminous Halos surrounding Shadows of Heads.

I REMEMBER when I was a boy, more than eighty years ago, that I used to notice this luminous halo surrounding the shadow of my head on the water when I was fishing from a bridge in the meadows below Salisbury. I think it was in some way connected with the ripple on the water, which was so clear that I could see the fish. I mention this because similar conditions could be easily met with.

O. FISHER.

Graveley, Huntingdon, January 30.

THIS phenomenon may sometimes be seen in this country when one's shadow falls on grass. It is not necessary that the grass should be wet, if the leaves have a shining cuticle; but the general direction of the blades (which grow usually more or less parallel to one another) in relation to the position of the sun at the time must be such that its rays strike their surface at an angle approaching a right angle. Under these conditions the blades of grass from which most light reaches the observer's eye are those upon which the sun's rays fall, and are reflected to him, most nearly perpendicularly, and the rays which do so are those which pass closest to his head without being intercepted by it. Hence there appears to him a ring of brighter illumination immediately surrounding the shadow of his head, the effect being heightened by contrast. Farther from the shadow, as the angle of incidence becomes more oblique, the luminous ring becomes gradually merged into the general illumination. The reason why the bright ring is not seen round the lower parts of the body or around the heads of other persons is that these are not so nearly in the direct line of incidence.

The phenomenon "A Shadow and Halo" is described in NATURE in 1888 by several correspondents (vol. xxxviii., pp. 540, 589, 619), and its production by reflection from dewy grass is explained on the lines I have mentioned.

An analogous phenomenon is the striped appearance of a lawn or grass field which has been rolled by a roller passing alternately in contrary directions. Where the roller has travelled in a direction from the position of the observer the blades of grass are bent

away from him, and he sees light from the sky reflected from the smooth cuticle on their upper surface. Where the roller has travelled in a direction towards the observer the blades of grass are bent over towards him, so that he sees more of their under surface, which, besides being partially shaded, has not so highly reflecting a cuticle as the upper surface, hence these strips appear, in comparison with the first, darker and of a deeper green.

H. FRANKLIN PARSONS.

Croydon, February 1.

WITH reference to the letters by Messrs. Evershed and Fermor in NATURE of January 30, it may be of interest that an amusing description of the appearance of halos around shadows is given by Benvenuto Cellini in his autobiography (book i., chap. cxxviii.). After being released from a well-deserved term of imprisonment, he noticed a halo round the shadow of his head, and interpreted it as a mark of the especial favour of heaven. A rough translation of the passage is as follows:—"Also I must not leave unmentioned a thing, the greatest that has happened to any man, which I tell to the glory of God and of His mysteries, who condescended to make me worthy of it. From that time . . . there remained a splendour (wondrous thing!) on my head, which is evident to all sorts of men to whom I have shown it (who have been very few). This is seen over my shadow in the morning from sunrise until two hours later, and is seen much better when the grass has dew upon it; it is visible again at sunset. I became aware of it in France at Paris, because the air there is so much more free from mist that one sees it more markedly than in Italy, where mists are more frequent."

Doubtless the "pochissimi" to whom he showed it knew him too well to confess that they saw the halo around the shadows of their own heads, not his.

I have often noticed the appearance, especially on short turf, such as that of golf links, when the grass is wet with dew, but it may sometimes be seen on dry grass.

L. DONCASTER.

Museum of Zoology, Cambridge, February 1.

Flowers in January.

SEVERAL interesting letters have recently appeared in these columns directing attention to the abnormal number of phanerogams in flower at the present time in Gloucestershire and other counties. In Somerset we have a similar increase in the number of plants flowering, as compared with the average January, and this month is not the only winter one in which such an increase has occurred. During the latter part of November I noticed more than eighty indigenous plants in flower, and many of these I considered to be survivals due to the retarding influence of the cold and wet summer followed by the cold and frosty nights of October. For the past two years the paucity of flowers in the early part of October has been particularly noticeable, but how different were the causes! In 1911 the flowering period had been accelerated by the large amount of sunshine, whilst in 1912 it was retarded or altogether eliminated owing to the lack of sunshine. In both years November was a happy month for flowers, in the first year the flowers being largely second blooms, in the last year retarded first blooms.

The acceleration of the life-cycle is also noticeable to a student of the lower forms of vegetation, some mosses, liverworts, and lichens showing a similar advance in the time of spore-production. For instance, amongst the mosses *Encalypta vulgaris* has well-developed capsules, and amongst the liverworts *Lophocolea cuspidata* is already shedding its spores, these phases of the life-cycle being one to three months earlier than the normal time. No doubt, in the case of these and many other accelerated cryptogams, the wet weather is as potent a factor in the acceleration of the life-cycle as the mildness of the season.

W. WATSON.

Taunton School, Taunton, Somerset.

The Current Winter.

A FEW years ago (in 1908) I expressed in your columns two views about the Greenwich winter, which both appear to gain further support from what is now happening. One is that after a very wet Rothesay summer, the Greenwich winter tends to be mild (NATURE, March 12, 1908, p. 438), the other that after an autumn at Greenwich with all three months dry, the Greenwich winter tends to be mild (NATURE, December 24, 1908, p. 221). We have both those antecedents in 1912—that is, the Rothesay summer was very wet, and the three months September–November at Greenwich were all dry—and the current winter may now be safely characterised as mild.

ALEX. B. MACDOWALL.

Torquay, January 25.

MATERIAL FOR THE HISTORY OF MAN AND BEAST.[1]

IT is easy to understand why Weimar was chosen as the meeting-place of the German Anthropological Society in 1912. The surrounding country is rich in remains of man of the Pleistocene and prehistoric periods; the municipal museum contains the fauna and flora of celebrated palæolithic stations such as Taubach, Suessenborn and Ehringsdorf; in this museum, also, can be seen one of the best collections in Europe for illustrating the evolution of prehistoric culture.

The three memoirs reviewed here were prepared to give the members of the Anthropological Society a just conception of the prehistoric treasures preserved at Weimar, but it must not be supposed that they will serve only a passing purpose. Far from it; each memoir is a valuable contribution to the department of knowledge to which it belongs. Dr. Ludwig Pfeiffer, well known to the medical men of Europe as a physician, writes on the evolution of human handiwork from the Pliocene to the present, employing the collections in the Weimar Museum to illustrate his memoir. Dr. Soergel deals with the greater mammals which became extinct during the Pleistocene period. Dr. Moeller, curator of the Weimar Museum, gives an account of the systematic exploration of one of the most remarkable tumuli ever opened. The subject-matter of all three memoirs is thus illustrated by the contents of the Museum of Weimar; Dr. Soergel's paper covers the Pleistocene epoch; Dr. Möller's deals with

[1] Festschrift zur xliii. allgemeinen Versammlung der Deutschen Anthropologischen Gesellschaft, Weimar, 4 bis 8 August, 1912. Erstes Heft. Die steinzeitliche Technik und ihre Beziehungen zur Gegenwart. By Dr. Ludwig Pfeiffer. Pp. vii+340. Price 13 marks.

Zweites Heft. Das Aussterben diluvialer Säugetiere und die Jagd des diluvialen Menschen. By Dr. W. Soergel. Pp. iii+81+3 plates. Price 5 marks.

Drittes Heft. Der Dersflinger Hügel bei Kalbsrieth (Grossherzogtum Sachsen). By Armin Möller. Pp. ii+76+4 plates. Price 5.40 marks. (Jena: Gustav Fischer, 1912.)

mankind in central Germany in post-Pleistocene times; Dr. Pfeiffer's inquiry covers both periods.

The tumulus explored by Dr. Möller (he had great difficulty in obtaining permission to undertake the work) lies about twenty miles north of Weimar, on a slight elevation among the flat fields which border the Unstrut—a tributary of the Saale. Interments were discovered which date from the early part of the Neolithic period down to mediæval times—roughly speaking, from 3–4000 B.C. to 1000 A.D. A section of the tumulus —oval in shape and measuring 30 metres in its longest diameter—revealed within it a small tumulus, covering a single interment, of the early Neolithic period. On the southern margin of the smaller and older tumulus were three intrusive burials—in the contracted posture—also Neolithic in date. At the southern base of the tumulus, at a still later Neolithic date, there had been placed a cyst, or slab tomb, flanked with altar floors. The larger tumulus, which covers the older and smaller one, had been thrown up over a fourth interment, a cyst burial, covered with a cairn of stones, which is ascribed to the close of the Neolithic period.

These four burials of the Neolithic period were accompanied by such evidence that their sequence and date could be determined with a fair degree of accuracy. The Bronze period is represented by only one interment, the body having been entombed within a dug-out canoe. The pre-Christian period was represented by three urn-burials; the tomb of a warrior of the fifth or sixth century marked the Merovingian age; lastly, numerous graves of people buried in early Christian times (ninth and tenth centuries) occurred all over the large tumulus. Dr. Möller's attention was more particularly directed to the pottery and other accompanying evidences of civilisation, which gave him a clue to the dates of the various interments. The skeletal remains of the men, women, and children buried in the tumulus, often reduced to little more than dust, are only incidentally touched upon. It will be thus seen that, in expert hands, tumuli become the most valuable of prehistoric documents

In Dr. Soergel's memoir a most useful contribution is made to the systematisation of our knowledge of the larger mammals which became extinct towards the end of the Pleistocene period. Every palæontologist has observed that the extinction of these great animals is coincident with the progress and distribution of human races in the Pleistocene period. Indeed, Dr. Steinmann (*Die geologischen Grundlagen der Abstammungslehre*, 1908) came to the conclusion that their extinction took place at the hands of man. Dr. Soergel does not agree with that view; he holds that the frequent changes of climate in the Pleistocene epoch led to a manifestation of a high degree of variability amongst certain of the mammalian genera, and that the forms which became most highly specialised—such as the Irish elk—in contradistinction to the less specialised form—*Cervus dama*—became extinct because of their highly specialised characters. An unprejudiced survey of the evidence inclines the reviewer to regard Dr. Steinmann's conclusion as the nearer approximation to the truth.

Dr. Pfeiffer's memoir—by far the more important of the three—is an honest attempt to lay archæology, so far as it is concerned in investigating the evolution and history of human handicraft, on a firm foundation. His work is beautifully illustrated, and he has spared no pains to obtain evidence by experiment and by direct observation. The scope of his memoir will be best indicated by giving the titles of its seven chapters: i., the technique employed in fashioning stone implements during the periods of stone; ii., the physical conditions determining the various forms of technique employed; iii., various forms of fashioned stones; iv., the bone implements of the Stone periods; v., wood implements of the Stone periods; vi., the utilisation of the products of the chase; vii., the extinction of the industries of the Stone periods. Dr. Pfeiffer does not touch on the evidence of a high surgical technique amongst the people of the Neolithic period. The ancient skulls with clear signs on them of extensive operations and limb-bones with well-healed fractures show that there were daring and successful surgeons amongst the Europeans of the Neolithic period.

THE PASTEURISATION OF MILK.

IN a former article on "Tuberculosis and the Milk Supply" (NATURE, November 7, 1912, p. 281), reference was made to pasteurisation as one of the means suggested for the provision of a pure milk supply.

Pasteurisation, as applied to milk, is a process of somewhat indeterminate nature. It denotes the heating of milk to a temperature which may range between 140° F. and 165° F. in "bulk" pasteurisers, in which the milk remains, and is maintained at the temperature employed during the whole period of treatment—some 20–30 minutes—or up to 180° F. in "flash" pasteurisers, in which the milk flows continuously through the apparatus and the period of heating is a brief one. In both cases the milk is immediately run on to coolers. Either method fulfils more or less completely the objects for which pasteurisation is carried out, which are (1) to destroy pathogenic micro-organisms, such as tubercle, typhoid, and diphtheria, that may have gained access to the milk; (2) to reduce the bacterial content of the milk, and, as a consequence, (3) to enhance the keeping qualities of the milk, and to allow its distribution in a merchantable condition. The treatment undoubtedly effects these objects more or less efficiently, but it remains to consider in what manner the after-condition of the milk may be influenced thereby.

By heating milk above a temperature of 165° F. a more or less rapid destruction of the lactic-acid-producing organisms occurs, while the more resistant putrefactive forms largely survive the treatment, and it is owing to this change in the bacterial flora that danger arises should the milk subsequently be kept at temperatures favourable

to bacterial growth and development. It is true that Ayres and Johnson have stated, as a result of their experiments on milk pasteurised at 145° F. for 30 minutes or at 160° F. "flash," that the resultant milk sours similarly to raw milk, and that the relative numbers of the various organisms remain unchanged.

Apart from the fact that these temperatures are probably untrustworthy for killing the tubercle bacillus, it is necessary to point out that, though the relative proportions of the organisms may be unaltered by this treatment, it by no means follows that the actual species remain the same, for the predominant lactic-acid organism (*Streptococcus lacticus* or *Güntheri*) certainly succumbs at these temperatures. In any event, the subsequent bacterial content of pasteurised milk depends not only on the pasteurising temperature, but also on the temperature at which it is subsequently kept. Milk pasteurised at a temperature above 165° F. for any time, and afterwards kept at a temperature above 65° F., always undergoes what may be termed a "peptolytic" change, allied to putrefaction, and the latter may actually occur if pasteurisation has been conducted at 170°–175° F.

With pasteurisation at these higher temperatures, this "peptolytic" change may take place without at first apparent alteration in the milk. These changes, however, do not take place if the milk, after pasteurisation, be kept below 50° F., and this is the crux of the matter so far as the bacterial content is concerned. The real danger of pasteurised milk arises from the fact that the milk is stored by the consumer in warm pantries, or is purposely kept hot in vacuum flasks or food-warmers for infant or invalid feeding! A similar danger may ensue if, as is frequently done, the milk be boiled and allowed to cool spontaneously. It is notorious that summer diarrhœa in children coincides with the period when room-temperatures of 70° F. and upwards prevail, and when the necessity for boiling the milk is considered to be greatest, the proper cooling and protection of such boiled milk being completely overlooked and omitted! The work of Dr. Ralph Vincent in this connection is strongly confirmative of this view.

