THURSDAY, FEBRUARY 26, 1914.

WHAT OF THE ANCIENT UNIVERSITIES?

A History of University Reform from 1800 A.D. *to the present time, with suggestions towards a Complete Scheme for the University of Cambridge.* By A. I. Tillyard. Pp. xv+392. (Cambridge: W. Heffer and Sons, Ltd., 1913.) Price 10*s.* net.

THE unrest amongst the critics—favourable and adverse, with knowledge and without—of our ancient universities continues. The old foundations have been compared, sometimes not very intelligently, and put into competition with the newer university institutions. Men have formed themselves into camps, very strong views as to the merit of the type of university for which they were contending have been formed, and a few thoughtful and illuminating articles have appeared. Lord Curzon set the ball a-rolling at Oxford, and, although the momentum acquired is not yet great, things are moving, and it is being discovered that around finance centre most of the possiblities of improvement or reform. At Cambridge, syndicates of men with extreme views, associated with a number of more moderate men, have formulated schemes which have been so far mutually destructive, that after years of heated discussion it has at last been agreed to recommend *the re-arrangement of the method of paying degree fees.*

From this it may be argued with some point that those within the University do not realise the importance of the questions that are being raised outside the University. Oxford and Cambridge are not private corporations, but national institutions, and some of the would-be reformers hold that they have a right to ask these Universities to continue to fulfil the functions for which they exist. Throughout this controversy, however, it has been manifest that many who have taken part in it are not acquainted with existing conditions or the past history of the universities. It is not surprising, therefore, that attempts made to stir up the question of university reform have been futile. The author of the work before us, though a classical scholar and taking comparatively little interest in the scientific work of the University, has undoubtedly adopted the scientific method of collecting, sifting, and verifying facts and of considering the history of the University and its relation to their present attitude and position.

The work opens with a brief but very interesting history of the University, in which, of course, Cooper's "Annals," Mullinger's "History of Cambridge," and Goldwin Smith are largely drawn upon. Then follows a brief but sufficiently detailed account of the attack made by the *Edinburgh Review* on the University of Oxford; and we are taken step by step through the second attack made by the review and Sir William Hamilton, all this leading up to an account of the controversies out of which arose the Royal Commissions of 1850 and 1872, and of the series of legislative measures which brought the two Universities more nearly into line with modern methods and requirements. Of this phase our author writes out of the fullness of knowledge arising from a careful study of numerous documents and the collation of facts and statistics derived from many sources.

Perhaps the most interesting chapters in the book are those dealing with the legislation ending in the abolition of tests and clerical Fellowships, in the opening wider of the doors of the universities, in strengthening and welcoming men seeking a broader curriculum on which might be built up more advanced professional training, in the institution of college contributions to a common university fund, and in the foundation of the Financial Boards and of the various Boards of Studies. A full abstract account of the finances of the Oxford and Cambridge Colleges enables the reader to form some idea of their resources, and only after giving a really impartial statement of facts and figures are any suggestions offered for a scheme of reform, a scheme dealing specially with Cambridge.

It is maintained that although in recent years great advances have been made, the education provided by our national universities is too exclusive and, at the same time, too costly. The extreme exclusiveness of the colleges has been broken through to some extent, for they are anxious to attract by scholarships and exhibitions brilliant scholars from whatever source, and brilliant boys are welcome, whether they come from the State schools or from the great public schools. From the former and the smaller public schools come those who devote themselves to the mathematical, the natural science, the moral science, and tripos examinations other than the classical; and with the increase of the natural science and physical-science tripos work in the university there has been a great extension in the study of the applied sciences—engineering, medicine, and agriculture.

It may be pointed out—this with no wish to detract from the merit of an admirable book—that the passing of difficult examinations, even if done at small cost, is not always the best thing for the student. The university has a higher function than that of training examination wallahs by

means of college tutors or the holders of several college and university offices, of university professors, some adequately, others very badly remunerated, or of lecturers or demonstrators so insufficiently paid that they must possess private means or undertake private coaching.

That the colleges have an important part to play in the training of men is accepted by the author, but he thinks that it should be brought home to them that where the college system is wasteful in the matter either of men or money, and where their interests clash with wider and greater interests, some attempt ought to be made to allow things to assume their proper proportions and perspective. Vested interests are firmly rooted and powerful, and the whole question is so complicated that it will be necessary to move warily, and to consider any suggested changes very carefully, but that some changes must come those who read this work will be thoroughly convinced.

Method rather than "subject" is the guiding factor in education, and it is recognised that the college system is valuable in the formation of character, but that the system might with advantage be modified very profoundly without impairing this special function scarcely admits of argument. Here finance is the key to the whole situation, and so long as the management of the bulk of the funds in the dual corporation of colleges and university remains with the colleges, any great economy appears to be out of the question. Those most intimately concerned appear to think that the colleges cannot transfer to the university any greater share of their endowments unless they can succeed in concentrating their forces and effecting great savings. If, then, the university is to avail itself of its great opportunities, it must look for additional support from the public, using all these terms in their widest sense.

It is interesting to find how some critics of the universities appear to belittle the physical and natural sciences as educative subjects; and even where they are pleading for the retention of these branches of knowledge in the university curriculum, to look upon them as supplying "soft options." Sir William Hamilton, speaking for these critics, argued that a university ought to teach the physical sciences because they require costly experiments, apparatus, and collected objects, whilst he looked upon the natural sciences as peculiarly fitted to the pass or poll men, and seemed to think that such subjects are worthy only of reception by inferior minds. By implication our author falls in with Sir William Hamilton, who says that "the knowledge which depends on the ocular demonstration of costly collections and experiments—this knowledge, easy and palpable, requiring an appliance more of the senses than of the understanding, can be fully taught to all, at once, by one competent demonstrator, the teaching of the natural sciences, therefore, ought to be 'professional' (professorial?)."

To some it appears that the university should concern itself not only with obtaining efficiency of education, but with elevating ideals, with raising the standard of culture, with the encouragement of research and the production of new knowledge, and with the building up of character. For all this the natural and physical sciences constitute as useful a medium as classics, mathematics or philosophy, whilst the latter, going hand-in-hand with science in the "search for truth," must, in the long run, prove irresistible.

All who take an interest in the welfare of our ancient universities should read this book; whatever may be their view as to the functions of these universities, they will here find, in convenient form, information that cannot but be valuable to them, information that hitherto has been accessible only to those who had the leisure and enthusiasm to read through an enormous amount of uninteresting detail in order to acquire material relevant to the subjects now under consideration. To many the book will be a call to action.

MEDICAL HYDROLOGY.

The Principles and Practice of Medical Hydrology. Being the Science of Treatment by Waters and Baths. By Dr. R. Fortescue Fox. Pp. xiv+295. (London: University of London Press, 1913.) Price 6*s*. net.

WITHIN the compass of fewer than 300 pages Dr. Fortescue Fox presents us with a most readable and comprehensive survey of the history and physiology of bathing, of hydrotherapy, of medicinal springs and baths, and of the indications for hydrological treatment. The author has so thoroughly digested his judiciously chosen material that he leaves the reviewer but little scope for criticism; and that material is presented in an easy flowing style which will commend itself to the non-professional reader as well as to the spa physician and the general practitioner. The lay reader will also find this book particularly useful for guidance in the hygienic use of baths for sensitive subjects and children.

The strong feature of the work, considered from the professional point of view, is the free use of physiology in explanation of the curative action of baths and waters, thus infusing into the empirical data of hydrotherapeutics the scientific element, which is the life-blood of an applied

science, such as that of "medical hydrology"—the appropriate term adopted by the author. But in thus binding his facts together in scientific order, he repeatedly insists on the individual physiological factor presented by each case. The author reminds us that medical hydrology in this twentieth century is not taught in any of our schools, whereas in France, Germany, Austria-Hungary, Italy, Switzerland, Holland, Belgium, and in the United States, the student can obtain instruction in this department of medicine. The irony of our position in this matter is emphasised by the fact that the modern conception of the use of baths and waters in health and in disease actually originated with an Englishman, Sir John Floyer, of Driffield, who, in 1697, published his work entitled, "An Inquiry into the Right Use and Abuse of the Hot, Cold, and Temperate Baths in England." In a word, though England is its birthplace, hydrology has been mainly reared abroad.

The author advocates the establishment of a chair in hydrology in this country. This matter has our entire sympathy and support. But we should bear in mind that the teaching of that chair should embrace a wider range than that of hydrology; for in these days spas are undergoing a process of evolution, and are widening their therapeutic methods beyond the use of medicinal waters—the latter being supplemented by the adoption of other forms of physio-therapy such as treatment by electricity, light, the different rays, physical exercises of different kinds, &c. Therefore the spa physician should possess a good working knowledge of all the various physiological lines of treatment now adopted at our watering-places.