There can be no doubt that summer diarrhœa of children is not due to an excessive development of the true lactic-acid-producers, for the administration of soured milk or whey is often of service in the treatment of the condition, and soured milk containing vast numbers of these organisms is a valued article of diet in all parts of the world, including the tropics. When summer diarrhœa occurs after the use of raw uncooked milk, the explanation is that an initially dirty milk has been kept at such a temperature that the peptolytic bacteria have developed more vigorously than the lactic forms, and these organisms or their products induce the condition.

If raw and pasteurised milks be kept at blood-heat until curdling ensues, the character of the curd and the microscopical appearances therein will be found to be entirely different, despite the fact that, even in the raw-milk sample, considerable proteolysis (though from a different cause) may have taken place.

If, then, pasteurised milk is to be taken in preference to raw milk, unless consumed at once there seems to be only two ways of safeguarding its use, either (1) to cool immediately and subsequently to keep it always at a temperature below 50° F., which in summer in the household is difficult to ensure, or (2) to add a sufficiency of an active culture of lactic-acid-producing organisms to reproduce the original condition of the raw milk, which may not be altogether practicable. Similar considerations affect the use of boiled milk. Unless safeguarded, pasteurisation may also lead to less care in the production and distribution of the milk, since obvious change in it occurs more slowly than in untreated milk. There will also be a tendency for the smaller and the less scrupulous dealers to treat dirty or returned milk, and thus to make sure of its ultimate disposal.

There is no need here to enter into the vexed question of the alteration and diminution in nutritive qualities which ensue from heating milk. The lower the temperature of heating the less the alteration, and in this respect pasteurised milk has the advantage over boiled or sterilised milk.

R. T. HEWLETT.

NOTES.

WE announce with regret the death on January 31, at sixty-five years of age, of the Earl of Crawford, F.R.S., president of the Royal Astronomical Society in 1878–79, and distinguished in the world of science by his work for astronomy.

A REUTER telegram from Stockholm announces the death, at sixty-seven years of age, of Dr. G. de Laval, the well-known inventor of the steam turbine which bears his name.

DR. W. CARTER, who for many years was professor of materia medica and therapeutics in the University of Liverpool, and took a large share in the initiation of the Liverpool School of Tropical Medicine, died on February 2 in his seventy-seventh year.

AT the annual general meeting of the Royal Astronomical Society, to be held on Friday, February 14, the gold medal of the society will be awarded to M. H. A. Deslandres, for his investigations of solar phenomena and other spectroscopic work, and the Jackson-Gwilt medal and gift to the Rev. T. H. E. C. Espin, for his observations of the spectra of stars and his discovery of Nova Lacertæ.

THE annual meeting of the Iron and Steel Institute will be held at the Institution of Mechanical Engineers, Storey's Gate, Westminster, on Thursday and Friday, May 1 and 2. The Bessemer gold medal will be awarded to Mr. Adolphe Greiner, general director of the Société Cockerill, Seraing, vice-president of the institute. The autumn meeting will be held at Brussels, at a date to be announced later.

WITH the current number, the second volume of the Bulletin of the Seismological Society of America is completed. The notes, which we have given from time to time, are some indication of the useful work carried on by the society, which now includes 375 members. The recent number contains a portrait and short memoir of Comte de Montessus de Ballore, the director of the Chilean earthquake service.

THE Board of Agriculture and Fisheries announces that, in conjunction with the economic ornithological committee of the British Association, it is engaged on an inquiry into the food of birds, especially those believed to be injurious to farmers and fruit-growers. Investigations are at present confined to the rook, the starling, and the chaffinch. The Board would be glad to receive the names of correspondents who are willing to send to an address which will be supplied them, specimens of one or more of these birds at regular intervals during the year. Correspondents are wanted from all counties in England and Wales.

THE death is announced of Dr. J. F. J. Sykes (medical officer of health of St. Pancras, London) in his sixtieth year. From an obituary notice in *The Times* we learn that for some years Dr. Sykes was an assistant examiner in hygiene to the Science and Art Department, and did a great deal for the improvement of public health in London. The Royal Statistical Society awarded him the Howard medal in 1900; he was Milroy lecturer of the Royal College of Physicians in 1901, member of the council of the Royal Sanitary Institute, president of the Society of Medical Officers of Health, and a member of various foreign societies of hygiene.

A CIRCULAR has reached us referring to an exhibition of interesting scientific objects and apparatus to be held at the Assembly Rooms, Surbiton, on February 19–22. In the list of exhibits we notice stellar photographs, photomicrographs, wireless telegraphy and telephony, the microphone, liquid air, the spectroscope, Lissajous's figures, Chladni's plates, singing flames, the spinthariscope, flint implements, many microscopes, with objects in the fields of view, and other things of scientific interest. Fifty years ago or more—in the days of Prof. Pepper and his optical illusions—such exhibitions as that to be held at Surbiton were common, and it is to be regretted that they are not now held more frequently. We hope the success of this exhibition will be sufficient to encourage the promoters to continue the exhibition at other places.

BY the death of Prof. Robert Collett, of Christiania, Europe has lost one of its leading vertebrate zoologists of the older school. His work on the mammals and birds of Norway was always sound and accurate, and its value is little, if at all, impaired by the fact that he seems never to have quite reconciled himself to the rules of nomenclature as evolved by the modern systematist. He had just completed his *magnum opus*, his "Mammals of Norway," wherein are summarised the study and observations of a long life devoted to the zoology of the mammals of his country. Europe, and the whole zoological world, are to be congratulated that he was spared to complete the above work, which must remain for a very long time the chief authority on the mammals of Norway, and is besides indispensable to students of the order in other countries.

THE friends of the late Mr. H. O. Jones, F.R.S., who with his wife met his death in such tragic circumstances last summer in the Alps, are of opinion that some permanent memorial to him should be established in the University of Cambridge. There is at present no teaching post especially associated with physical chemistry in the University, and as the laboratory now affords opportunity for study and research in this modern branch of chemistry, the committee appointed for the purpose of the memorial recommends that the endowment of such a post in connection with physical chemistry would form an appropriate and a lasting memorial to Mr. Jones, and one calculated to further a cause in which he was peculiarly interested. Subscriptions towards this appropriate form of memorial to Mr. Jones may be paid to either of the hon. treasurers, Mr. W. L. Mollison, Clare College, Mr. R. Waley Cohen, 11 Sussex Square, London, W., or to the Humphrey Owen Jones Memorial Fund, c/o Messrs. Barclay and Co., Cambridge Branch. Subscriptions to the extent of more than 2750*l.* have already been received.

THE present winter is proving exceptionally mild over the whole of the British Isles, and the midland and eastern districts of England have as yet experienced the greatest excess of temperature, whilst they have had a rainfall about half as much again as the normal. The mean temperature at Greenwich for January is 41·3°, which is nearly 3° in excess of the average, whilst in January last year the mean was 40·4°. The higher temperature this year is almost wholly due to an excess in the maximum or day readings. January this year had nine frosts against eight in the corresponding month last year; open to the sky there were twenty-one frosts this year and nineteen last year. The rainfall in January this year at Greenwich is 2·67 in., which is 0·74 in. more than the average, but 0·36 in. less than in January last year. In the London districts there was an excess of sunshine in January this year, the duration at Greenwich being fifty-six hours, which is ten hours more than the average of the last ten years, and twenty-two hours more than the average of the last thirty years. In January, 1912, the duration of sunshine at Greenwich was only twenty-eight hours. At Kew the duration of sunshine this January is forty-one hours, against 20·5 hours last year, and in the City, at Bunhill Row, the duration of sunshine this January is 13·5 hours, and was only eight hours in January last year. The rainfall for January is in excess of the average in all parts of the British Isles except in the north of Scotland; the greatest excess is in Ireland and in the southern and midland districts of England. The duration of bright sunshine for the past month is below the average in all districts of the United Kingdom except in the south-east of England, but the deficiency is only 0·2 hour per day

in the north of Scotland and in the north-west of England. In the east of Scotland and in the midland counties the deficiency is 0·6 hour per day.

PROF. H. E. JORDAN, in a paper entitled "Studies in Human Heredity" (University of Virginia Publications, Scientific series, i., 12, 1912) gives a number of pedigrees showing hereditary transmission of human abnormalities and diseases. The pedigrees are mostly small, and are suggestive rather than final. The greater number deal with left-handedness, a condition which usually appears to be recessive, although some pedigrees suggest that it may behave as a dominant. Of the several other abnormal conditions dealt with, including cancer, hermaphroditism, nephritis, and others, perhaps the most important is the tendency to tuberculosis, which the author discusses more fully in the Journal of the American Medical Association, lix., 1912, p. 1518. He gives pedigrees showing hereditary transmission through several generations, and refers to previous evidence of the importance of heredity in this disease. He appeals especially to the medical profession for the careful collection of further data, and points out the danger from the marriage of consumptives if, as he believes, inheritance plays a predominant part in predisposing to the disease.

THE paper on Morocco recently read before the Royal Geographical Society by Mr. A. G. Ogilvie afforded interesting examples of the application of theories of geographical control, in this way—that as Morocco is a country about which there exists relatively slight knowledge of geographical detail, it is necessary to add deduction to description in order to arrive at a fair general account. For example, rainfall observations are of the scantiest, but the author put forward a map of the probable distribution of rainfall based partly on the distribution of types of vegetation, as well as on a consideration of the relief of the land and the prevalent winds. From this he was able to pass on to a discussion of those areas which are most suitable for agriculture—not merely those which are cultivated, but also those which might be. He added Morocco to the list of potential granaries of the world, and mentioned the possibility of applying the principles of dry-farming in the interior steppes of the Meseta. Reference was also made to the alluvial fans at the foothills of the Atlas, highly fertile, and even now freely irrigated by the Berber inhabitants, through covered channels which guard against evaporation. These are only a few examples of a number of points of interest in the paper.

IN the January number of *The Zoologist* Mr. E. A. Smith states that Lord Denbigh has presented to the British Museum (Natural History) the collection of natural history objects made by Thomas Pennant, the author of "British Zoology," which has remained in a more or less undisturbed condition since the death of the original owner at Douning Hall, Holywell, Flintshire, on December 16, 1798. The collection chiefly consists of stuffed birds, shells, fossils, and minerals, but also includes a few mammals, fishes, and crustaceans. Among the recent shells fifteen types and sixty-one specimens figured in the "British Zoology" have been identified.

ACCORDING to the report for 1911–12, the Natural History Society of Northumberland, Durham, and Newcastle has taken steps to increase the educational use of its museum by an arrangement with the Newcastle Education Committee. As a result of this certain classes of scholars have been admitted to receive a course of lectures, chiefly on the British vertebrate fauna. During the year the society acquired the carcase of a rorqual (*Balaenoptera borealis*) measuring 45 ft. in length, of which the skeleton is being prepared for exhibition. The weight of the flesh removed is stated to have been 15 tons, and that of the skull half a ton; it would be interesting to know whether this is an exact statement or merely a rough estimate.

THE investigations of the black cotton soils of India have been carried a stage further by Messrs. Harrison and Sivan in the Memoirs of the Agricultural Research Institute, Pusa (No. 5). Previous investigators had shown that in certain areas titaniferous magnetite occurred to the extent of several per cent., and they therefore attributed the black colour to this substance. The present authors show that in other parts of India similar soils occur, but do not contain titaniferous magnetite, and they adduce reasons for supposing that in these cases the colour is associated with the compound particles of relatively small dimensions. They consider that the black material is a colloidal silicate of iron and aluminium, containing also organic matter.

MR. R. C. MCLEAN has recently described (*New Phytologist*, 1912, No. 8) two fossil prothalli from the Lower Coal Measures, one belonging to the Pteridospermic seed, *Lagenostoma Lomaxii*, the other to some member of the Lepidodendron family. There are very few examples of fossil prothalli preserved from the Palæozoic formations, and among the few a good state of preservation is decidedly rare. In the Lagenostoma prothallus, displaying in excellent preservation a structure hitherto unrecorded for this well-known plant, the arrangement of the tissue resembles that found in the prothalli of recent Gymnosperms, and this strengthens the view that the latter have arisen from an ancestral type characterised by the possession of a pollen chamber. The second prothallus, showing exquisite preservation, had developed outside the spore after the latter had been shed, and it remained attached to the spore-wall at its base, resembling in general form the prothalli of modern heterosporous ferns like Salvinia. Assuming that this specimen is referable to the Lepidodendroid genus Bothrodendron, the prothallus of this genus was more primitive than that of Lepidodendron, where the archegonia developed inside the spore.

TO the first volume of the *Fortschritte der Mineralogie, Kristallographie und Petrographie*, issued under the auspices of the recently founded German Mineralogical Society, Prof. Berwerth contributes a valuable

memoir on the progress made in the study of meteorites since 1900, in which he gives, besides lists of the literature published and of the falls or discoveries of meteorites made during the decade, and full particulars of chemical analyses, interesting articles on such important questions as the origin of meteorites, their form and surfaces, &c.

AMONG various items of useful information included in the United States Meteorological Charts for February, we may specially mention an account of three recent Pacific volcanic eruptions, by Prof. McAdie, with concomitant atmospheric phenomena and illustrations, viz.: (1) at Taal, Luzon, January 30, 1911; (2) at Asama-yama, Japan, May 8, 1911; and (3) at Mount Katmai, Alaska, June 6, 1912. Although these occurrences have already been reported in the publications of the respective countries, it may be of interest to general readers to be able to refer to them in one periodical. The chart in question can presumably be easily obtained from the Washington Weather Bureau, or from American Consular offices at important seaports abroad. The volcano at Katmai was supposed to be extinct, but eruptions have taken place in several months subsequent to June.

COMPARED with the neighbouring islands of Japan, the peninsula of Korea is singularly free from earthquakes. The records contained in the old chronicles of the country extend back, however, for nearly two thousand years, the first known earthquake having occurred in the year 57 B.C. These and other records have recently been examined by Dr. Y. Wada, the director of the Meteorological Observatory of Chemulpo (Scien. Mems. of the Met. Obs. of the Government-General of Korea, vol. ii.). The total number of earthquakes in the period mentioned amounts to 1671, of which fifty-nine were notable shocks, many of them having attained a strength sufficient to damage buildings, and several to result in loss of life. Dr. Wada gives an interesting map of what he calls the seismic density of the different parts of the country. North of the parallel of 37° N., the seismic density decreases almost uniformly from west to east, while south of that parallel, that is, in the part of the country facing Japan, there is a rapid decrease in density from east to west.

A REMARKABLE difference exists between the climates of western and central Japan, so much so that these districts are distinguished by the two names Sanindō (shady side) and Sanyōdō (sunny side) respectively. During the long and rigorous winter of western Japan, the central provinces, bordering the Inland Sea, enjoy dry and comparatively mild weather. The two regions are separated by mountain ranges, and the factors determining their climatic conditions are distinct. In the Journal of the Meteorological Society of Japan (xxxi., No. 9, 1912), Mr. G. Ishida gives the results of some elaborate investigations carried out by others and himself in this connection. He finds that while the winter climate of central and southern Japan depends on the south-western monsoons, that of the western coast is directly related to the barometric area of North China. Records of the mean daily temperature at Tientsin, representing the continental area, for a period of six years from 1904–5 to 1910–11, comprising the eight months from September to April in each case, were collated with corresponding records taken at Hamada and Sakai, representing western Japan. The diurnal variations at Tientsin for each month in the whole period of six years, ranging from 169 days for February to 186 days for December, were obtained and compared with those recorded at the Japanese stations respectively on the same day, and one, two, and three days later. The results indicate a striking similarity between the winter temperatures of North China and western Japan, especially as regards the records taken at an interval of two days between the two areas.

THE *Eugenics Review* for January contains a report of the research committee of the Eugenics Education Society regarding the standardisation of the notation used in drawing up pedigrees. Among various features of the committee's recommendations we note use of squares and circles to denote male and female offspring, arrangement of children in order of age, darkening of the whole or part of the circle or square to denote presence or absence of any special characteristic which it is desired to record, and the use of certain letters to denote age of death, death by suicide, or other particulars.

PROF. F. Y. EDGEWORTH'S presidential address to the Royal Statistical Society, published in the Journal of the society for January, deals with the use of probabilities in statistics relating to society. In this address Prof. Edgeworth draws an analogy between the phenomena exhibited by a medium of gas molecules and a collection of individuals, and argues that as the doctrine of probabilities enables definite laws to be established according to the kinetic theory of gases, similar laws may be built up regarding social phenomena. Although Prof. Edgeworth does not actually use this term, it may be possibly suggested that the analogy is due to both groups being in the language of Boltzmann, "molekular ungeordnet."

THE method in use at the Reichsanstalt for the testing of magnetic materials with high-frequency currents is described by Drs. H. Fassbender and E. Hupka in vol. vi. of the *Jahrbuch der drahtlosen Telegraphie und Telephonie*. The wire tested is in the form of a ring, and is magnetised by the high-frequency currents from a Poulsen arc. The values of the magnetising field and the rate of change of the resulting magnetic induction are obtained by means of the electrostatic deflections of the kathode rays of a Braun tube, the two deflections being at right angles to each other. A complete hysteresis curve is obtained from the loop on the screen at the end of the tube. Of the various suggestions as to the quantity which should be adopted as the measure of the dynamical permeability, the authors find the best to be the quotient of the maximum induction by the maximum field.

WE have received a copy of the reprint of Dr. M. Jakob's paper on the specific heat and specific volume of steam for pressures up to twenty atmospheres and

temperatures up to 550° C., which appeared in the *Zeitschrift* of the Association of German Engineers last year. The work is based on the experimental determinations of the specific heat of steam made by Knoblauch and Jakob and by Knoblauch and Mollier. From these values the author, by a graphical method which solves the thermodynamic equation connecting the rate of increase with pressure of the specific heat at constant pressure with the rate of increase of the expansion with temperature, determines the specific volume over the range stated in the title of his paper. Up to eleven atmospheres and 190° C. the calculated values agree closely with the observations of Linde, so that it seems probable that they may be trusted over the much wider range covered by the author.

THE second lecture on chemistry in gasworks, arranged by the Institute of Chemistry, was delivered by Mr. W. J. A. Butterfield, on January 31, at University College. Mr. Butterfield showed that the sensitiveness of lead acetate paper as a test for the presence of sulphuretted hydrogen varies inversely with the area of the paper exposed to the gas. The sulphur impurity remaining in gas after the extraction of sulphuretted hydrogen, he considers to be objectionable on account of its destructive action on the metal-work of inverted burners and fittings directly exposed to the undiluted products of combustion of gas. In connection with the by-products of gas manufacture, he stated that the predominant uses of tar at present are for the production of pitch for the supply of the patent-fuel industry of South Wales, and for road construction and treatment. Physical tests of tar and pitch are misleading as to the value of these materials for the latter purpose, because the physical characteristics change with efflux of time, and the extent and bearing of the changes which thus occur in tar and pitch can be ascertained only by appropriate chemical examination of them. Mr. Butterfield directed attention to the acceptance practically everywhere, except in German-speaking countries, of the Harcourt 10-c.p. pentane lamp as the reference standard of light for all photometric work. The secondary electric standard lamps are calibrated by comparison with it Comparative tests have been made of the light afforded by about 150 different specimens of the Harcourt 10-c.p. lamp, and a disagreement by more than 0·2 per cent. has never been found, except in cases where there has been a fault in construction.

AT the sixth congress of the International Association for Testing Materials, held in New York last September, fifteen papers were submitted dealing with impact and endurance tests. These are summarised by Dr. W. Rosenhain in *The Engineer* for January 31. In drawing conclusions, Dr. Rosenhain states that the general feeling at the congress was not in favour of introducing impact tests into specifications as yet. While enough has been done to show that some form of impact test is desirable, there is a lack of consistent results from different machines and different forms of test pieces. It is evident that what is now required is carefully directed research by many independent workers with the view of clearing up the causes of discrepancies. Further progress in mechanical testing by dynamic methods should be sought by simplifying the test conditions as much as possible, and by arranging the experiments in such a way as to isolate and measure one single physical property or constant of the material, rather than by any attempt to imitate in the laboratory the complex conditions of practical use.

A COPY of the Almanac of the Egyptian Government for 1913 has been received. In addition to full particulars of the various Government departments, the Almanac contains valuable meteorological, magnetic, and other scientific data.

A COPY has been received of a new, revised, and enlarged edition of the pamphlet published in 1908 by Ilford, Ltd., giving notes on the Ilford X-ray plates. Scientific workers desiring to possess copies of the pamphlet, which is effectively illustrated, may obtain them, free of charge, on application to the company at Ilford.

OUR ASTRONOMICAL COLUMN.

COMET 1912*a* (GALE).—Gale's comet, discovered in September last, is now a circumpolar object, of about the tenth magnitude, in our latitudes. From the following ephemeris, abstracted from a daily ephemeris published by Dr. Ebell in No. 4627 of the *Astronomische Nachrichten*, it will be seen that the comet is now travelling southwards through Cassiopeia, and may be observed high up in the west during the evening.

Ephemeris 12h. M.T. Berlin.

1913	α h. m.	δ ° ′	1913	α h. m.	δ ° ′
Feb. 7	3 15·1	+78 45	Feb. 19	4 17·2	+71 56·2
11	3 42·1	+76 24	23	4 29·9	+69 51·7
15	4 1·8	+74 7	27	4 40·6	+67 54·3

Observed by Herr G. van Biesbroeck at Uccle between January 4 and 9, the magnitude of the whole comet was about 9·0, and the diameter, observed in a finder, was about 10′. In No. 4625 of the *Astronomische Nachrichten*, Herr Moschonkin directs attention to the similarity between the elements for Gale's comet and those for a comet which appeared in 1672.

THE EXPECTED RETURN OF FINLAY'S SHORT-PERIOD COMET.—With a period of 6·5 years, the comet discovered by Finlay at the Cape in 1886 is shortly due at perihelion. According to elements previously calculated by M. Schulof, perihelion passage should take place on March 24, but the comet passed very near to Jupiter in the summer of 1910, and, from a study of the perturbations, M. G. Fayet finds that perihelion has probably been advanced by about six weeks. His new elements, published in No. 4626 of the *Astronomische Nachrichten*, give February 6 as the date and he gives three search-ephemerides based on the assumptions that perihelion would be passed on February 6, January 29, and February 14 respectively. The first gives the present position as lying in Aquarius very near the western horizon at sunset. At no time during this apparition will the comet be an easy object, chiefly owing to its apparent proximity to the sun, but it may be rediscovered by means of one of the powerful instruments now available; during February the theoretical brightness is about that at the time of the comet's discovery.

THE MAGNITUDE VARIATIONS OF NOVA GEMINORUM No. 2.—A large number of observations, made at

several observatories, of the magnitudes of Nova Geminorum No. 2, are published in No. 4624 of the *Astronomische Nachrichten*. In addition to the tables giving the magnitudes recorded at the Berlin Observatory, Herr Freundlich publishes a light-curve showing the variations of the nova's magnitude from March 14 to May 18, 1912. This curve agrees fairly well with that previously published by Herr Fischer-Petersen, and shows maxima, successively decreasing in intensity, on March 14, 23, April 3, 19, and May 1.

POSSIBLE CHANGES OF A LUNAR FEATURE.—In the January number of *L'Astronomie*, M. Pierre Stoïan directs the attention of lunar observers to a small "hill" which, according to his observations, undergoes changes of form and size. This small feature lies to the north of the line joining Thebit and Birt, and about half-way between the former and the small crater at the northern end of the Straight Wall. M. Stoïan points out that Nasmyth recorded nothing in this position, Neison saw a double peak, and the Paris photographs show a crescent-shaped eminence which to Gaudibert was an oval; others have recorded it as larger than the smaller of the two small craters in the N.E. wall of Thebit, while to some observers it has appeared to be smaller. The feature appears to be worth further attention on the part of selenographers.

PHOTOGRAPHIC TRANSIT OBSERVATIONS.—By the munificence of Messrs. Krupp, Prof. Ambronn was able to secure a photographic transit apparatus for use at the Göttingen Observatory in the early part of 1911. The instrument has been tested and used by Herr R. Trümpler, who describes it and the results secured in No. 4620 of the *Astronomische Nachrichten*. The focal length of the Göttingen instrument is 180 cm., the aperture 18 cm., and photographic transits of stars down to the eighth magnitude may be secured. A slight relative displacement every second results in the photographic trace of each star being a wavy line, each minute being especially marked; the images of the transit-threads are also impressed upon the plate, so that any plate may be measured or re-measured at leisure, the time of starting the exposure having been recorded. The excellence of the images is shown by a plate accompanying the paper, and a comparison of Herr Trümpler's with other results promises well for the photographic recording of star transits.

THE MARINE BIOLOGICAL STATION AT PORT ERIN.

THE twenty-sixth annual report of the Liverpool Marine Biology Committee gives evidence of the rapidly increasing importance of the laboratory at Port Erin as a centre for research and for the instruction of students. The number of workers has more than doubled during the last six years; there were seventy-four workers during the year 1912. The extension

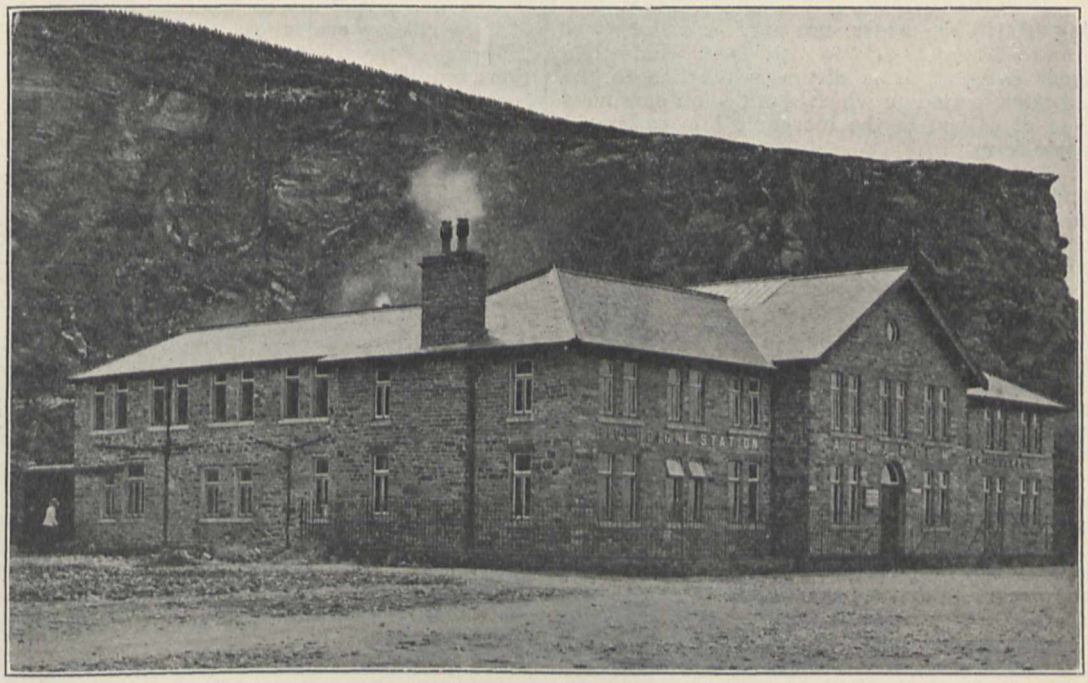

FIG. 1.—The Port Erin Biological Station from the north-east.

effected two years ago has been fully occupied, and the director (Prof. Herdman) reports that already further accommodation for research is urgently required.