We trust that a progressive practical university, like that of London, will decide to set up a chair of "medical hydrology and physico-therapeutics," and allot it to a lecturer, such as Dr. Fortescue Fox himself, who has the experience of many years as a spa physician, and is endowed with the requisite scientific spirit.

GEOGRAPHICAL OUTLOOK AND CONTROL.

(1) *The Continent of Europe.* By Prof. L. W. Lyde. Pp. xv+446+maps. (London: Macmillan and Co., Ltd., 1913.) Price 7*s.* 6*d.* net.

(2) *Industrial and Commercial Geography.* By Prof. J. Russell Smith. Pp. xi+914. (New York: Henry Holt and Co., 1913.) Price 3.50 dollars.

(1) IN this important volume Prof. Lyde applies higher geographical methods to the treatment of the continent of Europe. The use of the word "higher" is intended to convey the fact that the volume is clearly intended for students at an advanced stage, if not, indeed, for their teachers. In fact, the reader is frankly faced, in the initial chapter, with five pages the difficulty of which there is no endeavour to conceal; it presupposes a very strong mental digestion, the active forces of which include a complete fore-knowledge of the tetrahedral theory of the earth's shape, and are expected to assimilate a philosophy of the "world-relations" of Europe, based (in part) upon that theory. These five pages passed, we are on easier ground when the regional relations of Europe, its relief in general and its climate, and the geographical "control" exercised by these factors, are considered. These topics occupy nine chapters, while the remainder deal with the four great European peninsulas, and within these, and thereafter, with divisions purely political. The regional relations of the continent are wisely made clear at the outset, and thereafter kept in subordination to the political divisions; geographical work of this character must necessarily proceed on these lines, and Prof. Lyde admits in his preface that he finds it "difficult to picture clearly the precise limits of a natural region"; it might, indeed, be asked whether anyone supposes that such limits exist.

Throughout the book geographical control is kept constantly in view, whether as exercised over natural distribution or over human activities. In a book of so general a character, it is a matter for congratulation that the author (unlike many writers of smaller volumes, in which the fault is even less justifiable than it would be here) refrains from straying into the domain of pure history, and only permits himself reference to historical facts in such cases, let us say, as that of a town which has risen or decayed from its former estate, and when in the explanation of such process a geographical factor is involved.

The author has some slight tendency (but here again he exercises more restraint than others) towards the creation of a vocabulary of his own, the necessity for which is not always apparent; he explains, however, and gives reasons in his preface for certain unfamiliar terms which he prefers, such as "wyr" and "wind-whirl." It is a matter for question whether he makes out a case for the exclusion of "cyclone" and "anti-cyclone," or whether geography, borrowing these terms from another department of science, with which it is in a condition of mutual dependence, has any right to attempt to replace them.

The book is fully mapped, Messrs. Philip's coloured physico-political maps being satisfactory; the textual maps and diagrams are of varying

quality. The printers perhaps share with the author a certain disregard for system in the spelling of place-names; some signs lie outside their view, even one so necessary as the Swedish å, which is a different letter, with a totally different sound, from *a* in that language; the transliterations adopted for Balkan names are not always beyond criticism.

(2) Prof. Russell Smith's "Industrial and Commercial Geography" is laid out on no actually original lines, though they are in some respects unusual. He wholly omits the discussion of the general industry and commerce of countries individually. In a first part, which is headed "Industrial Geography," he deals with agriculture generally, and its departments—grains, domestic animals, fruit, sugar, and the like—with fisheries, with manufactures (forest industries, metal industries, and the rest), and with mineral industries. His second part, "Commercial Geography," deals with trade routes principally, and here perhaps, in comparison with other commercial geographies, this book has its chief value. The material for the analysis of trade routes has to be gathered from many sources, and is not easy to digest and adapt to geographical methods when gathered, and geographers owe Prof. Smith gratitude for his chapters on this subject. He deals successively with the trade routes of North America and Europe, with the North Atlantic route, with the routes of Asia, the North Pacific route, South American routes, African routes, and that of the Cape of Good Hope, those of Australasia and the South Pacific—a logical geographical sequence, occupying nine illuminating chapters.

There is the inevitable prophetic chapter on the Panama Canal; it is more acceptable than others of its kind, inasmuch as it refrains from conveying any expectation of instantaneous world-wide revolution in ocean-traffic when the canal is opened. There are numerous black-and-white maps and diagrams, and they reach a high standard of excellence in both style and reproduction—and this is a comment which it is not often possible to make upon American cartography. There are also a number of appropriate photographs.

This volume, like others before it, very clearly illustrates the difference of outlook upon commercial geography and geographical methods generally, as between American and British writers. There are not only many facts, but also whole chapters, in Prof. Russell Smith's work, which, so far from dealing with commercial geography as we understand it, are not even founded on a geographical basis. The British student is not led to expect in his geographical text-book any lessons in the balance of trade, or in specific methods of manufacture, except in so far as these may be dictated by geographical conditions. It may be that there is a mean to be struck between the two systems; if there is, it may lie in the direction of a more complete endeavour to describe the effects of industry on the surface of the earth—the appearance of the standing crop, the infinite variety in the aspect of manufacturing or other industrial centres or districts in different parts of the world. The connection of financial or other such industrial problems with geography is not apparent.

OUR BOOKSHELF.

The Animal Kingdom illustrated in twenty-seven coloured plates, containing several hundreds of species. The letterpress by Dr. Zwanziger, translated from the original German text by Gerard K. Gude. Pp. vi+92. (London: Society for Promoting Christian Knowledge, 1914.) Price 8*s.* 6*d.* net.

In the matter of illustrations, this volume is above the majority of works of a similar type published in this country. Indeed, it may be said that it is excellent in this respect, notwithstanding that a few animals, such as the zebu and the buffalo, are drawn from immature or poor representatives.

In general style the text is well suited to readers for whom it is intended, being clear, simple, and not encumbered with technicalities. The translator, however, has in places followed the German text a little too literally, as in the use of "East India" and "Further India." It would, moreover, have been better if the author, instead of confining his remarks to particular species, had given some information with regard to the distribution of the genera to whch they belong in cases where this presents any special feature. It is, for example, throwing away an opportunity merely to state that one species of tapir inhabits South America, without a word as to the remarkable range of the group; this omission being still more marked in the case of the penguins, where it is stated that one selected species hails from the Antarctic. There is, however, a more serious matter connected with distribution, for we are informed on page 10 that rodents "are distributed over the whole globe, except Australia, where they are replaced by placental mammals." Whether, in this statement, "placental" is a slip of the translator for "implacental," we are unaware. Again, in the paragraph (p. 25) relating to marsupials, there is not a word with regard to their distribution; while on the following page it is stated that the opossum is a native of North America, when the reader should have been informed that it is an immigrant from South America, the home of the family.

Whether it was advisable to introduce scientific names may be a matter of opinion, but as this

has been done care should have been taken not to be so behindhand as to include the roebuck in the same genus as the red deer. A more serious error occurs on page 24, where *Balaena mysticetus*, the name of the Greenland whale, is misapplied to the common fin-whale, which, by the way, is neither the largest animal in existence nor attains a length of 90 feet. R. L.

Things Seen in Oxford. By Norman J. Davidson. Pp. 258+plate. (London: Seeley, Service and Co., 1914.) Price 2*s.* net.

IF Mr. Davidson's little book on Oxford is to be recommended to the readers of NATURE, it must be on the understanding that they are not to expect guidance in scientific matters. We read with surprise that the University Museum "is excelled by no other in the world for its completeness in the Natural Sciences," and that "during the winter months Oxford is invariably flooded." Neither statement is wholly true. The information on undergraduate life also is somewhat antiquated, for the average undergraduate now goes bareheaded, and when he gets back to his rooms in the evening is more likely to switch on his light than to "turn up his lamp." But then it not infrequently happens that to visitors "things seen in Oxford" differ considerably from the same things as known to residents. The illustrations from Taunt's photographs are excellent.

Indian Administration. By Prof. Vaman G. Kale. Pp. vi+298. (Poona: Aryabhushan Press, 1913.) Price 1.4 rupees.

THE machinery of Indian government and administration is described in this book in a manner which should appeal to the ordinary, intelligent Indian citizen. One chapter is devoted to Indian education, and provides a summary of progress and policy since 1854. From one of Prof. Kale's tables we find that in 1912 there were in India 187 colleges concerned with higher education, and that 36,334 students were in attendance at them. The existing provision for university education is not, it is urged, adequate to the ever-growing demand, and new seats of learning will have to be founded in parts of the country where there are at present no facilities.

The Examination of School Children. A Manual of Directions and Norms. By Dr. W. H. Pyle. Pp. v+70. (New York: The Macmillan Company, 1913.) Price 2*s.* net.

As Dr. Pyle says, an accurate knowledge of the mental and physical characters of each child under his care would assist greatly a schoolmaster's lessons. The object of this little book is to provide directions for the examination of the mental and physical natures of school children, and to supply tables dealing with normal cases of various ages. It is to be feared that ordinary teachers have not the necessary knowledge and experience to make trustworthy tests, but the hints given should prove of value to psychological and medical experts.

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.*]

Weather Forecasts in England.

THE Meteorological Offices of this and some other countries issue weather forecasts each day for the succeeding twenty-four hours, these forecasts being based on information telegraphed from various surrounding stations. They are often, but not always, right, or partly right, and it may not be without interest to compare the actual weather, first, with the official prediction, and then with such predictions as might be made without any information except such as can be gathered on the spot from the barometer and the "look of the weather."

The British Isles, with no land to the west and south (except the Azores) for some thousand miles, are unfortunately situated as regards weather prediction, for the greater part of the changes which affect them come from a part of the Atlantic which is traversed by comparatively few steamers, and from which, therefore, but few wireless messages can be received, and no other source of information is available. Central Europe and America are better off in this respect.

With the view of examining the correctness of the English forecasts, I have recently gone through the weather reports for 1913, and extracted from them those forecasts relating to the London and S.E. district, which is perhaps the most favourably situated for prediction. The results of this examination, though they refer only to a single district for a single year, will give some idea of the use of telegraphic information, but before considering the tables in which these results are stated, I will add a few general remarks.

There are in England four clearly distinguished types of weather, namely, those which accompany winds from the south to west, north to east, west to north, and east to south, their relative frequency being in the order stated.

The characteristics of each type are:—

S. to W.—Warm, wet, cloudy.

N. to E.—Cold, dry, with haze.

W. to N.—Cold, clear air, with hail in spring.

E. to S.—Very variable in character.

There are, of course, frequent exceptions, but in the main these are the leading features of winds from the respective quadrants. The correct prediction of the type of weather is for most purposes more important than that of the amount of rain or sunshine to be expected.

In regard to whether forecasts are to be judged as right or wrong, it must be noticed that in our Weather Reports they are often so worded as to make a decision difficult, and to bring to mind the fortune-teller's "dark man" and "fair man." The wind, for instance, is to be "light, moderate, fresh, or strong," or "strong at times in places." For the weather, "Some rain, fog, or mist, but with fair intervals." The temperature is described as "moderate," "rather warm," "cool," "below normal," and so on, but whether it is rising or falling is rarely stated.

Rain, cloud, and sunshine are more variable than wind or temperature, and in the following table I have considered only the latter two.

In marking the forecasts as right or wrong, regard has been had in the first place to direction of the wind and secondly to its strength. If, for instance, a west wind is predicted and a S.S.W. follows, this would

be marked "right," but a W.N.W. wind "wrong," because this type of weather accompanying the two is different. So with regard to easterly winds, if, say N. is predicted and E.N.E. follows, this would be "right," but an E.S.E. following on the prediction of N.E. would be "wrong."

With regard to strength, the forecasts often make anything less than a gale a possibility.

The temperature forecasts are generally vague, but if a rise of temperature occurs when the prediction is "cool," this would be marked "wrong," or, again, if moderate temperature is predicted and the true temperature differs much from the average for the time of year. So far as possible I have given a favourable interpretation to all the forecasts with the results which are here shown in Table I.

TABLE I.—*Comparison of Weather in London in 1913 with the Forecasts made on the Previous Day. The actual Weather is Judged from the Morning Weather Chart of the Day.*

—	Wind				Temperature			
	Right	Wrong	?	No forecast	Right	Wrong	Doubtful	No forecast
January ...	18	9	—	4	15	10	2	4
February..	13	11	—	4	14	8	2	4
March ...	14	7	4	6	13	7	4	6
April ...	15	10	1	4	13	9	4	4
May ...	13	11	3	4	12	13	2	4
June ...	17	6	2	5	14	9	2	5
July ...	20	6	1	4	12	11	4	4
August ...	14	8	4	5	15	9	2	5
September	12	12	2	4	13	8	5	4
October...	13	13	1	4	15	10	2	4
November	13	9	1	7	11	7	5	7
December	19	5	3	4	14	8	4	4
Total ...	181	107	22	55	161	109	38	55
Percentage on No. of forecasts	58	34·5	7·5	—	52	36	12	—

So far therefore as the present very limited examination goes, the probability of finding the predicted weather on the morning of the day succeeding the forecast is as follows:—

	Wind	Temperature
Probability for	0·58	... 0·52
,, against ...	0·35	... 0·36
,, doubtful ...	0·07	.. 0·12

TABLE II.—*Change of Type of Weather.*

—	Changes of type	Forecast		Percentage of correct forecasts
		Right	Wrong	
January... ...	15	11	4	73
February ...	10	8	2	80
March	9	4	5	44
April	11	7	4	63
May	14	10	4	71
June	6	4	2	66
July	12	10	2	83
August	9	4	5	44
September ...	13	7	6	54
October ...	18	15	3	83
November ...	12	6	6	50
December .	9	7	2	78
Total	138	93	45	789
Percentage .	—	67·4	32·6	—

Table II. shows the number of changes of type of weather, as reckoned by the direction of the wind. This is intended to indicate the correctness of the forecast as regards *change* of weather, and here the percentage of success is higher, being 67·5.

It will be noticed that during the year the type of weather changed 138 times. If, therefore, anyone with no information whatever had been content with saying "To-morrow will be like to-day," he would have been wrong 138 times, and right 227 times, and the probability in favour of his prediction being 0·62, and against 0·38. With the help of a barometer and ordinary local observation, he might probably improve on this somewhat.

Comparing these figures with the results obtained by such a fairly complete knowledge of the simultaneous conditions in surrounding regions as is afforded by telegraph day by day to the Meteorological Office, it does not appear that for this latitude and country the odds in favour of the latter are large.

On looking over the immense mass of figures—considerably more than 1000 entries—which are used in the construction of each Weather Chart, I am reminded of a sentence in the late Sir G. (then Mr.) Airy's report to the board of visitors of the Greenwich Observatory in 1867, when speaking of the proposed increase in the number of meteorological observatories, "whether the effect of this movement will be that millions of useless observations will be added to the millions that already exist, or whether something may be expected to result which will lead to meteorological theory, I cannot hazard a conjecture." De Morgan quotes this sentence (the last in the report in question) in his "Budget of Paradoxes," and remarks:—"This *is* a conjecture, and a very obvious one: if Mr. Airy would have given 2½*d.* for the chance of a meteorological theory formed by masses of observations, he would never have said what I have quoted."

Personally, I think it extremely improbable that any trustworthy weather forecasts for periods so long as twenty-four hours will, or can, ever be made for regions outside latitudes 30 N. or S. or thereabouts, with the exception perhaps of a few places where the local conditions are paramount.

The reasons for this view will be given in a subsequent note. A. MALLOCK.

February 17.

The Darwinian Theory of Atolls.

IN the review of "Letters and Recollections of Alexander Agassiz" (NATURE, January 29)—an article in which we are given a picture of an exceptionally interesting personality drawn by an intimate friend—there is a brief paragraph on the formation of coral reefs to which I should wish to refer.

My friend, Sir Ray Lankester, concludes that Agassiz "certainly succeeded in showing that the views advocated by Darwin and by Dana are not capable of universal application, nor, indeed, of general validity" (pp. 603–4).

It would be unreasonable to claim "universal application," but "general validity" is a matter to be determined by a comparison of the number and extent of the regions in which Darwin's explanation holds good with the number and extent of those in which it does not. The results of the Funafuti boring offer, I think, important evidence in regard to the Pacific area. A test locality was chosen with the utmost care by unbiassed authorities. A bore-hole was drilled, at great expense and in spite of many difficulties, to a depth of 1100 ft. *Only shallow water organisms were found in the core.* For some reason or other—probably because it is more exciting to overturn than to confirm—very little has been said about this evidence. We all hope for more borings; but in the meantime the only important trial that has been made

entirely supports the validity of Darwin's theory, in the locality selected as a test.

EDWARD B. POULTON.

Oxford, February 20.

The Accuracy of the Principal Triangulation of the United Kingdom.

THERE was some discussion of this question at the last meeting of the British Association, and an investigation by Capt. H. St. G. L. Winterbotham has been published by the Ordnance Survey (Professional Papers, new series, No. 2). It appears, however, that the measurement of Lossiemouth Base, valuable as it was, did not definitely decide the question, but that a moderate amount of further computation would do so.