Among noteworthy matters mentioned in the report are the weekly lessons and demonstrations given by the curator (Mr. H. C. Chadwick) to the boys from the local secondary school.

Prof. B. Moore and his colleagues are carrying out an extensive physiological and chemical investigation into the nutrition and metabolism of marine organisms. The results show that the amount of organic carbon present in the sea-water is almost negligible, being well below one milligramme per litre of water, and that Pütter's estimates are incorrect. They also show that, while the plankton-supply, as found generally distributed, may prove sufficient for the nutrition of such sedentary animals as sponges and ascidians, it is quite inadequate for active animals, such as crustaceans, molluscs, and fishes. These latter, however,

are able to seek out their food, and are not dependent only upon what they may filter from the sea-water. The investigation has also brought to light a notable change in the reactions of sea-water at different seasons of the year, no doubt in correlation with the development of vast quantities of plankton-organisms.

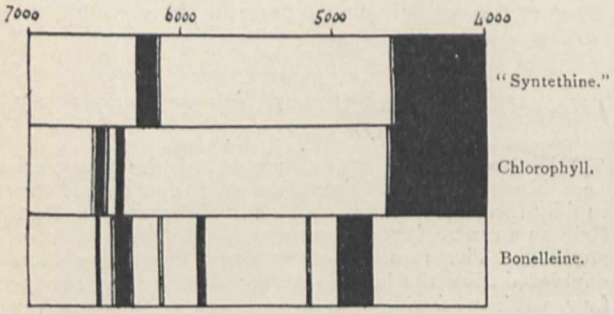

FIG. 2.—Absorption bands of pigments.

In spring (April) the water, not only near the shore but in the open sea, is acid to phenolphthalein, while in summer (August) it is distinctly alkaline to the same indicator, a change which signifies an enormous conversion of carbon in the inorganic into carbon in the organic form.

Prof. Moore, Dr. Adams, and others have studied the chemical changes taking place in the reproductive organs of the sea-urchin. They have found that, under normal conditions of nutrition, the amount of food consumed by a sea-urchin is many times that required for the ordinary metabolic uses of the animal. The excess is converted into storage products—glycogen, lecithides, and fats—which, throughout the non-breeding period, accumulate in the reproductive organs in quantities as great as are usually found in the liver or hepato-pancreas of other animals, and form a reserve for use during the breeding season.

Prof. Herdman has continued his observations on the occurrence of the dinoflagellate Amphidinium on the beach at Port Erin, and records certain variations in the form of this organism, and the alternate appearance in the same area, during the early part of the year, of Amphidinium and of diatoms (*cf.* NATURE, November 28, 1912, p. 371).

Prof. Herdman and his assistants have collected and examined, during 1912, about 400 samples of plankton from Port Erin and the neighbourhood. These show that diatoms, dinoflagellates, and copepods succeed each other in the summer plankton of the Irish Sea. The autumnal phyto-plankton increase was greater than usual in 1912, immense numbers of diatoms, chiefly Chætoceras, being present in the latter part of September. Plankton gatherings were also made along the chain of the Outer Hebrides, and proved to be oceanic in character.

During this Hebridean cruise, specimens of the ascidian *Syntethys hebridicus* were dredged. They were pale green when alive, but when placed in spirit became mauve or violet in colour. The colour is due to a new pigment, syntethine, the absorption-bands of which differ from those of chlorophyll and bonelleine (see Fig. 2).

NOTES ON THE CEREMONIES OF THE HOPI.[1]

MR. H. R. VOTH is known to all students of North American ethnology for his researches into the sociology and religion of various Pueblo groups, and now, owing to the resources of the Stanley McCormick benefaction, they are indebted to him for further studies on the Hopi of Arizona. The description of the Oraibi winter and summer Marau ceremonies is the result of several partial observations in different years; as the ceremonies are sometimes going on day and night, it is a physical impossibility for one man to make an exhaustive study of a nine-day (and night) ceremony at one time, but a protracted study of the same ceremony, on different occasions, has several compensations, and it is evident that Mr. Voth has done all that was possible to render his account accurate and as complete as circumstances would permit.

As an instance of Mr. Voth's method, it may be mentioned that he gives the names of those who take important parts in the ceremonies. Even these isolated villages are subject to the social and religious influence of the white man, so these careful investigations are of especial value. In addition, "Strife and contentions between the different factions have driven a large part of the inhabitants from the village [of Oraibi]. These have started new villages. This fact makes it highly probable that the Marau ceremony, as well as the others, will, in the future, never be the elaborate affairs that they used to be in the past."

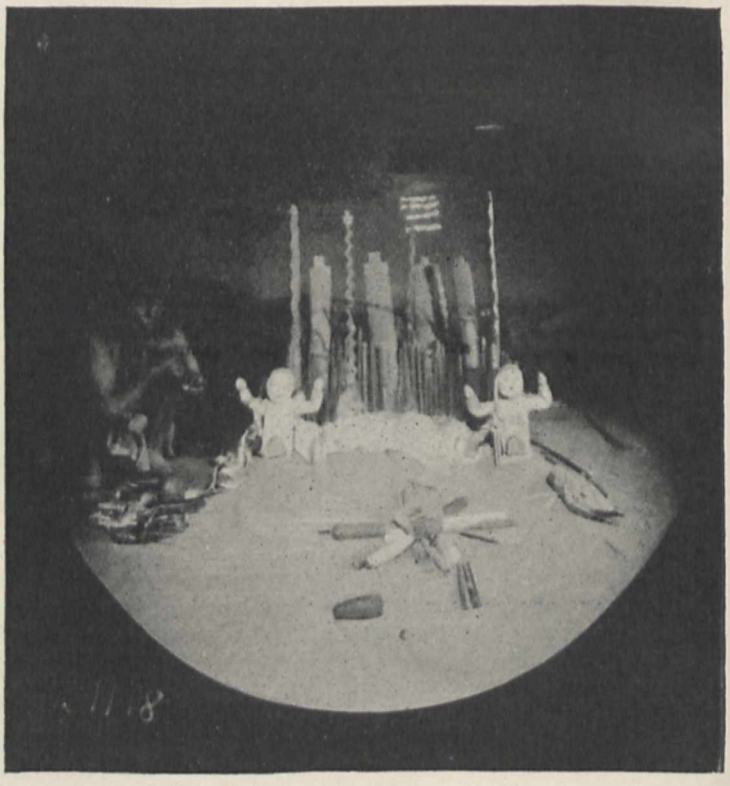

FIG. 1.—The chief priest smoking over prayer offerings. From "The Oraibi Marau Ceremony."

[1] Field Museum of Natural History. Anthropological series, vol. xi., No. 1, Publication No. 156. "The Oraibi Marau Ceremony." By H. R. Voth. Pp. 88+plates. Vol. xi., No. 2, Publication 157. "Brief Miscellaneous Hopi Papers." By H. R. Voth. Pp. v+99-149. (Chicago, 1912).

The chief interest of the Marau Society is that it "is a woman's fraternity, and in Oraibi has its own kiva, or underground ceremonial chamber; but, as is the case with all women's societies, a number of men also belong to the order, who perform certain functions and control certain sacred objects in all the ceremonies." The cult conforms to the usual type of the ceremonies of the Pueblo Indians. There are altars with a screen of slabs of wood representing cornstalks, lightning, and deceased members of the order, at the sides are figurines of the deities of the order, in front is the medicine bowl with six ears of corn, aspergills, &c., trays with meal, rattles, bone whistles, and other articles used in the rites.

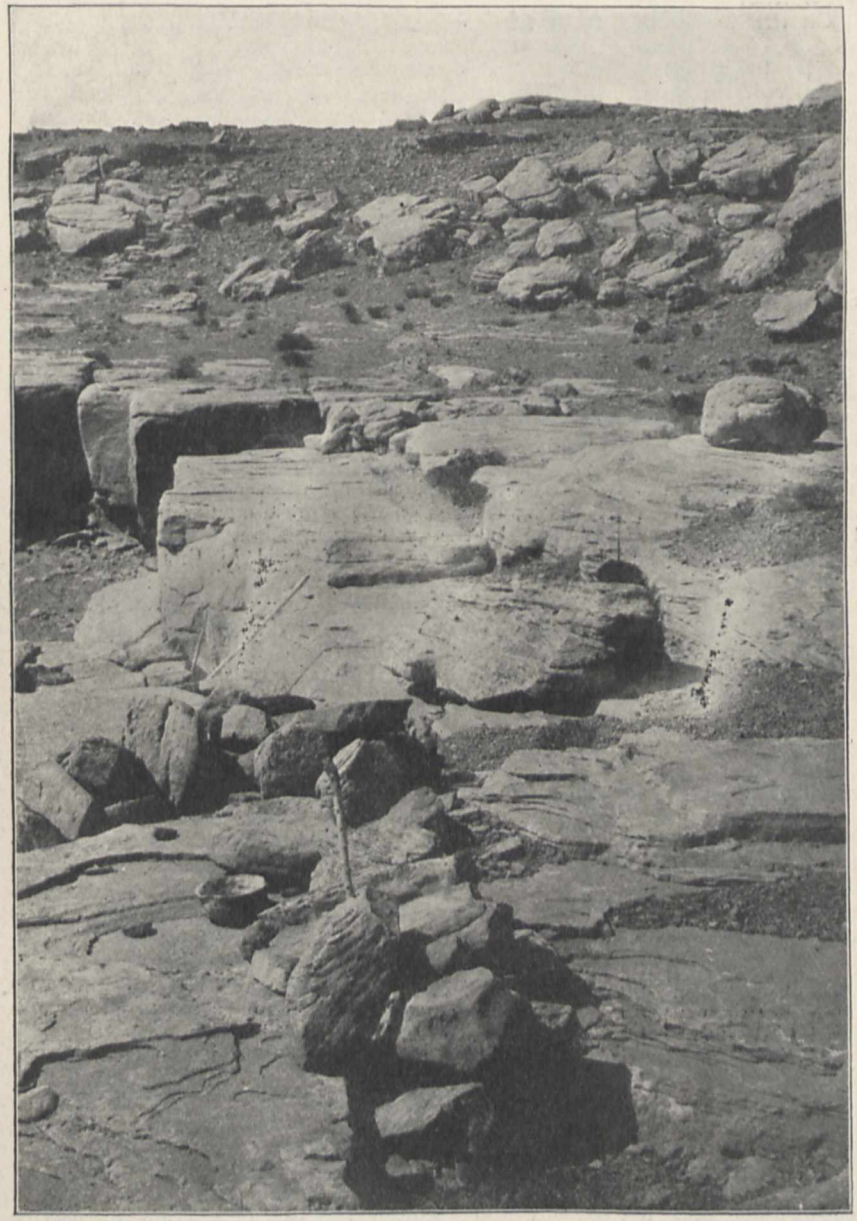

FIG. 2.—Children's burial places, top view. The piles of the smaller stones at the edge of the mesa, on some of which sticks and food bowls may be seen, indicate the crevice graves. From "Brief Miscellaneous Hopi Papers."

The ceremonies are too elaborate to describe; they consist largely of ceremonial smoking, asperging, sprinkling meal, offering feathered prayer-sticks, repeating prayers, and the like (Fig. 1). It is significant that this woman's ceremony is connected with agriculture, and that, as in other societies, the summer or autumn ceremonies are more elaborate than the winter performances. A free translation of one of the songs runs as follows:—"Now, then, here we array (decorate), these four different ones (somewhere in the four world quarters), our fathers, the chiefs (deities); therefore cooperate we here with our offerings. From somewhere, may, with their help, the four different ones (the deities of the four world quarters) have pity upon us quickly, and let it rain at the right time."

Mr. Voth has wisely given all the details he observed, but it would be very helpful if he would prepare a short synopsis of this and other ceremonies giving only such details as are sufficient to illustrate the symbolism of the ritual, and describing the real significance of the ceremony and the religious sentiments which it is designed to promote. Certain words in many songs, and often those of entire songs, are not understood by the Hopi; generally these are not archaic Hopi words or songs, but have been introduced from the Pueblo Indians on the Rio Grande—another example of cultural borrowing.

In the notes on modern burial customs of the Hopi Mr. Voth says that a child which has not yet been initiated into one of the religious societies is not buried in a cemetery but a crevice in the edge of the mesa (Fig. 2). A road is made then towards the child's home, because it is believed that the soul of that child returns to the house of its parents, and is reincarnated in the next child to be born in that family. Other notes deal with the Eagle cult of the Hopi, the Oraibi new year ceremony, the winter ceremony of the Drab Flute Society, and Hopi marriage rites. An important element in the last is the washing of the hair of the couple, "and especially the washing of the two heads in the same bowl is said to be the 'crucial moment' in which the two are supposed to 'become one.'" Most of the articles are richly illustrated by photographs.

A. C. HADDON.

DANA'S PROOF OF DARWIN'S THEORY OF CORAL REEFS.

JAMES DWIGHT DANA, born four years to a day after Darwin, on February 12, 1813, naturalist of the United States Exploring Expedition under Wilkes from 1838 to 1842, and afterwards until his death in 1895 professor of geology at Yale University, was for more than half a century a leading figure among American men of science. On the hundredth anniversary of his birth it is fitting to direct attention to the independent proof that he found many years ago for Darwin's theory of coral reefs, a proof that has long been overlooked, although it supplies the most important confirmation for the theory of subsidence that has ever been brought forward.