(1) It will be generally admitted that statistical evidence as to the precision of any kind of observation is of no great value unless it is based on a large population. For example, if we may assume the principal triangulation to have been all executed by similar observers under similar conditions, and no unjustifiable rejections to have been made, we may accept with great confidence the probable error of $\pm 1{\cdot}23''$ computed from the closure of 552 triangles. But nowadays one would not think of estimating the precision of a base-line by the discrepancy between two measurements of it, though one might reject the measurements if they did not agree as well as was to be expected from the known usual probable error of a measurement. Thus discussion of a large population of discrepancies gives a good estimate of the probable accidental error of a measurement, but a small population only fixes a lower limit to that probable error. Now we have only a population of three independent discrepancies between the four bases of Lough Foyle, Salisbury Plain, Lossiemouth, and Paris, and even if it is brought up to six by the inclusion of the three bases measured with steel chains, yet it must be considered a very small population upon which to base any estimate of precision.

(2) But the original question, to what extent the strength of the figure compensates for the large probable error of an angle, is not necessarily a question for experiment, but it is essentially a question for computation. Given the probable error of an angle in a block of triangulation adjusted rigorously by least squares, if it is required to find the probable error of the distance from any point of it to any other point, the first step is to express the unknown error in that length as a linear function of the unknown errors in a number of independent angles (*i.e.* two angles of each triangle in a chain of independent triangles stretching from one point to the other, and in another chain stretching from one of the points to the nearest base). It then remains only to add another column to the least square computation by the method described in Wright and Hayford's "Adjustment of Observations," paragraph 123. May I venture to suggest that if two or three such cases could be worked out for strong figures in the United Kingdom, and for comparison two or three cases for weaker figures, either there or elsewhere, it would not only set at rest the immediate question, but would also establish results of great importance for surveyors in general.

T. L. BENNETT.

Computation Office, Egyptian Survey Department.

ONE can but agree with Mr. Bennett in insisting on a large "population" of discrepancies upon which to found a calculation of a probable error, whether it be of the measurement of a base-line or of an angle. His example of a base-line measurement is not, however, strictly comparable with the investigation in question. In the former a large number of independent measurements must be made from which to deduce the most probable length and the individual discrepancies from this length. In the latter the measured bases may be regarded as errorless compared with the triangulation, and the actual errors can therefore be deduced with surety.

Neglecting the steel chain bases, we have four independent measures upon any one of which the triangulation can be made to depend. These four are widely distributed.

The longest line from base to base is that from the new base at Lossiemouth to the Paris base, and along this line the old steel chain bases add additional proof that no serious errors are inherent in the triangulation.

I agree that, "if we may assume the principal triangulation to have been all executed by similar observers under similar conditions and no unjustifiable rejections to have been made, we may accept with confidence the probable error of $1{\cdot}23''$ computed from the closure of 552 triangles," but it must be remembered that this is the probable error of an observed angle. The date of the work makes this a matter of no surprise. The point at issue, however, is not the probable error of an observed angle, but the probable error of an adjusted angle, or, in other words, to find out how far the intricacy of the figure has compensated for the lack of precision of angular measurement.

To say that this question is essentially one for computation is not, to my mind, correct.

The probable error of the ratio of any two sides as derived from the triangulation depends upon the probable error of an adjusted angle. This calculation is possible, but from the complexity of the figure and the intricate system of weighting the angles, impracticable. Moreover, the answer to it would still be the probable, and not the actual, error.

It is, however, possible to pick out of the general figure chains of simple triangles connecting the bases. Supposing that these chains had been the only paths of calculation, and that they had shown the same errors of ratio between the bases as are actually found, we can deduce what the probable error of an observed angle would have been to have effected this result. Such an investigation has been made, and the probable error of an observed angle in these "equivalent" simple chains is $0{\cdot}85''$, or approximately the same as that given by General Ferrero, in his 1892 report, as the mean figure for the probable error of an observed angle in the triangulations of those twenty countries represented on the International Geodetic Association.

Although, therefore, further investigation on the lines advocated by Mr. Bennett would be one of the greatest interest, I do not think that it promises a result commensurate with the time and expense it would entail.

H. S. L. WINTERBOTHAM.

Atomic Models

I AM indebted to Mr. Chalmers for pointing out (NATURE, February 19, p. 687), what I had indeed suspected, that the magnetic moment due to an electron moving in a circular orbit, assuming the angular momentum to be $h/2\pi$, is *exactly* five times the magnetic moment of the magneton. The original value $(15{\cdot}94 \times 10^{-22})$ of the latter quantity, given by Weiss, and quoted in my former letter, was based on the value of Avogadro's constant found by Perrin. If we divide the magnetic moment of the atom gram, 1123·5, by the more recent value for Avogadro's constant given by Millikan $(60{\cdot}62 \times 10^{22})$ we obtain as the magnetic moment of the magneton $18{\cdot}54 \times 10^{-22}$, which is exactly

one-fifth of the value of the magnetic moment, $92{\cdot}7 \times 10^{-22}$, for the electron moving in a circular orbit.

Sir Oliver Lodge has directed attention to the importance of all cases where commensurable numbers enter into physical problems. Mr. Chalmers thinks that the present result indicates that, in magnetic materials, there is a unit of five (or ten) atoms, which has a constant number of magnetons. Since in the last resort we must consider magnetism to be an atomic property, I should prefer to regard the result as affording further evidence for the view that the magnetic effects of the complex nucleus must be taken into consideration. The magneton may then result as a difference effect.

To make this clearer, it may be worth while discussing a simple illustrative model. Prof. Peddie has put forward some interesting suggestions as to the structure of the atom in the February number of the *Philosophical Magazine*. He supposes that the atom may be built up of concentric spherical shells of electrification, which may be in rotation round a common axis. Following this suggestion, suppose we have a uniform sphere of positive electrification of radius A rotating with angular velocity Ω. Outside this, suppose we have a single ring containing n (from 1 to 8) valency electrons. The remaining negative electrification may be relegated to a central core having no rotation. Then the magnetic moment of the rotating sphere may be taken as $\frac{1}{5}EA^2\Omega$, where E is the total positive charge, which we shall assume equal to Ne.

We have no direct evidence as to the value of $A^2\Omega$, but if for convenience we assume that it has the same value as $a^2\omega$ for a ring electron, we obtain the result that the magnetic moment of the rotating core is equivalent to 2N magnetons. The resultant magnetic moment for such a model would be the difference between the 2N magnetons of the core and the $5n$ magnetons of the ring. This is only intended to illustrate the way in which the magneton may be introduced as a unit for measuring magnetic moments without involving the necessity of a single magneton existing as an independent entity. If the core of an atom is built up of α and β particles in orbital motion, the experimental results of Weiss indicate that the resultant magnetic moment of these particles can be expressed in terms of the magneton.

H. S. ALLEN.

Wheatstone Laboratory, King's College,
London, W.C.

Origin of Structures on the Moon's Surface.

IN NATURE of February 5 Dr. Johnston-Lavis writes, "the more I compare the moon's surface with volcanic vents, in different parts of this world, the less I see a resemblance between the two," and "the more does the planetoid and meteorite projectile theory become acceptable."

G. K. Gilbert, in his address to the Philosophical Society of Washington, 1892, gives an extremely interesting summary of the various theories to account for the features of the moon's face. After a very clear description of the phenomena to be accounted for, he accepts the meteorite theory with modifications. He remarks that, if the so-called craters of the moon were due to the impact of meteors, their form would be for the most part elliptical, whereas, in fact, they are circular. His own theory is that the earth was at one time attended by a ring similar to that which encircles the planet Saturn, and that this afterwards "gradually coalesced, gathering first around a large number of nuclei, and finally all uniting in a single sphere," the moon. He attempts to show that this hypothesis accounts for the facts.

In NATURE (vol. xxv., p. 243, 1862) I suggested that when, according to Sir G. H. Darwin's view, the moon broke away from the earth and commenced an independent existence, the scar left by the great catastrophe forms now the basin of the Pacific Ocean. The same idea was elaborated five years later by Prof. Pickering (*Journal of Geol.*, vol. xv., No. 1, 1907). It is evident that if the Pacific Ocean indicates the place from which the moon departed, the continents surrounding it must have been then in existence and the earth covered with a solid crust. Both Prof. Pickering and myself make this assumption. The question which I would ask, therefore, is this: Does the moon's surface bear traces of this mode of origin?

The material detached from the earth would have been partly solid, derived from the cooled crust, and partly liquid, derived from the molten substratum. The expulsion would have been probably explosive, owing to the gases dissolved in the substratum. The material would consequently have been scattered. Subsequently it would have collected about its centre of gravity, the smaller masses falling in last. The paths of the falling masses would have been radial. What the telescope now reveals would be the final effect after the mass had settled into the spherical form. May not, then, the circular so-called craters have been caused by the impact of fragments of the solid crust, and may not the mountains of the moon be also angular portions of the earth's crust projecting above the mean spherical surface of the moon?

The above suggestions do not exclude the possibility of true meteors also having fallen, and left their mark upon the moon, but it is not probable that many *large* meteors have struck the moon, because they are rare upon the earth, and if many *siderites* had so fallen, the moon's specific gravity would have been higher than it is, viz., about 3.

It has occurred to me to inquire at what distance from the earth's surface the centrifugal force would balance the earth's attraction, because it is difficult to see how the material, which is supposed to have been detached from the earth to make the moon, could have got away until that distance was reached.

This condition is expressed by the equation, $a\omega^2 = g\frac{a^2}{r^2}$, where a is the earth's radius, 20,926,202 ft., ω the angular velocity, assumed in this case to be $2\pi/18{,}000$ seconds, g gravity, 32 ft. a second, and r the distance from the centre required. From this I get the required distance from the earth's surface, viz., $r-a$, equal to 53,205,200 ft., or more than double the earth's radius. How this distance could be reached seems unaccountable.

Sir G. H. Darwin, in the summary of his paper on the remote history of the earth, does not refer to this point; but since his theory has been adopted without demur by Sir Robert Ball and Prof. Pickering, the difficulty which strikes me must be more apparent than real. Can some reader of NATURE explain it?

O. FISHER.

Graveley, Huntingdon.

I HAVE read with a great amount of interest the letter by Dr. Johnston-Lavis which appeared in the issue of NATURE for February 5, as regards the ray systems of the moon from a vulcanologist's point of view. Even taking into consideration his explanations, however, I cannot now help comparing the moon with our own planet, especially when Laplace's nebular hypothesis, and subsequent theories in reference to the relation of the moon to the earth are considered, which seem to prove conclusively that the moon was once a portion of this world. Then with

regard to his remarks about the lava flows from a crater, though I am by no means an authority upon this subject, such as Dr. Johnston-Lavis, I would beg to point out that the lava from the crater of Skaptar Jokul in the year 1783 formed two main streams which flowed for a distance of forty to fifty miles each, and varied in thickness or depth from 600 to 1000 ft. Now I cannot help thinking that such streams, only so much bigger, might have flowed from the craters of the moon, and it is well known that enormous floods have issued from volcanoes in the Sandwich Islands without much eruption of rocky, or pumaceous débris, which might hide the effect of the lava, as Dr. Johnston-Lavis suggests, though Prof. Pickering puts forward the suggestion that it is some material, such as pumice, which we see in the moon's rays. Apart from which geologists tell us that apparently in prehistoric times lava seems to have issued from vertical fissures, and deluged large areas, as is well seen in the great basalt plain of Snake River, Idaho, North America. Assuming that these fissures were caused by the contraction of the earth's outer crust when cooling, and again comparing the moon with the earth, we at least come to Nasmyth's well-known theory as regards these ray systems, though the manner in which these peculiar phenomena radiate from the craters still seems to suggest to me the same actions which took place from Skaptar Jokul, and in the Sandwich Islands. However, assuming Dr. Johnston-Lavis to be correct in his objections to this theory, I should like to know if he considers Nasmyth's theory any more likely to solve this interesting problem?

Then with reference to the meteorite theory, it seems to me that this scarcely satisfies all the objections. In the first place, these rays are in many cases as wide as ten to twenty miles, and of a very considerable length, and it would take a meteor or other body of excessive size to cause such markings, apart from which the speed would have to be truly prodigious, and, however horizontally the object was approaching the lunar surface, the gravitational attraction, though comparatively slight, would tend to divert the path into a vertical one to some other portion of the surface. Again, it is a curious coincidence that by far the greater number of these rays radiate from the principal craters, and if the meteorite theory is correct, how is it they crossed such a huge-walled crater as Clavius without apparently breaking down its walls, though leaving their marks? The rills and clefts certainly lend themselves to this theory, though when we consider the Sirsalis cleft, 300 miles long, and that there are no fewer than forty in the interior of Gassendi, it becomes difficult to explain even these.

I certainly agree with Dr. Johnston-Lavis, that a practical astronomer with a high-power instrument ought to collaborate with a thoroughly practical vulcanologist, when perhaps some satisfactory explanation would be arrived at. Until then, I am afraid things will have to remain as they are.

C. HUBERT PLANT.

Lichfield Road, Walsall, February 10.

The Discovery of Australia.

IN a note in NATURE of November 27, 1913 (p. 379) relative to the Houtman's Abrolhos Islands, the remark is made:—"The wreck of the Dutch East India Co.'s ship, the *Batavia*, under the command of Capt. Pelsart, in 1629, is said to have led to the first recorded discovery of Australia."

Without entering into the vexed question of who first discovered Australia, I may point out that there are records of more than a dozen visits of Dutch ships and one English ship to the northern and western coasts of Australia before 1629. In fact, the general outline of the whole of the present State of Western Australia and of the Gulf of Carpentaria was known to the Dutch before that date.

The Abrolhos Islands were discovered by the ships *Dordrecht* and *Amsterdam*, under the command of Frederik de Houtman, whose name they still bear, in 1619 (vd. Heeres, "The Part Borne by the Dutch in the Discovery of Australia"). They were rediscovered by the ship *Tortelduif* in 1624, and the East India Co. recognised their danger to navigation, and had accordingly issued warnings to the commanders of all its vessels before Pelsart sailed from Holland.

From a scientific point of view the wreck of the *Batavia* is of most interest, because it led to the discovery of the first member of the kangaroo family, viz., the Dama Wallaby, *Macropus eugenii*, which is plentiful on the two largest islands of the group.

As it is generally supposed that the first discovery of the kangaroo was made by Sir Joseph Banks on Captain Cook's first voyage in 1770, I think that zoologists may find Pelsart's account of this smaller species, written nearly 150 years earlier, of interest.

He says:—"We found in these islands large numbers of a species of cats, which are very strange creatures; they are about the size of a hare, their head resembling the head of a civet-cat; the forepaws are very short, about the length of a finger, on which the animal has five small nails or fingers, resembling those of a monkey's forepaw. Its two hind legs, on the contrary, are upwards of half an ell in length, and it walks on these only, on the flat of the heavy part of the leg, so that it does not run fast. Its tail is very long, like that of a long-tailed monkey; if it eats, it sits on its hind legs, and clutches its food with its forepaws, just like a squirrel or monkey.

"Their manner of generation or procreation is exceedingly strange and highly worth observing. Below the belly the female carries a pouch, into which you may put your hand; inside this pouch are her nipples, and we have found that the young ones grow up in this pouch with the nipples in their mouths. We have seen some young ones lying there, which were only the size of a bean, though at the same time perfectly proportioned, so that it seems certain that they grow there out of the nipples of the mammæ, from which they draw their food, until they are grown up and are able to walk. Still, they keep creeping into the pouch even when they have become very large, and the dam runs off with them when they are hunted." W. B. ALEXANDER.

The Western Australian Museum and Art Gallery, Perth, Western Australia, January 10.

DAILY SYNOPTIC CHARTS OF THE NORTHERN HEMISPHERE AND ABSOLUTE UNITS.

ON January 1 of this year, as already mentioned in the Notes of the issue of NATURE for February 5, the Weather Bureau of the United States commenced the issue of a daily weather map of the northern hemisphere, compiled from observations received daily at Washington by telegraph.

In addition to the regular reports from the United States and Canada, represented in the well-known daily weather map of the bureau, reports are obtained from upwards of forty stations, which are sufficiently distributed in latitude and longitude to form the basis of a chart of isobars and isotherms for the northern hemi-

sphere. The information is given on the back of the daily bulletin, and the Weather Bureau is to be congratulated upon being the first to publish a map showing the distribution of pressure and temperature over a hemisphere *on the day of issue*.

It rests with the bureau, or with some still more enterprising institute if there be one, to add the available observations from the southern hemisphere, and realise what everyone who thinks about the subject knows to be the most sure basis for the study of the daily weather, viz., a daily map of the main features of the distribution of pressure and temperature over the globe.

Practically no lines are drawn on these maps for latitudes lower than 25°, and it is interesting to speculate as to what sort of characteristics a synoptic chart of the equatorial regions would show if it could be drawn. North of 25° the rotation of the earth makes it possible for pressure differences represented by "parallel isobars" to be sufficiently permanent to be charted, while ordinary centrifugal action makes "circular" isobars also equally possible. Hence on a chart for temperate and polar regions, isobars may take any shape between the small circle of a cyclonic depression and the great circle of "straight" isobars; but in the equatorial region there is no place for "parallel isobars," as they are understood further north, because the influence of the rotation of the earth is too feeble; the winds required to balance isobars such as those to which we are accustomed would be prodigious. Consequently a pressure distribution sufficiently permanent to be mapped could only be made up of "circular" isobars, and therefore a chart of isobars for part of the equatorial region ought to be a collection of small circles with whatever may be necessary to represent the diurnal variation. It would be interesting to have this conclusion verified, and the transition between the region of circular isobars and the region of straight isobars carefully explored.