Darwin most ingeniously invented his theory of subsidence while he was in South America, before he had seen a true coral reef; he had afterwards only to test the theory by comparing its consequences with the facts that he observed during the voyage of the *Beagle* across the Pacific and Indian Oceans, and with the records of other explorers which he studied after his return home. The theory bore the test admirably; it was universally regarded as "true" for a generation, although apart from certain correlations of coral reefs with areas of recent uplift and with active and extinct volcanoes, which appear to be less assured now than seventy years ago, the theory of subsidence did not gain that increased probability of correctness which comes to a theory from the capacity to explain facts that were unknown or unnoticed when the theory was invented.

During the last thirty years several new theories of coral reefs have been introduced, and Darwin's theory has been more or less discredited in the minds of some investigators. Murray re-introduced what may be called the theory of outward growth, which Darwin had considered and adopted for certain special cases in association with subsidence; but in its new form subsidence was excluded from this theory, and two provisos were added as to the organic upbuilding of submarine banks until they reach the moderate depth at which they may serve as foundations for atolls, and as to the production of lagoons by the removal of the inner part of reefs by solution (Proc. Roy. Soc., Edin., ix., 1880, 505–518). Agassiz, in his world-wide explorations of coral reefs, emphasised the possible complications in their history; he pointed out the frequent occurrence of uplifted "coralliferous limestones," which might be worn down and dissolved away while fringing reefs grew around them, thus producing barrier reefs and atolls in association with elevation instead of subsidence. At the same time he reintroduced the idea—which Darwin had rejected on good grounds—that reefs could grow on the outer margin of platforms cut by the waves around volcanic islands, thus producing barrier reefs without subsidence, elevation, or solution (Bull. Mus. Comp. Zool., xxxiii., 1899; Mem. Mus. Comp. Zool., xxviii., 1903). Wharton went still farther in suggesting that a volcanic island might be worn down to a depth of twenty or twenty-five fathoms by marine agencies, thereby producing a flat submarine bank on which an atoll could afterwards grow up; thus accounting for atolls as Agassiz had for barrier reefs, without subsidence, elevation, or solution.

The possibility of producing barrier reefs and atolls by the wearing down of uplifted "coralliferous limestones," as suggested by Agassiz, may be regarded as a modification of any theory that will explain barrier reefs and atolls before the uplifts occurred. Darwin recognised at least one instance of wearing down an uplifted reef ("Coral Reefs," 1842, p. 55), and would certainly have welcomed the larger application of this process, had he known the results of modern exploration.

The formation of atolls by up-growth from submarine banks of proper depth is eminently possible, if the banks can be provided in sufficient number, but possibility is not proof. When subsidence is demonstrated as having taken part in the production of barrier reefs, as will be shown below, its exclusion from this theory of atolls is unreasonable.

The development of a foundation of atolls by the marine truncation of a volcanic island, as indicated by Wharton, is eminently possible, provided that floating coral larvæ do not establish themselves upon it until truncation is complete; but the ordinary relation of fringing and barrier reefs to their central islands shows that this proviso is inadmissible. The formation of a fringing reef will be begun as soon as a narrow platform is abraded, and such a reef once established, further truncation of the island by wave work is practically stopped. Moreover, the Alexa and other submarine banks described by Wharton can be explained by regarding them as submerged atolls quite as well as by regarding them as truncated volcanic islands; hence this theory is not satisfactory.

The formation of veneering barrier reefs on the outer margin of sea-cut platforms around still-standing islands, an old idea (see footnote in Darwin's "Coral Reefs," 1842, p. 49) recently given prominence by Agassiz, is open to the same difficulty that is fatal to Wharton's theory of truncation. However, if a barrier reef were ever formed in this manner, the central island should rise from the cut-back shore line in a wall of steep cliffs, as Darwin clearly stated, and the broader the platform, the simpler the outline of the cliff-walled island should become. It may be confidently asserted that the central islands of barrier reefs do not possess these significant features; hence there is no more reason for accepting this theory to-day than when Darwin rejected it.

The theory of outward growth and solution, advocated by Murray for the production of barrier reefs around volcanic islands, without subsidence, or even in areas of slow elevation, involves several consequences which, when compared with the facts, contradict its verity; for during the slow outward growth of the reef around a still-standing island, the streams from the mountainous interior must form deltas in the shallow water at their mouths, and by the time the reef has grown far enough outwards to be called a barrier, the delta plains must become more or less confluent laterally, thus forming a low alluvial plain around the original island, as Darwin clearly saw ("Coral Reefs," 1842, pp. 128–130). When such lowlands occur, they indicate a still-stand of the island; but their prevailing absence suffices to exclude the general application of the postulated still-stand.

It would thus appear that the theories of outward growth and solution for the production of barrier reefs, of marine truncation for the production of atolls, and of coral veneers on the margin of sea-cut platforms for the origin of barrier reefs, all fail to satisfy the requirements of observation, when they are tested by certain consequences that have not been explicitly stated by their inventors. It remains to be seen whether Darwin's theory of subsidence suffers the same fate when tested in the same manner.

The accompanying diagram (Fig. 1) exhibits three stages in the subsidence of a dissected volcanic island; the first stage shows a fringing reef, the second a barrier reef, the third an atoll, as indicated by Darwin's original figures, which are here reproduced in

substance on the front face of each block. But the surface of the second block shows a feature which Darwin did not notice, although it is quite as essential a consequence of his theory as any other. This is the invasion of the previously eroded valleys of the subsiding island by the sea, so that the relatively simple shore line of the first stage is in the second stage transformed into an embayed shore line, possessing several of "those deep arms of the sea . . . which," as Darwin said, "penetrate nearly to the heart of some encircled islands" ("Coral Reefs," 1842, p. 49). So long as subsidence continues the bays cannot be filled with deltas and the ridges cannot be cut back in cliffs. Darwin recognised that the central island must diminish in size as it subsides, but he did not also perceive the necessary modification of its outline.

It requires but a brief examination of large-scale charts of the Pacific island-groups to discover that the central islands of barrier reefs are repeatedly characterised by an embayed shore line, that the bays

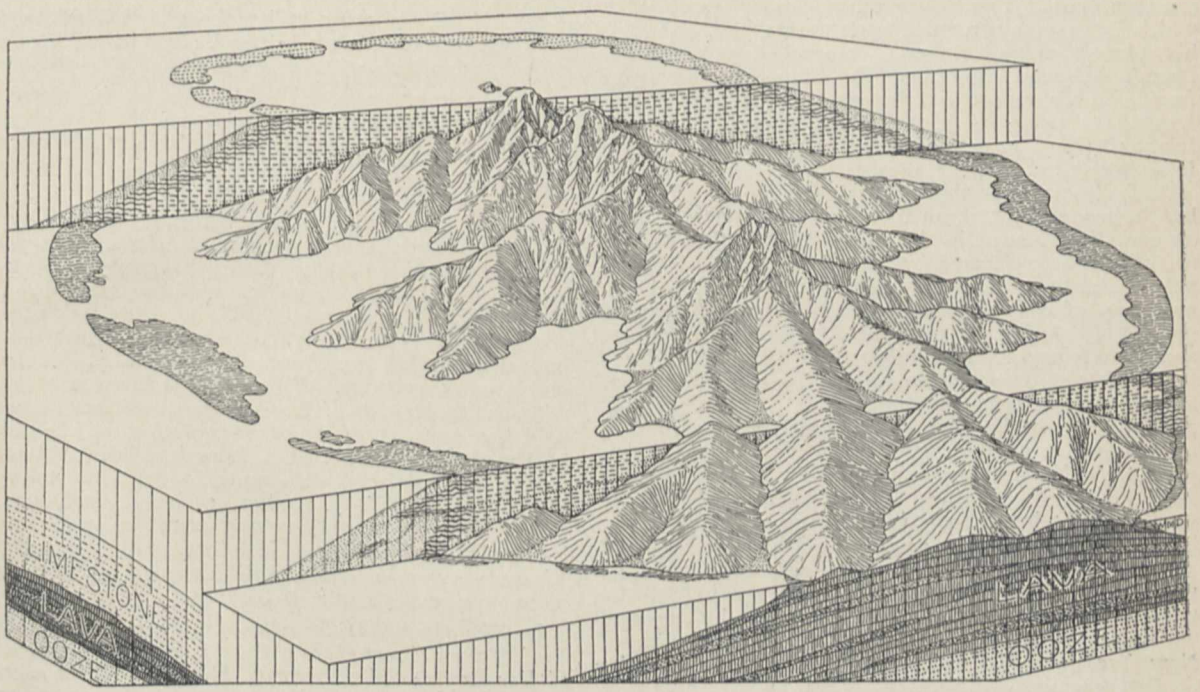

FIG. 1.—Stages in the subsidence of a dissected volcanic island.

are not filled with delta-plains, and that the ridge ends are not truncated in cliffs. Kandavu and Mbengha in the Fiji group (Admiralty chart 167), the western members of the Society group (chart 1060), and especially Bora Bora (1428), Gambier Island (1112), a western member of the Paumotus, and Rossel Island (1473), in the Louisiade archipelago of British New Guinea, may be instanced among many others as affording good illustration of at least some of these features, particularly of embayed shore lines.

In view of the remarkable accordance that is thus found between the inferred consequences of the theory of subsidence and the observed features of central islands of barrier reefs, and in memory of the failure of corresponding consequences of other theories to match the facts, an open-minded inquirer cannot hesitate long in making choice among the several explanations that have been suggested for barrier reefs, and with them, of atolls.

Dana first learned of Darwin's theory when the Wilkes expedition reached Sydney near the end of 1839. Several months earlier, during "the ascent of Mt. Aorai on Tahiti, in September of 1839," he had conceived the production of an embayed shore line as a necessary result of the subsidence of a dissected land mass. Let it be noted in passing that he was the first clearly to announce this important principle, which then had no place in geology or geography, although it is hinted at in De la Beche's "Researches in Theoretical Geology" (London, 1834, p. 193). In Dana's first report he says, when following Darwin in explaining barrier reefs and atolls by subsidence:—"The very features of the land, the deep indentations, are sufficient evidence of subsidence to one who has studied the character of the Pacific islands" ("Geology," U.S. Expl. Exped., 1849, p. 131); and on a later page a more explicit statement is made under the general heading, "Evidence of Subsidence," and the special heading, "Deep Bay-indentations in Coasts as the Terminations of Valleys":—"In the remarks upon the valleys of the Pacific islands, it has been shown that they were in general formed by the waters of the land, unaided by the sea; that the sea tends only to level off the coast, or give it an even outline. When, therefore, we find the several valleys continued on beneath the sea, and their enclosing ridges standing out in long narrow points, there is reason to suspect that the island has subsided after the formation of the valleys. For such an island as Tahiti could not subside even a few scores of feet without changing the even outline into one of deep coves or bays, the ridges projecting out to sea on every side. . . . The absence of such coves, on the contrary, is evidence that any subsidence which has taken place has been comparatively small in amount" (p. 393). Similar statements are made in Dana's first book on this subject, "On Coral Reefs and Islands" (New York, 1853, pp. 118–119), and in all the editions of his larger book, "Corals and Coral Islands" (New York, first edition, 1872, pp. 319–320; third edition, 1890, pp. 273–274).

It is remarkable how rarely the value of this capital point has been recognised. It is referred to in

Bonney's appendix to the third edition of Darwin's "Coral Reefs" (London, 1889, pp. 310–311), but without sufficient indication of its value as an independent and therefore important confirmation of Darwin's theory. It is noted by Krämer, who gives it local application in explaining certain bays on the Samoan islands, but without recognising its value in relation to the theory of subsidence in general ("Bau der Korallenriffe," Leipzig, 1897, p. 24). It is quoted by Gardiner, but without understanding of its importance, for he adds: "Such evidence when applied to volcanic islands is, I submit, of very doubtful value" (Proc. Camb. Phil. Soc., ix., 1898, p. 490). Murray does not refer to it; Agassiz quotes and rejects it in reference to the Marquesas Islands (Mem. Mus. Comp. Zool., xxviii., 1903, p. 5), and does not mention it elsewhere. Singularly enough, Darwin himself refers in the second edition of his book only twice, and then very briefly, to Dana's evidence of subsidence; both references concern the Marquesas Islands ("Coral Reefs," second edition, London, 1874, pp. 163, 201). I have found no other passage in which Darwin says a word upon the subject, although his discussion is otherwise marvellously complete. Dana's inference regarding the Marquesas is to be found in his report on the geology of the Wilkes Expedition (1849, p. 397), in his "Coral Reefs and Islands" (1853, p. 122), and in his "Corals and Coral Islands" (1872, p. 325; 1890, p. 361).

Doubtless other earlier writers cited Dana's principle, but it has not yet come to be generally accepted as an essential element in the demonstration that barrier reefs have been formed by subsidence. This is probably because an understanding of the reasonable evolution of coastal forms has not yet taken general possession of the scientific mind, or perhaps because some students of the coral-reef problem still adhere to the obsolete explanation of bays by marine erosion, an explanation that Dana explicitly excluded; can it possibly also be because there is as yet no sufficient understanding of the logical principle that a theory, even if it be well recommended by explaining the things that it was invented to explain, still needs confirmation by independent, unexpected evidence, before it deserves to be accepted as "demonstrated"?

Several recent writers on the coral-reef problem, particularly those in Australia, have recognised the value of the evidence for subsidence given by drowned valleys. The latest of these is Marshall, of Otago, New Zealand. He writes as follows regarding the Society Islands, in his recent essay on "Oceania" in the *Handbücher der regionalen Geologie*:—"The deep inlets that intersect the coast line . . . are clearly due to stream erosion. Prolonged marine action would have shallowed or filled them, or at least would have built up bars of coastal débris across the entrances. The author is therefore strongly of opinion that the absence of cliffs at the termination of the radiating spurs, the presence of deep water in the lagoon, and of far-reaching inlets, prove that marine erosion has not had any influence on the form of these islands at the present sea-level. . . . Finally, the deep inlets appear to be drowned stream valleys, and their nature strongly supports the belief that the islands have been subjected to an important movement of subsidence."