Variations of pressure, small in magnitude, but associated with weather changes, are shown as irregularities in the course of the well-known diurnal variation, on barograms for equatorial regions, and the translation of a collection of barograms into synoptic charts is an attractive problem. It would presumably tell us what the meteorological conditions would be if the earth were fixed and the sun went round it in twenty-four hours as the ancients used to suppose.

One of the striking features of the maps now issued by the Weather Bureau is that for the first time in the history of official meteorological institutions, c.g.s. units of pressure and the absolute scale of temperature are used for a daily issue of charts. The isobars are figured for every five millibars, and the isotherms for every ten or five degrees on the centigrade scale measured from 273° below the freezing point of water.

This is indeed a remarkable step towards the unification of the methods of expressing pressure over the globe, and it has been immediately followed by the Meteorological Office in the corresponding charts which are published in the weekly weather report. The office figures the centibars, while the bureau figures the millibars, but that is only a matter of decimal point.

Millibars are in future to be used, though not exclusively, for the international publication of the results of the investigation of the upper air, so that while it now seems likely that before many years are passed we may see a daily synchronous chart for the globe, and really begin to study weather as it ought to be studied, we may at the same time expect to take leave of the inch and the millimetre as measures of pressure. They certainly have had a very long innings on a side to which they did not properly belong, and it will be interesting to see how the more scientific measure of pressure in pressure-units will adapt itself to practical requirements. The Meteorological Office is to make use of c.g.s. units of pressure for the Daily Weather Report on May 1 of the current year, and the preparations for that event have already placed some well-known facts in a curious light. The task which during the last sixty years we have been setting to British instrument-makers is as follows:—"Construct a barometer which will give a true pressure reading when the whole instrument is in latitude 45°, the mercury at 273° A., and its brass case at 290° A." Continental makers have had a problem that sounds simpler, viz. to construct a barometer which will give a true pressure reading when the instrument and its case are in latitude 45° at 273°A. The figures show that if instrument-makers were to make a barometer which was correct at the equator at the freezing point of water, it would be correct in latitude 45° at the ordinary air-temperature of 289° A. (61° F.) and at the poles at 305° A. (89·6° F.). So for each latitude there would be a temperature within the common range for which the readings were true pressures. At other temperatures, of course, a correction would be required. W. N. S.

THE RECENT SEISMOLOGICAL DISTURBANCES IN SOUTH JAPAN.

IN the accompanying figure is reproduced, on about half the original scale, an interesting seismogram received from Prof. A. Belar, of Laibach, through the courtesy of the foreign editor of the *Daily Mail*. The earthquake in question occurred on the morning of January 12, and was recorded by a Galitzin seismograph with electromagnetic damping. The times indicated on the diagram are referred to mean time of central Europe, which is one hour in advance of Greenwich time. In a second letter, Prof. Belar gives 10h. 40m. 35s. as the time of arrival at Laibach of the first preliminary tremors, and he estimates that the earthquake occurred at 6h. 29m. 2s., p.m., Japan time.[1] According to

[1] According to the data given by Prof. Belar in a more recent letter, it would seem that the time at the origin should be 6h. 30m. 13s. (mean time of 135 E.) p.m., which does not differ materially from that given above.

information recently received from Japan, 337 earthquakes occurred in the south of the country on January 12, the strongest of all being recorded at Nagasaki at 6h. 29m. 27s. The coincidence is so close as to justify Prof. Belar's conclusion that the earthquake recorded at Laibach originated near the south coast of Japan. That the earthquake was of considerable strength is evident from an account by the Rev. A. C. Hutchinson, of Kagoshima, which appeared in *The Times* for February 6. "The earth," he says, "seemed to leap convulsively upwards. The quaking was so great for two minutes that it was difficult to stand."

Prof. Belar remarks that the interest of the seismogram is due to the possible connection of the earthquake with the eruption of Sakurajami on the same day. As a rule, the foci of volcanic earthquakes are close to the surface, and the vibrations are insensible, even with instrumental aid, at considerable distances from the epicentre. If the shock recorded at Laibach were of volcanic origin, this would be the first instance of a volcanic earthquake being recorded across an entire continent since the horizontal pendulum was adapted for seismographic purposes.

Of earthquakes connected with a volcanic eruption, those which are due to the actual explosions are usually of less intensity than those which occur at other times, while the strongest shocks may originate at some distance from the volcano. For instance, in the south-west corner of Hokkaido (the northern island of Japan), there is a group of volcanoes, of which three—the Komaga-take, the Tarumai-san, and the Usu-san—have been active recently. Earthquakes are extremely rare in this part of the country, but each of the last four eruptions has taken place in fairly close connection with a strong earthquake the epicentre of which has been from sixty to 170 miles from the volcano.[1]

It seems clear that the earthquake of January 12 must have originated at some distance (perhaps fifty miles or more) from the recently active volcano of Sakurajami, for the seismic sea-waves which swept over the low-lying parts of Kagoshima arrived half-an-hour or more after the earthquake was felt in that city. But, notwithstanding this, it seems probable that Prof. Belar is correct in assigning to the earthquake a place among the volcanic phenomena, and to its focus a depth considerably greater than is usual in volcanic earthquakes. C. DAVISON.

[1] F. Omori, Bull. Imp. Earthq. Inves. Com., vol. v., 1911, pp. 5-7.

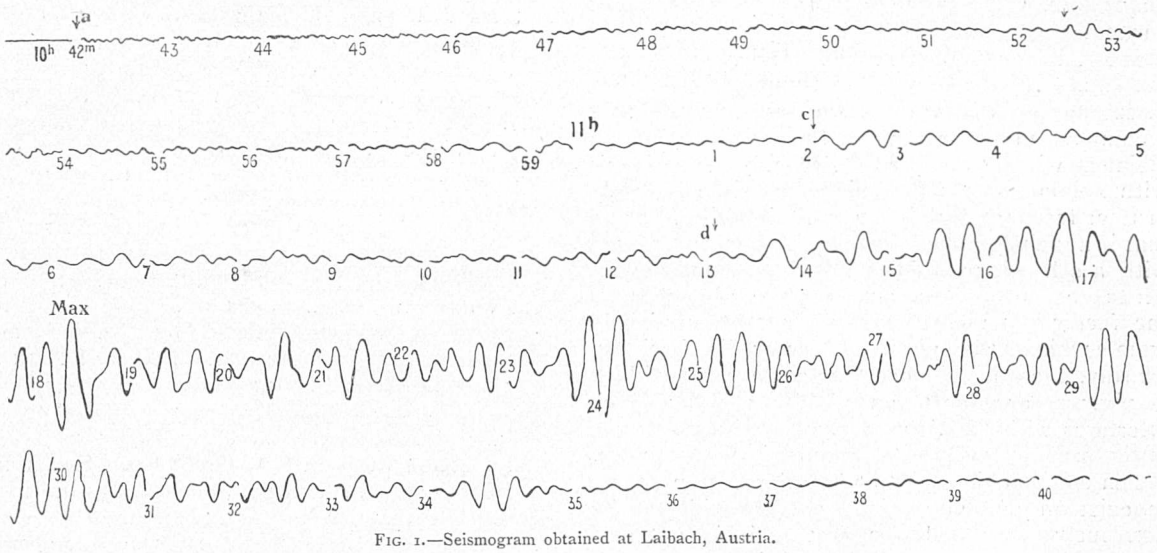


FIG. 1.—Seismogram obtained at Laibach, Austria.

ALBINISM.[1]

THE word albinism is used in several senses. In the strictest sense it is used only of cases in which pigment is completely, or apparently completely, absent from the skin, hair, and eyes; in the widest sense it includes many grades of deficiency of pigment, whether generally over the body or in restricted areas. The memoir before us illustrates the difficulty of defining albinism, for according to the authors all grades of pigment reduction occur, both in Man and other Vertebrates, so that no sharp line would seem to exist between total and partial albinism. There is little doubt, however, that a number of quite different causes may give rise to pigment reduction, and that much might be done to classify the various manifestations into natural groups. Some of the more outlying types are already clearly separable, *e.g.* pathological leucoderma, and the whitening of the hair of certain species in winter, which is due to a shedding of pigmented hair and its replacement by white in autumn, followed by moult in the other direction in the spring.

Another group of so-called albinotic cases can be separated by their mode of inheritance. An inspection of pedigrees at once reveals the fact that some cases of "partial albinism" in man, in which the skin is spotted with white, or in which there is a white patch of hair on a body

[1] "A Monograph on Albinism in Man." By Karl Pearson, F.R.S., E. Nettleship, F.R.S., and C. H. Usher. Part ii., Text. Pp. 265–524 +atlas. Price, 30*s.* net. Part iv., Text. Pp. iv.+136+xxiii+atlas. (London: Dulau & Co., Ltd., 1913.) Price, 21*s.* net. (Drapers' Company Research Memoirs. Biometric Series, viii. and ix.)

otherwise normally coloured, are inherited as typical Mendelian dominants, the affection being always transmitted in the direct line. On the other hand, many, probably the majority, of cases of complete or nearly complete albinism behave as recessives, and appear especially in the offspring of consanguineous marriages between affected stocks.