It is a pleasure to find a colleague who has a personal knowledge of coral islands and with whose opinion I can so closely unite, even though we are physically separated by the greatest distance that the earth affords. I am glad to join with him in emphasising the importance of Dana's principle as an independent confirmation of Darwin's theory of coral reefs.

W. M. DAVIS.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—The readership in forestry will be vacant on March 31 by the resignation of Mr. A. Henry. The general board will in the Easter term appoint a reader. The annual stipend is 400*l*. Candidates are requested to send their applications, with such testimonials as they think fit, to the Vice-Chancellor on or before April 15.

OXFORD.—On February 4 the decree providing for the allocation of a site on the south side of the University Park for the erection of an engineering laboratory was not moved.

The subject of Prof. D'Arcy Thompson's Herbert Spencer lecture on February 14 has been altered to "Aristotle as a Biologist."

MR. R. H. MOODY has been appointed professor of mathematics at the Muir Central College, Allahabad.

MR. F. E. ARMSTRONG has been appointed to the professorship of mining in the University of Sheffield in succession to Prof. Hardwick.

A COURSE of three public lectures on the electrical properties of flames will be delivered in the Physics Theatre of University College, University of London, by Dr. E. N. da C. Andrade, on Mondays, February 10, 17, and 24, at 5 p.m.

THE first term of the newly formed University in Western Australia will open in March of this year. Three out of the eight chairs have been filled in England. That of chemistry will be taken by Dr. N. T. M. Wilsmore, and Dr. A. B. Ross will occupy the post of professor of mathematics and physics, both having left for Australia by R.M.S. *Moldavia* on January 30. Dr. Wilsmore has been associated with the University of London for some time, having held the position of assistant-professor of chemistry at University College. Dr. Ross has been assistant-professor of natural philosophy in the University of Glasgow. Dr. W. J. Dakin, assistant professor in the department of zoology and comparative anatomy in University College, London, will proceed to Western Australia by R.M.S. *Mongolia* on February 7, to occupy the chair of biology.

IN *The Quarterly Journal of Forestry* for January Prof. Fraser Story gives a short account of the School of Forestry at Selmeczbanya, Hungary. This school, which is about 150 miles north of Budapest, was founded in 1807, and is thus one of the oldest forestry schools on the Continent. There is also a mining school in the same building, and the combined staff of the two includes twenty professors each with an average of two assistants. No fees are charged except a registration fee of less than 1*l*.; on the other hand, liberal scholarships are provided by the Hungarian Government conditionally on the holders subsequently serving two years in the Government Forestry Department. As for the laboratory equipment, even the list of physical apparatus is on the most elaborate scale, the electrical instruments including galvanometers, amperimeters, voltameters, resistance boxes, alternating-current generators, transformers, rheostats, accumulators, Röntgen-ray apparatus, and Ruhmkorff coils giving sparks more than 18 in. long.

THE New Zealand University Reform Association has for some three years been urging on the public the need of various reforms, both in the constitution of the Senate and of the governing bodies of the four affiliated colleges, as well as in the method of

examining for the degrees, and in a number of other less important directions. The Senate, at its meeting in January, 1912, summoned an annual conference of the professors of the four colleges; the first meeting was held in November, when it was resolved to recommend to the Senate the merging of the two degrees of B.A. and B.Sc. into one, to be called B.A. The attempt by the reformers to introduce the system of intermediate and final examinations for the degree was thrown out, and the general scheme of the Conservatives, if we may so call them, was adopted. It was also resolved to recommend that at the end of five years the present system of examination should cease, and that examinations be conducted by boards of examiners, composed of the New Zealand professors.

THE second part, dealing with financial statistics for 1910–11–12, of "Statistics of Public Education in England and Wales," is now available (Cd. 6551). In the year ending March 31, 1912, the net total expenditure by the Board of Education in England and Wales was 14,298,030*l*. Of this 11,775,390*l*. was spent on elementary education, 758,525*l*. on secondary schools, 587,213*l*. on technical and art schools and classes, and 571,143*l*. on the training of teachers. The amounts allocated definitely to higher education were small; among these sums may be mentioned 20,000*l*. to the Imperial College of Science and Technology, 17,238*l*. to the Science Museum at South Kensington, and 20,170*l*. for the Geological Museum and Geological Survey. A table giving the expenditure of local authorities in England on education other than elementary is of special interest. Their total receipts for this purpose were 4,327,842*l*., somewhat less than their total expenditure. Of this amount 1,081,835*l*. was from Parliamentary grants, 1,840,155*l*. from rates and borough funds, and 193,957*l*. from local authorities.

THE report for the third session of the faculty of engineering in the University of Bristol has now been published. During the session 1911–12, seventy-four day students attended, of whom fifty-three were matriculated students of this University; the percentage of matriculated students, which was forty in 1909–10 and fifty-eight in 1910–11, increased to seventy-one. This is higher than the corresponding percentage of matriculated engineering students in other provincial universities. Of these day students, three were engaged in post-graduate research work. The number of individual students in attendance at the evening classes conducted by members of the teaching staff of the faculty was 444; of these, eighteen were registered as candidates for the university degree or certificate in engineering, and two had matriculated. The report points out that each year it becomes easier to find places for students who have completed their courses of study. This arises partly from the fact that employers are realising the benefits to be derived from engaging recruits who have had a sound technical training, and partly that students unwilling to work hard enough are dissuaded from continuing their studies. This reduces the number of students in the faculty, but increases enormously the efficiency of the work.

IN his recent report on the work of the Massachusetts Institute of Technology, President R. C. Maclaurin says there can in future be no serious talk of merging the institute with Harvard University, but he shows at the same time how desirable proper cooperation between the two colleges is. The Institute of Technology has received during the past year gifts amounting to about 1,200,000*l*., and is strong enough either to stand alone or to enter into alliances. Dr. Maclaurin shows how unwise it would be for the institute to establish a group of collections for its students when the splendid University Museum of Harvard is so close at hand. The institute, he points out, is intending to erect the most complete mining and metallurgical laboratories in the world, and it would be a waste of money for Harvard to try to duplicate these. He believes that there should be a further interchange of the strong teachers in both institutions. For years the institute students in geology have had the advantage of Prof. Daly's skill, enthusiasm, and scientific achievements, and now he has gone to Harvard it would be regrettable if the students should be out of his influence, the more so since the number of advanced students in the two schools together is not too large for him to deal with effectively. In return, Harvard is not likely, Dr. Maclaurin says, to attempt the task of duplicating such a man as Prof. Lindgren, now at the institute.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, January 23.—Sir Archibald Geikie, K.C.B., president, in the chair.—E. **Mellanby**: The metabolism of lactating women.—Dr. F. W. **Edridge-Green**: Colour adaptation. As in dark adaptation there is a considerable effect which takes place immediately on entering a dark room, so is there a considerable effect produced when a person enters a room illuminated by an artificial light, having previously been in daylight. This effect, which may be designated colour adaptation, increases with the time during which the eyes are subjected to the adapting light. The effect of colour adaptation was estimated by four methods.—Dr. F. W. **Edridge-Green**: Trichromic vision and anomalous trichromatism. The following are the conclusions arrived at after the examination of a large number of persons belonging to each class:—(1) Trichromic vision (on the author's classification of colour-vision) is not synonymous with anomalous trichromatism. (2) Many persons with otherwise normal colour perception make an anomalous equation. (3) Many colour-blind persons (dichromics and trichromics) make an absolutely normal match with no greater mean deviation than the normal. (4) Colour weakness is not characteristic of anomalous trichromatism but of trichromic vision. (5) Anomalous trichromatism and colour weakness are not synonymous. (6) A large mean deviation indicates colour weakness. (7) Anomalous trichromatism appears to be due to an alteration in the normal relations of the response to the three colours (lights) used in the equation.—W. E. **Agar**: The transmission of environmental effects from parent to offspring in *Simocephalus vetulus*. The main result of a number of experiments on the transmission of environmental effects in a common Daphnid, *S. vetulus*, has been to show that certain characters, acquired ontogenetically by individuals placed in abnormal environments, may appear in their offspring which have been born and have lived in a normal environment, *i.e.* one in which control individuals do not show the characters in question.—Dorothy M. **Cayley**: A preliminary note on a new bacterial disease of *Pisum sativum*.—Dr. J. **Homans**: The relation of the islets of Langerhans to the pancreatic acini under various conditions of secretory activity.—H. O. **Feiss** and W. **Cramer**: Contributions to the histo-chemistry of nerve; on the nature of Wallerian degeneration.—I. B. J. **Sollas**: Onychaster, a Carboniferous brittle-star.—Prof. H. E. **Armstrong**, E. F. **Armstrong**, and E. **Horton**: Herbage

studies. II., Variation in *Lotus corniculatus* and *Trifolium repens* (cyanophoric plants). During the past summer, by testing very carefully the apparently acyanophoric form of *L. corniculatus* described in part i., it has been found that this contains a minute proportion of cyanide; moreover, two varieties of this form have been met with, in close proximity, the one rich in enzyme, the other having little, if any, enzymic activity towards linamarin. The manner in which the plant has been found to vary, especially in different parts of Scotland, is discussed at some length. Attention has also been directed to white clover in particular, on account of its importance as the chief leguminous plant in pasture lands. The authors have been forestalled by Mirande (C.R., 1912, vol. clv., p. 651) in the discovery that this plant is cyanophoric, like *L. corniculatus*. But their observations go further and show that whilst the wild form of *T. repens* is uniformly more or less cyanophoric, the cultivated form is destitute of cyanide.—T. G. **Brown**: The phenomena of "narcosis progression" in mammals.—Prof. C. S. **Sherrington**: Reciprocal innervation and symmetrical muscles.—Dr. F. **Medigreceanu**: The manganese content of transplanted tumours.—Dr. J. W. W. **Stephens** and Dr. B. **Blacklock**: The non-identity of *Trypanosoma brucei* (Plimmer and Bradford, 1899) with the trypanosome of the same name from the Uganda ox. In this paper the authors deal with the *T. brucei* causing Nagana in Zululand and *T. brucei* of Uganda. It has generally been accepted that these two trypanosomes are (morphologically) identical, and that they are both of the dimorphic type, presenting long free flagellated forms and short stumpy forms without free flagellum. The name *T. brucei* was first given by Plimmer and Bradford to the parasite, but they do not mention short stumpy aflagellar forms. Again, Laveran regards *T. brucei* as a monomorphic trypanosome which always has a free flagellum. The authors have had the opportunity of examining both strains of *T. brucei*, *i.e.* that from Zululand and that from Uganda, and in addition have had access by the courtesy of several observers to their films of the Zululand strain. As a result of their investigations they have come to the conclusion that the trypanosome called *brucei* from Uganda presents very distinct and obvious morphological differences from the Zululand parasite. In order to avoid confusion, it is considered advisable that this Uganda trypanosome should be re-named, and the name *T. ugandae* is proposed.

January 30.—Sir Archibald Geikie, K.C.B., president, in the chair.—Prof. W. H. **Young**: The formation of usually convergent Fourier series.—R. V. **Southwell**: The general theory of elastic stability. The paper deals principally with the general principles which govern the mathematical investigation of problems in elastic stability, but two examples of some importance are considered for purposes of illustration, viz. the problems of the boiler flue and of the tubular strut.—C. M. **Stubbs**: A spectro-photometric comparison of the emissivity of solid and liquid copper and of liquid silver at high temperatures with that of a full radiator. (1) The emissivity of solid and liquid copper and of liquid silver at high temperatures, relative to that of a full radiator at the same temperatures, has been measured throughout the visible spectrum. (2) As in the case of gold, the emissivity of copper is discontinuous at the melting point, the "relative emissivity" curve of the liquid showing no flexure. (3) The curve of "relative emissivity" of solid copper at high temperatures differs considerably from that of absorptivity at low temperatures. It possesses a much less marked flexure in the green, and it is suggested that this is due to the same causes which ultimately bring about the total absence of a marked bend in the curve for the liquid. (4) Contrary to Burgess's results, no appreciable temperature coefficient of "relative emissivity" was found for liquid copper over a range of 100°. (5) The "relative emissivity" of liquid silver is throughout remarkably low, but seems to be somewhat greater than the corresponding values of the absorptivity of solid silver at ordinary temperatures. (6) "Black body" temperatures of solid and liquid copper and of liquid silver at the respective melting points are calculated.—G. W. **Walker**: A new analytical expression for the representation of the components of the diurnal variation of terrestrial magnetism. Attention is directed to the fact that Fourier analysis of the observed diurnal variation of the components of terrestrial magnetic force does not lead to a concise specification of the data. Thus progress towards a knowledge of the physical causes has been limited. It is suggested that the phenomena are probably purely diurnal, that no physical significance may attach to the twelve-hour, eight-hour, &c., terms, but that the facts may be more suitably expressed by a function that recurs only once in twenty-four hours.—Prof. E. W. **Marchant**: An investigation into the magnetic behaviour of iron and some other metals under the oscillatory discharge from a condenser. The method adopted in the investigation was to photograph by a revolving mirror the spark caused by the discharge. In order to check the accuracy of measurement spark photographs were taken of the discharge from an air condenser through an air-core inductance. The agreement between calculated and observed frequencies was within 1 per cent. With a glass condenser the capacity measured by the frequency of the discharge through an air-core self-induction was less than that obtained by ballistic measurements. When the discharge from these condensers was passed round a coil having a core of fine iron wires, the discharge consisted of a series of oscillations, the time for each oscillation increasing as the discharge died away. The discharge was much more quickly damped when the iron wire core was inserted. From the measurements of the first half oscillations of a number of discharges the "effective permeability" of the iron wire core was calculated, the "effective permeability" being defined as that which the iron would have if it were constant, in order to give an oscillation of the same periodic time as that which was observed. From these results a curve has been drawn giving the relation between magnetising force and "effective permeability." This curve has been employed to determine approximately the resistance of the spark.—Florence **Isaac**: The spontaneous crystallisation and the melting- and freezing-point curves of two substances which form mixed crystals and the freezing-point curve of which exhibits a transition point. Mixtures of *p*-bromonitrobenzene and *p*-chloronitrobenzene.