When the more sharply defined cases have been separated out, there remains a large mass of material which still requires analysis, and one of the most hopeful ways of dealing with this seems to be by a comparison with cases in animals which have been or might be worked out experimentally. Such experiment has already shown, first, that skin and coat colour is due to the combined effect of at least two separately inherited factors, one of which is necessary for the production of any kind of pigment, while the other determines the colour of the pigment which is produced. Vertebrate albinos are commonly produced by the absence of the first factor, and may therefore bear the factors which determine particular colours, although they do not show them. Albinos are therefore not all alike in their inherited constitution, and it is probably only by disentangling the various factors involved that a complete understanding of the causes of human albinism will be obtained. Secondly, experiment with animals shows that piebalding is completely distinct from total albinism in its inheritance, and that if a piebald appears when an albino is crossed with a self-colour, this is not due to mosaic inheritance, but to the fact that the albino bears the factor for piebalding—is, in fact, a piebald from which the pigment factor is lacking. Thirdly, there is evidence that some cases of lack of pigment are due to an inhibiting factor which interferes with the development of pigment, even in the presence of both the required colour-factors. When complications of this kind have been shown to exist in animals which can be subjected to rigorously controlled experiment, it is not surprising that the examination of human albinos and their pedigrees reveals irregularities.

A comparison with animal cases suggests, however, that by the careful collection of evidence, and especially by the classification of cases (1) according to the results of clinical observation, supplemented by microscopical examination when possible, and (2) according to the mode of inheritance, much could be done to disentangle the various factors which are involved. Much of the preliminary work in this direction could be done with the data now available, but as long as we continue to group together, in thought as well as in name, such different phenomena as total absence of pigment, general reduction of pigment, piebalding, and wall-eye, and, from the point of view of inheritance, cases which are clear Mendelian dominants, others which are scarcely less clearly recessive, and others, again, which have undoubted sex-limited inheritance, so long the present confusion will continue.

The monograph before us, though scarcely making any attempt at a classification such as we suggest, will provide most useful material for future workers on the subject. It gives a full account of the clinical and microscopic characters of various kinds of albinism in the widest sense of the word, both in man and animals; discusses their occurrence and geographical distribution, and includes, in part iv., nearly 700 fully described pedigrees, some of them extending to 100 or more individuals.

PROF. S. P. LANGLEY AND AVIATION.

I have brought to a close the portion of the work which seemed to be specially mine, *the demonstration of the practicability of mechanical flight*; and for the next stage, which is the commercial and practical development of the idea, it is probable that the world may look to others. The world, indeed, will be supine if it do not realise that a new possibility has come to it, and that the great universal highway overhead is now soon to be opened.

THUS spoke the late secretary of the Smithsonian Institution, Samuel Pierpont Langley, after his memorable experiment of May 6, 1896, in which he launched a heavier-than-air machine in the air, which flew under its own power (steam), traversing a distance of half a mile. This experiment it was that convinced the world of the practicability of mechanical flight, and which crowned the success of all his previous experimental researches. It was not until the year 1903 (December 17) that the Brothers Wright, Wilbur and Orville, fitted a motor to their gliding machine, and made two flights, the first successful flights ever made by man in a heavier-than-air machine driven by its own power.

It was a fitting tribute of the Board of Regents of the Smithsonian Institution to found, on December 15, 1908, a Langley medal "to be awarded for specially meritorious investigations in connection with the science of aerodromics and its application to aviation," and it was most appropriate that the brothers Wilbur and Orville Wright were the first (1909) to receive the award. The presentation of this medal is now made on May 6, a date selected in order that the ceremonies incident to the presentation may take place in connection with the observance of "Langley Day," which was established by the Aero Club of Washington in 1911 to commemorate Langley's achievement.

A recent Smithsonian Institution publication (No. 2233) contains an account of the exercises on the occasion of the presentation of the Langley Medal and the unveiling of the Langley Memorial Tablet on May 6, 1913, including the addresses of Dr. Alexander Graham Bell, Monsieur J. J. Jusserand, the Ambassador to the United States, Dr. John A. Brashear, and the secretary, Dr. Charles D. Walcott. The bronze memorial tablet is situated in the Smithsonian building, and represents Prof. Langley seated on a terrace where he has a clear view of the heavens, and, in a meditative mood, is observing the flight of birds, while in his mind he sees his aerodrome soaring above them.

The second and third medals were awarded to Mr. Glen H. Curtiss and M. Gustave Eiffel, the former "for advancing the art of aerodromics by his successful development of a hydro-aerodrome, whereby the safety of the aviator has been greatly enhanced," and the latter "for advancing the science of aerodromics by his researches relating to the resistance of the air in connection with aviation."

The orations are interesting reading, especially that by Dr. Brashear, who was one of Prof. Langley's oldest and closest friends.

The publication contains reproductions of the Langley Tablet and of the two handsome medals. The illustration of the medal awarded to M. Eiffel is here reproduced.

At the close of the exercises, the secretary directed attention to the action of the Board of Regents, who have decided on the re-opening of the Langley Aerodynamical Laboratory. Sufficient provision is available to start and continue the work in a modest way, and it is hoped that investigations under the name of Langley will be pursued to develop and standardise aeronautical science.

Such an institution well organised and equipped would be a noble monument to the man, and one which he, no doubt, would have most desired.

FIG. 1.—Langley medal presented to M. Gnstave Eiffel.

NOTES.

THE attention of the British Science Guild was directed towards the end of last year to the fact that the Post Office authorities were contemplating a charge of two guineas, in respect of licences in connection with apparatus proposed to be installed by owners of observatories, watch and clock makers, &c., for the purpose of receiving the international wireless time signals sent out from the Eiffel Tower. Protests against the proposed tax had been forwarded to the Post Office authorities by the National Association of Goldsmiths, the British Horological Institute, and Mr. F. Hope-Jones, chairman of the Wireless Society of London. In consequence of the representations made to it upon the subject, an inquiry was instituted by the British Science Guild in relation to the wisdom of the policy of levying such a charge at the present time, the possibility of collecting the same economically in the event of the policy being persisted in, as well as in relation to the powers conferred on the Postmaster-General under the Wireless Telegraphy Act, 1904. The result of this inquiry was such as to persuade the guild that the imposition of a tax would be impolitic, and at the same time would not be likely to produce a revenue commensurate with the expense involved in attempting to collect the same, whilst such a tax could not fail to give rise to intense irritation. As was pointed out in an article in NATURE of November 13, 1913 (p. 320), it appeared to be extremely doubtful whether the Postmaster-General possessed statutory authority to impose such a tax, since by the terms of the Wireless Telegraphy Act, 1904, it is expressly provided that "nothing in this Act shall prevent any person from making or using electrical apparatus for any purpose other than the transmission of messages." The views of the British Science Guild were recently forwarded to the Secretary of the Post Office, who was desired to place the document containing these views before the Postmaster-General for his consideration, and at the same time the Postmaster-General was requested to receive a deputation from the guild in relation to this matter. We learn that the representations of the British Science Guild and other bodies have been considered by the Postmaster-General, who has now intimated

that he does not intend to proceed with the proposal to levy the contemplated tax.

PROF. P. EHRLICH, director of the Royal Institute for Experimental Therapeutics, Frankfort-on-Main, has been awarded the Cameron prize of the University of Edinburgh, in recognition of his discovery of salvarsan, of his researches on numerous synthetic organic compounds of arsenic, and of his important work on immunity.

THE twenty-third annual meeting of the Royal Society for the Protection of Birds will be held at the Westminster Palace Hotel, Victoria Street, London, S.W., on Thursday next, March 5. The chair will be taken at 3 p.m. by the Right Hon. Lord Newton. A resolution will be submitted in favour of the Government Plumage Bill.

PROF. W. P. BRADLEY, who has occupied the chair of chemistry at Wesleyan University, Middletown, Connecticut, since 1893, has resigned that post on accepting a position as chemist with a large rubber company. He is especially known for his work on problems connected with the liquefaction of permanent gases, and he conducted the first liquid air plant that was set up in America for research purposes.

SIR JAMES WILSON, K.C.S.I., has been appointed to act as delegate for Great Britain and Ireland, the Dominions of Canada, Australia, New Zealand, the Union of South Africa, and the Government of Mauritius on the permanent committee of the International Institute of Agriculture at Rome. Lieut.-Colonel Sir David Prain, director of Kew Gardens, Sir James Wilson, and Mr. A. G. L. Rogers, head of the Horticulture Branch of the Board of Agriculture and Fisheries, are the representatives of the Board at the International Phytopathological Conference opened at Rome on Tuesday, February 24.