Geological Society, January 8.—Dr. Aubrey Strahan, F.R.S., president, in the chair.—J. B. **Scrivenor**: The geological history of the Malay Peninsula. A brief statement of the information bearing on the geological history of the Malay Peninsula gathered since 1903. During the Mesozoic era earth-movements took place in a part of the crust now the site of the Malay Peninsula. These movements resulted in two anticlinal folds. The folding admitted of the intrusion of two masses of granite, accompanied by faulting of the rocks in the folds. The rocks affected by the folding are the Raub Series of calcareous rocks, and the Malayan Gondwana rocks. The palæontological evidence cannot be reconciled with the field evidence. No fixed horizon has been discovered in these rocks,

which may be either Carboniferous or Permo-Carboniferous. At the base of the Gondwana rocks are glacial deposits to be referred to the same horizon as the late Palæozoic glacial deposits of Peninsular India, the Salt Range, Australia, and South Africa, but this horizon cannot be defined exactly. Its presence shows that the Raub Series must be older than the Productus Beds of the Salt Range, or equivalent to the shales below the boulder-bed in the trans-Indus section of the Salt Range. The glacial deposits are succeeded by littoral deposits, and far to the east of the glacial deposits a Rhætic horizon has been described and named the Myophorian Sandstone. The glacial deposits show that this portion of the Gondwanaland coast contained stanniferous granite and also much corundum. Denudation has brought to light the two anticlinal folds and the granite masses upon which they now rest. On the west is the Main Range Anticline, on the east the Benom Anticline. The eastern limb of the former and the western limb of the latter meet in the Main Range Foothills. The eastern limb of the Benom Anticline is formed by the main Gondwana outcrop. The igneous rocks of the Benom Anticline are less acid than those of the Main Range Anticline. The area of the Benom Anticline coincides with the "gold-belt" of the peninsula. Tertiary Coal Measures, unconformable on the Gondwana rocks, are known in Selangor. Their exact age cannot be determined. Evidence has been found in the peninsula supplementing the evidence described by Dr. A. R. Wallace, of changes in the archipelago in Tertiary times. When the land-connection that allowed the migration of the fauna of the archipelago from the north was destroyed by submergence, the subsidence continued until the peninsula became an island or group of islands. Subsidence then gave place to elevation, which restored the peninsula.—C. T. **Trechmann**: A mass of anhydrite in the Magnesian Limestone at Hartlepool. The harbour of Hartlepool owes its existence to the erosion of a mass of anhydrite of great thickness, proved by boring to exist in proximity to the Upper Magnesian Limestone upon which the towns of Hartlepool and West Hartlepool are built. The anhydrite is included in, and represents the time-equivalent of part of, the Middle and part of the Upper Limestones. The former presence of sulphates in the Magnesian Limestone is discussed. Evidence is brought to show that quantities of anhydrite were originally deposited with the Magnesian Limestone, the subsequent hydration and removal of which are responsible for the collapse, brecciation, and other alterations that are features of the present formation. The distribution of organisms in the Magnesian Limestone was influenced by the sulphates present in the water. The Shell Limestone is a chain of reef-knolls. The curious distribution and present position of the Upper Magnesian Limestones in Durham is noticed, and an explanation offered. The Permian succession is shown to be more complete in the southern than in the northern area of the county. Various sections in the Upper and Upper Middle Limestones in the Hartlepool area are described.

Linnean Society, January 16.—Prof. E. B. Poulton, F.R.S., president, in the chair.—Prof. E. L. **Bouvier**: Les Caridines des Seychelles, avec des observations sur leurs variations.—Rev. A. E. **Eaton**: (1) Psychodidæ of the Seychelles. (2) Ephemeridæ of the Seychelles.—H. **Campion**: Odonata of the Seychelles.—W. A. **Harding**: A new land leech from the Seychelles.

Physical Society, January 24.—Prof. C. H. Lees, F.R.S., vice-president, in the chair.—S. W. J. **Smith** and H. **Moss**: The resistance of electrolytes. In experiments described in 1911 a modification of Wien's method was used—the optical telephone being replaced by a vibration galvanometer—and the conclusion was drawn that the resistance of an electrolyte varies to an easily perceptible degree with the frequency of the alternating currents to which it is subjected. It is unsound to use the method to test whether the resistivity of an electrolyte depends upon the frequency of the currents to which it is subjected, unless it is shown that the effects of leakage through the electrolytic condensers can be neglected or allowed for. In order to remove or justify any doubt upon the question test experiments have been performed. The method depends upon simultaneous measurement of the voltage between the ends of a tube containing the electrolyte and of the current passing through it. It was found that the resistivity of the electrolyte was constant within 0·05 per cent., whether steady currents or currents of any frequency up to 2300 alternations per second were used. Until the instruments were calibrated there appeared to be a small difference of about 1 part in 600 between the resistance as measured by continuous currents and the values obtained with alternating currents. Some experiments were made with the object of elucidating the behaviour of the instruments which this calibration disclosed. The fact that the apparent contact P.D. within the voltmeter was a function of the applied voltage, decreasing as the latter was raised, would cause an effect of the same sign as that observed. Unallowed-for leakage, greater with steady than with alternating currents, might also provide a partial explanation of the results.—W. S. **Tucker**: The electrical conductivity and fluidity of strong solutions. In adopting Callendar's association theory of strong solutions difficulty is experienced in getting the strongest solutions of electrolytes to conform to the laws. This is attributed to the inaccuracy of the ionisation data. It may be supposed that the viscosity of the solution will affect its conductivity, and experiments to determine if there were any relation between conductivity and fluidity in the case of calcium chloride solutions were carried out. The feature is the simultaneous observation of viscosity, electrolytic resistance, and temperature. Solutions were contained in an unsilvered Dewar cylinder. A platinum thermometer records the temperature. While the thermometer oscillates the readings of electrical resistance were measured. The viscometer was in the form of a capillary pipette immersed in the solution to a known depth. Viscosities correct to less than 1 per cent. were obtained. Perfectly smooth curves for conductivity and fluidity were obtained. No connection between conductivity, fluidity, and concentration can be derived if the last is expressed in terms of volume, but if concentration is expressed as a ratio of masses—molecules of solute to 100 molecules of solvent—the ratio conductivity C/fluidity F stands in linear relation to the concentration n when the latter exceeds one-fourth its maximum value. One solution of nearly cryohydric strength was examined at temperatures from 40° C. to −50° C. The failure of the fluidity-temperature and conductivity-temperature curves to exhibit the same variations was shown. Conductivities of solutions were examined from 40° C. to their freezing points and the curves C/n and temperature plotted. The increasing curvature with concentration is shown, and the error involved in applying the ratio, molecular conductivity to that at infinite dilution, obtained at one temperature, to indicate ionisation at another temperature, is quite apparent. The results obtained suggest that no dependence can be placed on ionisation data derived from electrical conductivity observations.

DUBLIN.

Royal Irish Academy, January 13.—Rev. Dr. Mahaffy, president, in the chair.—H. **Ryan** and J. **Algar**: Montanic acid and its derivatives. The formula of montanic acid is $C_{28}H_{56}O_2$. The acid was converted into its methyl, ethyl, and propyl esters, and the esters when treated with alkyl magnesium halides gave tertiary alcohols, such as dimethyl- and diethyl-heptacesyl carbinol, diphenyl-heptacesyl carbinol, and the corresponding di-*p*-tolyl and di-α-naphthyl compounds. The chloride and amide of the acid were prepared, and an unsuccessful attempt to descend the series was made.—H. **Ryan** and Rev. R. **Fitzgerald**: Identity of baphinitone with homopterocarpin. In view of a possible relationship between the colourless, crystalline constituents and the red dye of barwood the authors isolated and examined baphinitone. They found that the latter substance, which was discovered by Anderson in 1876, is lævorotatory, and is identical with homopterocarpin, which was isolated in 1874 by Cazeneuve from Sanderswood. Bromination of homopterocarpin gives a colourless crystalline derivative, the formula of which is $C_{17}H_{14}Br_2O_4$.

January 27.—Rev. Dr. Mahaffy, president, in the chair.—G. P. **Farran**: Marine Entomostraca (in connection with the Clare Island Survey). Four species of Cladocera, sixty-five Ostracoda, and 152 Copepoda are recorded from the Clare Island district. The list of Ostracoda, due almost altogether to the work of Brady and Norman, comprises two-thirds of the total number known from the west coast of Ireland, and probably includes all the common forms. The list of Copepoda is, as regards its largest section, the littoral species, merely a preliminary one, and it is evident, on comparing it with the fauna of other localities, that, although it adds at least seventy species to the Irish fauna, it does not contain half the species which may be expected to occur. Four new species of Copepoda are described in the paper.

EDINBURGH.

Royal Society, January 6.—Prof. Hudson Beare, vice-president, in the chair.—Dr. G. E. **Gibson**: A method of determining vapour densities at high temperatures, and a new form of quartz manometer. The essential feature of the manometer was the thin flexible membrane which terminated the small quartz bulb, and which responded to the changes of pressure in the same manner as the metallic membrane in an aneroid barometer. To this membrane was attached a small quartz plate, the upper surface of which was polished so as to act as a mirror. Close to this quartz mirror, and lying as nearly as possible in the same plane, was a second quartz mirror attached by a rigid connection to the quartz tube, the enlargement of which formed the bulb. The reflected ray from this second mirror acted as the zero with reference to which the movements of the first mirror were measured. With this apparatus highly accurate measurements had been made on mercury vapour and on phosphorus vapour up to temperatures of 912° C. and 1250° C. respectively.—J. S. **Anderson**: The absorption of light by inorganic salts. No. vii., aqueous solutions of iron salts.—A. R. **Brown**: The absorption of light by inorganic salts. No. viii., alcoholic solutions of copper, cobalt, and nickel salts in the ultra-violet. These were further instalments of a series of investigations planned by Dr. Houstoun. In the case of the iron salts, both the visible spectrum and the infra-red were studied. It was found that ferric chloride and ferric bromide showed the same increase in absorption with concentration which characterised the chlorides and bromides of cobalt, nickel, and copper. The formation of colloid hydroxide was a disturbing factor in the case of weak solutions of ferric salts. The alcoholic solutions were studied in the ultra-violet region, and the conditions were found to be very complex. The absorption of light by ethyl alcohol was also measured for the first time.

PARIS.

Academy of Sciences, January 27.—M. F. Guyon in the chair.—E. H. **Amagat**: The laws of corresponding states.—L. **Maquenne** and E. **Demoussy**: The value of the respiratory quotient for green plants. Modifications in the method of measuring respiratory coefficients have been described by the authors in earlier papers; data are now given for forty-six plants. The coefficient for young plants is generally greater than unity, and this appears to hold for all green leaves during their period of active growth.—Pierre **Duhem**: The adiabatic growth of entropy.—M. **Graebe** was elected a correspondant for the section of chemistry in succession to Sir William Ramsay, elected foreign associate.—Francesco **Severi**: The algebraic correspondences existing on the curves of a linear system traced on a surface.—A. **Rosenblatt**: The algebraic surfaces which possess an irrational bundle of curves of genus 2.—V. **Kostitzin**: Some remarks on complete systems of orthogonal functions.—Angelo **Tonolo**: The potential of an analytical line.—E. **Benoit**: Formula appropriate to the calculation of the coordinates of the summits of a primordial geodesic chain.—Ch. **Maurain** and A. **Toussaint**: The measurement of pressures and rarefactions on large surfaces in motion in the air. Results of experiments bearing on the motion of aëroplanes.—Marcel **Brillouin**: The theory of black radiation.—A. **Schidlof** and Mlle. J. **Murzynowska**: The application of the law of Stokes to the fall of very small drops, and the determination of the charge of the electron. An experimental study of the fall of minute drops of olive oil in air, a modification of Millikan's method being employed. Cunningham's theorem was found to be applicable in this case.—P. **Vaillant**: A method of measuring large polarisable resistances and its application to the measurement of the resistance of bubbles in a liquid.—A. **Perot**: Certain peculiarities of the velocity of the luminous centres in hydrogen tubes.—Marcel **Boll**: The measurement of the energy of an ultra-violet radiation given off by a mercury arc working under different conditions. The difference of potential was found to be a linear function of the watts consumed by the lamp. The energy of wave-length 2536 A.V. emitted by a mercury arc is a parabolic function of the power expended.—Félix **Bidet**: The displacement of the primary amylamines by ammonia gas.—Émile **Baud**: The partial miscibility of liquids.—A. **Portevin**: The deformation of the plastic alloys and their annealing after deformation. For an isolated grain of the alloy the elastic limit is a vectorial quantity, and the effect of a deformation depends on the direction of the applied force.—Paul **Pascal**: Remarks on the additivity of diamagnetism in combination. A comparison of atomic magnetisation coefficients determined directly with those found in combination shows a close agreement, proving that this coefficient is an additive property.—P. **Lebeau** and A. **Damiens**: A method of analysis of mixtures of hydrogen and saturated gaseous hydrocarbons. Complex mixtures. A development of the method described in an earlier paper, based on fractional distillation at low temperatures, together with a eudiometric analysis of the fractions, each fraction containing only two hydrocarbons. Details are given of the results of the analysis by this method of a mixture of ethane, propane, and butane.—E. **Chablay**: Some reactions of sodium amide in presence of liquid ammonia. Forma-

tion of ethylenic hydrocarbons. The alkyl iodide, if allowed to fall into sodium amide in suspension in liquid ammonia, generally reacts with production of an unsaturated hydrocarbon, propyl iodide giving propylene, and isobutyl iodide, isobutylene; methyl iodide behaves differently, methylamine being formed.—Ém. **Bourquelot**, H. **Hérissey**, and M. **Bridel**: Syntheses of galactosides of alcohol with the aid of emulsine. β-Propylgalactoside and β-benzylgalactoside.—Marcel **Godchot** and Félix **Taboury**: α-Chloro-*cyclo*pentanone and its derivatives.—Albert **Robin**: The comparative mineral contents of regions of the liver affected by cancer and regions relatively healthy. Cancerous liver contains a higher proportion of mineral matter than healthy liver; the composition of the mineral matter is also modified in the parts affected by cancer.—A. **Desmoulière**: The antigen in the Wassermann reaction. Further remarks on the preservation and use of the syphilitic antigen, the prepartion of which has been described in earlier communications.—L. **Tribondeau**: The use of plant extracts in the Wassermann reaction. Extracts of certain plants (oats, lentils, peas) behave like animal lipoid extracts; they become the complement in presence of syphilitic sera, but not with normal sera. The most suitable solvents are indicated.—E. **Bodin** and F. **Chevrel**: The bacterial purification of oysters in filtered sea-water. Experiments confirming those of M. Fabre-Domergue, proving the complete bacterial purification of oysters in artificial sea-water in six days.—J. **Loris-Mélikov**: Anaerobic bacteria in typhoid fever.—F. **Maignon**: Influence of the seasons and of the genital glands on respiratory combustion in the guinea-pig.—Jacques **Mawas**: The function of the conjunctive tissue of the ciliary body, in the transmission of the contraction of the ciliary muscle, and the importance of the zonule in the accommodation of the eye.—Éd. Le **Danois**: The Medusæ collected in the plankton during the 1912 expedition of the *Pourquoi-Pas?* in the North Sea, under the control of Dr. J. B. Charcot.—M. **Painvin**: The prosiphon of the Spirula.—E. **Chaput**: An attempt to date the old alluvial deposits of the Loire and its affluents.—Robert **Douvillé**: The individuality of the Ammonite fauna in the *Peltoceras athleta* layers.—R. de **Kövesligethy**: Study of the constitution of the globe by means of the seismic radii.

BOOKS RECEIVED.

Coal, and the Prevention of Explosions and Fires in Mines. By Dr. J. Harger. Pp. vii+183. (Newcastle-on-Tyne: A. Reid and Co., Ltd.; London: Longmans and Co.) 3*s*. 6*d*. net.

Hausa Superstitions and Customs. By Major A. J. N. Tremearne. Pp. xv+548+plates+map. (London: J. Bale, Ltd.) 21*s*. net.

The Travels of Ellen Cornish. By Dr. Vaughan Cornish. Pp. xvi+293+65 plates. (London: W. J. Ham-Smith.) 12*s*. 6*d*. net.

La Biologie Synthétique. By Prof. S. Leduc. Pp. iii+206. (Paris: A. Poinat.)

Cambridge County Geographies: Middlesex. By G. F. Bosworth. Pp. x+165+2 maps. (Cambridge University Press.) 1*s*. 6*d*.

The Vertebrate Skeleton. By Prof. S. H. Reynolds. Second edition. Pp. xvi+535. (Cambridge University Press.) 15*s*. net.

Text-book of Mechanics. By Prof. L. A. Martin, jun. Vol. iv., Applied Statics. Pp. xii+198. (New York: J. Wiley and Sons; London: Chapman and Hall, Ltd.) 6*s*. 6*d*. net.

Messmates: a Book of Strange Companionships in Nature. By E. Step. Pp. xii+220+48 plates. (London: Hutchinson and Co.) 6*s*. net.

Injurious Insects: How to Recognise and Control Them. By Prof. W. C. O'Kane. Pp. xi+414. (New York: The Macmillan Company; London Macmillan and Co., Ltd.) 8*s*. 6*d*. net.

Eugenics Record Office. Bulletins Nos. 1, 4, 5, 6, 7, 8. Memoir No. 1, The Hill Folk. Report on a Rural Community of Hereditary Defectives. By F. H. Danielson and C. B. Davenport. Pp. v+56+3 charts. Memoir No. 2, The Nam Family. A Study in Cacogenics. By A. H. Estabrook and C. B. Davenport. Pp. iii+85+4 charts. (Cold Spring Harbor, New York.)

Mendel's Principles of Heredity. By W. Bateson. Pp. xiv+413+vi plates. (Cambridge University Press.) 12*s*. net.

Propriétés Cinématiques Fondamentales des Vibrations. By A. Guillet. Pp. 405. (Paris: Gauthier-Villars.) 16 francs.

Guide Scientifique du Géographe-Explorateur. By P. Crépin de Beauregard. Pp. x+250+2 plates. (Paris: Gauthier-Villars.)

The Petrology of the Sedimentary Rocks. By Dr. F. H. Hatch and R. H. Rastall, with an Appendix on the Systematic Examination of Loose Detrital Sediments. By T. Cook. Pp. xiii+425. (London: G. Allen and Co., Ltd.) 7*s*. 6*d*. net.

A Dictionary of Entomology. By N. K. Jardine. Pp. ix+259. (London: West, Newman and Co.) 6*s*. net.

Chemie der Fette, Lipoide und Wachsarten. By Dr. W. Glikin. Erster Band. Pp. xvi+789. Zweiter Band. Pp. xi+788. (Leipzig: Gebrüder Borntraeger.) 72 marks.

"Red Books" of the British Fire Prevention Committee. No. 177, Fire Tests with Fire Extinguishers. Petrol Fire Extinguishers, &c., the Committee's Report. Pp. 32. (London: 8 Waterloo Place, S.W.) 2*s*. 6*d*.

Heaton's Annual, 1913. Pp. 574. (Toronto; London: Simpkin and Co., Ltd.) 5*s*.

An Introduction to Zoology. By R. Lulham. Pp. xv+457. (London: Macmillan and Co., Ltd.) 7*s*. 6*d*.

The Duab of Turkestan. By W. R. Rickmers. Pp. xv+564+illustrations+2 maps. (Cambridge University Press.) 30*s*. net.

Black's Sentinel Readers. By Prof. E. E. Speight. Book VI. Pp. xii+254+8 plates. (London: A. and C. Black.) 1*s*. 9*d*.

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

The Plant Alkaloids. By Dr. T. A. Henry. Pp. vii+466. (London: J. and A. Churchill.) 18*s*. net.

The Interpretation of Radium. By F. Soddy. Third edition, revised and enlarged. Pp. xvi+284+plates. (London: J. Murray.) 6*s*. net.

Volcanoes: their Structure and Significance. By Prof. T. G. Bonney. Third edition. Pp. 379+xvi plates. (London: J. Murray.) 6*s*. net.

Heredity. By Prof. J. A. Thomson. Second edition. Pp. xvi+627+plates. (London: J. Murray.) 9*s*. net.

Statische und kinetische Kristalltheorien. By Dr. J. Beckenkamp. Erster Teil. Pp. viii+206. (Berlin: Gebrüder Borntraeger.) 9.60 marks.

A History of British Mammals. By G. E. H. Bar-

rett-Hamilton. Part xiii. (London: Gurney and Jackson.) 2s. 6d. net.

The Syrian Goddess. By Prof. H. A. Strong. Edited, with Notes and an Introduction, by Dr. J. Garstang. Pp. xiii+111. (London: Constable and Co., Ltd.) 4s. net.

The New Steam Tables, together with their Derivation and Application. By Prof. C. A. M. Smith and A. G. Warren, with an Introduction by Sir J. A. Ewing. Pp. xii+101. (London: Constable and Co., Ltd.) 4s. net.

Legislative Assembly. New South Wales. Second Report of the Government Bureau of Microbiology, dealing with work performed during the years 1910–11. Pp. 244. (Sydney: W. A. Gullick.) 5s.

Indian Civil Veterinary Department Memoirs. No. 3. Report of the Research Work of the Imperial Bacteriological Laboratory, Muktesar, during 1910–11. by Major J. D. E. Holmes. Pp. 276+xxii plates. (Calcutta: Thacker, Spink and Co.)

Memoirs of the Geological Survey. England and Wales. Explanation of Sheet 338. The Geology of Dartmoor. By C. Reid and others. Pp. vi+102+2 plates. (London: H.M.S.O.; E. Stanford, Ltd.) 2s. 3d.

Annual Report of the Board of Regents of the Smithsonian Institution for the year ending June 30, 1911. Pp. xii+688+plates. (Washington: Government Printing Office.)

Journal of the Academy of Natural Sciences of Philadelphia. Second Series. Vol. xv. Published in Commemoration of the One Hundredth Anniversary of the Foundation of the Academy, March 21, 1912. Pp. cxliv+614+lix plates. (Philadelphia.)

DIARY OF SOCIETIES.

THURSDAY, FEBRUARY 6.

ROYAL SOCIETY, at 4.30.—The Influence of the Resilience of the Arterial Wall on Blood Pressure and on the Pulse Curve: S. R. Wells and L. Hill.—The Occurrence of a Ganglion in the Human Temporal Bone not hitherto described: A. A. Gray.—The Action of Adrenin on Veins: J. A. Gunn and F. B. Chavasse.—A Preliminary Report on the Treatment of Human Trypanosomiasis, and Yaws, with Metallic Antimony: Capt. H. S. Ranken.—Further Researches on the Extrusion of Granules by Trypanosomes and on their Further Development. (With a Note by H. G. Plimmer on a New Method of Blood Fixation): Major W. B. Fry and Capt. H. S. Ranken.

ROYAL INSTITUTION, at 3.—Recent Research on the Gas Engine: Prof. B. Hopkinson.

LINNEAN SOCIETY, at 8.—Crosses of a Wild Pea with Cultivated Types: A. W. Sutton.—*Rheoxylon africanum*, a New Medullosean Stem: N. Bancroft.—Revision of the Linnean Types of Palæarctic Rhopalocera: Dr. R. Verity.

FRIDAY, FEBRUARY 7.

ROYAL INSTITUTION, at 9.—Life in the Great Oceans: Sir John Murray, K.C.B.

GEOLOGISTS' ASSOCIATION, at 8.—The Weathering Down of the Rocks: J. W. Evans.

SATURDAY, FEBRUARY 8.

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

MONDAY, FEBRUARY 10.

ROYAL GEOGRAPHICAL SOCIETY, at 8.30.

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

INSTITUTION OF MECHANICAL ENGINEERS, at 8.—The Applications of Polarised Light to Mechanical Engineering Problems of Stress Distribution: Prof. E. G. Coker.

TUESDAY, FEBRUARY 11.

ROYAL INSTITUTION, at 3.—The Heredity of Sex and some Cognate Problems: Prof. W. Bateson

INSTITUTION OF CIVIL ENGINEERS, at 8.—Durban Harbour, South Africa: C. W. Methven.—Natal Harbour Works: C. J. Crofts.

WEDNESDAY, FEBRUARY 12.

AERONAUTICAL SOCIETY, at 8.30.—The Law of Similarity connecting Models and Full-sized Machines: L. Bairstow.

ROYAL SOCIETY OF ARTS, at 8.—New Sources of Supply for the Manufacture of Paper: C. Beadle and H. P. Stevens.

THURSDAY, FEBRUARY 13.

ROYAL SOCIETY, at 4.30.—*Probable Papers:* A Cassegrain Reflector with Corrected Field: Prof. R. A. Sampson.—Studies of the Processes Operative in Solutions. XXV. The Influence of Non-electrolytes on Solubility. The Nature of the Processes of Dissolution and Precipitation: Prof. H. E. Armstrong and Dr. J. V. Eyre.—Studies of the Processes Operative in Solutions. XXVI. The Disturbance of the Equilibrium in Solutions of Fructose by Salts and by Non-electrolytes: E. E. Walker.—The Excitation of γ Rays by the α Rays of Ionium and Radiothorium: J. Chadwick and A. S. Russell.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—Notes on Parallel Operation: A. R. Everest.

CONCRETE INSTITUTE, at 7.30.—Three Steel-frame Structures in London: S. Bylander.

ROYAL SOCIETY OF ARTS, at 4.30.—Kathiawar: Sir W. Lee-Warner.

MATHEMATICAL SOCIETY, at 8.—Figures in n-Dimensional Space analogous to Orthocentric Tetrahedra: T. C. Lewis.—A Property of the ζ-Function: J. E. Littlewood.—The Summability of a Fourier's Series: G. H. Hardy.—Trigonometrical Series which Converge Nowhere or almost Nowhere: G. H. Hardy and J. E. Littlewood.—A Theorem Concerning Power Series: H. Bohr.—The Theorem of Quadratic Reciprocity: P. J. Heawood.—The Irreducibility of Legendre's Polynomials: J. B. Holt.

FRIDAY, FEBRUARY 14.

ROYAL INSTITUTION, at 9.—New Gyroscopes and their Applications: Prof. Andrew Gray.

PHYSICAL SOCIETY, at 8.—Annual General Meeting.—The Dynamics of Pianoforte Touch: Prof. G. H. Bryan.

INSTITUTION OF MECHANICAL ENGINEERS, at 8.—Annual General Meeting.—Modern Condensing Systems: A. E. Leigh Scanes.

ROYAL ASTRONOMICAL SOCIETY, at 5.—Anniversary Meeting.

MALACOLOGICAL SOCIETY, at 8.—Annual Meeting.

SATURDAY, FEBRUARY 15.

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

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