A COMMITTEE has been appointed in Berlin to make arrangements to celebrate the seventieth birthday of Prof. A. Engler on March 25 next, by the presentation to him of his life-size marble bust and in other ways, as a sign of the appreciation of botanists of his varied and valued contributions by publication and otherwise to the advancement of systematic, geographical, and economic botany. Readers of NATURE who may wish to join the botanists of Germany and other countries in this celebration are invited to send their subscription to Prof. T. Johnson, Royal College of Science, Dublin, for transmission to, and acknowledgment by, Prof. L. Wittmack, of Berlin.

AT the anniversary meeting of the Geological Society of London, held on Friday last, February 20, the officers were appointed for the ensuing year as follows:—*President,* Dr. A. Smith Woodward, F.R.S.; *Vice-Presidents,* Dr. H. H. Bemrose, Mr. W. Hill, Mr. Clement Reid, F.R.S., and Dr. A. Strahan, F.R.S.; *Secretaries,* Dr. H. H. Thomas and Dr. H. Lapworth; *Foreign Secretary,* Sir Archibald Geikie, O.M., K.C.B., F.R.S.; *Treasurer,* Mr. Bedford McNeill. The awards of medals and funds, announced in NATURE of January 15 (p. 561) were made. The president delivered his anniversary address, which dealt with problems of post-glacial denudation.

AT the annual general meeting of the Physical Society of London on February 13, the following officers were elected for the ensuing year:—*President:* Sir J. J. Thomson, O.M., F.R.S. *Vice-Presidents* (not including those who have filled the office of president): Prof. T. Mather, F.R.S., Dr. A. Russell, Mr. F. E. Smith, and Mr. R. S. Whipple. *Secretaries:* Mr. W. R. Cooper and Dr. S. W. J. Smith. *Foreign Secretary:* Dr. R. T. Glazebrook, F.R.S. *Treasurer:* Mr. W. Duddell, F.R.S.. *Librarian:* Dr. S. W. J. Smith. *Other Members of Council:* Dr. W. H. Eccles, Sir R. A. Hadfield, F.R.S., Prof. G. W. O. Howe, Prof. J. W. Nicholson, Major W. A. J. O'Meara, C.M.G., Mr. C. C. Paterson, Prof. O. W. Richardson, F.R.S., Prof. the Hon. R. J. Strutt, F.R.S., Dr. W. E. Sumpner, and Dr. R. S. Willows. *Assistant Secretary and Reporter:* Mr. J. Guild.

WE learn from *The Pioneer Mail* that the foundation-stone of the School of Tropical Medicine at Calcutta was to have been laid on February 24. The Government of India has provided six lakhs of rupees for the site and laboratory, and has agreed to contribute towards the upkeep of the school, thus emphasising the Imperial character of the work. An appeal is made for liberal endowments. The building will accommodate several whole-time research workers, in addition to the teaching staff. Four lakhs, or annual subscriptions of 20,000 rupees, guaranteed for at least five years, will be required for the endowment of each additional research investigator. The possibilities of carrying out important investigations of tropical diseases, which cause more than one-third of the deaths in Calcutta, and at least as large a proportion over India as a whole, are limited only by the amount of financial support which may be afforded to the new institution.

MR. VICTOR ANESTIN, of Bucharest, referring to Mr. W. F. Denning's note in our issue of February 12 (vol. xcii., p. 670) on the detonating fireball of January 19, sends us fuller particulars of the old Rumanian superstition that bolides may be abundantly observed from January 14–20, and especially on January 19. The superstition has been held for hundreds of years by peasants and townsfolk alike. The belief is that on January 19 "les cieux s'entr'ouvrent," and young people look out for this celestial phenomenon, believing that if they offer up a wish at the moment of its occurrence it will be granted during the same year. The same belief is held concerning the appearance of fireballs on November 17. In both these months the sky is always covered with cloud at Bucharest, so that a bright fireball produces an effect of the heavens opening as expressed in the superstition. The date January 19 is, however, not fixed; sometimes the meteors are seen several days before, and at other times after that date. Thus in 1906 "le ciel s'est entr'ouvert" on January 14, and this year the luminous effects of the meteors were seen on January 21.

DR. LOUIS BELL writes from Boston, U.S.A., to describe an unusual meteorological phenomenon observed there last month. On January 13, which was the coldest day known in Boston for many years, the

thermometer not ranging above zero for a period of thirty hours extending through the entire day, Dr. Bell, upon entering a large train shed, some 75 ft. high and of a very extensive area, found that snow was steadily falling, produced by the congelation of the steam from the numerous locomotives. The interesting point was that the snow had aggregated into flakes of fair size, not distinctly crystalline, but still flakes, in spite of the short distance of the possible fall. The thermometer was then about 5° F. below zero, and in the evening at a similar temperature the whole interior of the train shed was still white with this deposit of snow. The general phenomenon, of course, has been many times recorded, but is very rarely seen, particularly on so large a scale and for so long a time.

THE exceptionally mild character of the present winter is being maintained until its close, and for a persistent continuance of warm days in January and February it surpasses all previous records. At Greenwich the thermometer in the screen was above 50° for eighteen consecutive days from January 29 to February 15. Previous records since 1841 have no longer period than eleven days, in the months of January and February combined, with the thermometer continuously above 50°, and there are only four such periods—1846, January 21–31; 1849, January 16–26; 1856, February 6–16; and 1873, January 4–14. Besides these there are only three years, 1850, 1869, and 1877 with a consecutive period of ten days in January and February with the temperature above 50°. The persistent continuance of the absence of frost is also very nearly a record. To February 24 there have been thirty consecutive days at Greenwich without frost in the screen, and the only years with a longer continuous period in January and February are 1867, with thirty-seven days, 1872, with forty-three days, and 1884, with thirty-two days. The maximum temperatures in the two months have seldom been surpassed. In many respects there is a resemblance between the weather this winter and that in 1899, when in February blizzards and snowstorms were severe on the other side of the Atlantic, with tremendous windstorms in the open ocean, whilst on this side of the Atlantic the weather was exceptionally mild. It is to be hoped that this year we shall be spared the somewhat sharp frosts experienced in the spring of 1899.

THE annual Home Office report and statistics of the output of mines and quarries in Great Britain for the year 1912 has been published. It is greatly to be regretted that the report should take nearly a twelvemonth before the definite figures of the year's mineral production can be published, as by this time these figures present but little interest. It is true that the approximate figures issued at an earlier date give a great deal of the information, and that the early figures rarely require much alteration. As a matter of fact, however, the Department of Mineral Statistics, like so many departments of the Government that do useful but not showy work, is neglected in favour of others that make a more direct appeal to the gallery. Our Department of Mineral Statistics is understaffed, and the collection and definition of mineral statistics are not, as they should be, controlled by precise and definite legal enactments. Thus it is impossible to know from the report whether the item coal means "drawings," inclusive of "walings," or whether it refers to clean coal only; or, again, whether the quantity of coal is inclusive or exclusive of colliery consumption. What is really needed in this country is a brief Mineral Statistics Act, regulating the precise manner in which the various statistics should be collected and tabulated, and giving legal force to the definitions now so loosely employed, and if such an Act could be drawn up as the result of an international conference, so that the statistics of the great mineral-producing countries of the world could be correctly compared with each other, a great advance would be made towards the scientific study of this important branch of knowledge.

IN the February issue of *Man*, Sir C. H. Read describes a remarkable Bactrian bronze ceremonial axe which has been recently added to the British Museum collections. It is composed of the figures of three animals—a boar, a tiger, and an ibex. The cutting edge is formed of the back of the first, which is attacking the tiger, who is turning round and gripping the flanks of a crouching ibex. Our present scanty knowledge of the archæology of Afghanistan in the centuries preceding the Sassanian dynasty does not admit of any distinct statement of the uses to which an object of this kind might be put, nor are we able to interpret the symbolism of the conjunction of these three animals. The nearest analogy is an axe presented to the British Museum by Major P. M. Sykes, from Kerman in Persia. In this the animal forms are degraded and almost lost; but a second axe of the same find has the beasts standing free and well-defined, though the execution is not so artistic as in the present example, which, by comparison with the Oxus treasure in the museum, is probably a specimen of the art of Bactria about the time of Alexander the Great.

ACCORDING to the reports published in the December issue of the Proceedings for 1913, the Philadelphia Academy of Sciences appears to have had a prosperous year, having received during that period two considerable money bequests, while a number of cases in the museum have been rearranged. The accessions to the library were nearly 1000 in excess of those in the preceding year.

PARTS viii. and ix. of Dr. Koningsberger's "Java" contain a brief account of the fishes of the island—both fresh-water and marine—which are stated to be still very imperfectly known. Another section is devoted to the reptiles, in which it is stated that Schlegel's gharial (*Tomistoma schlegeli*), of Sumatra, Borneo, and the Malay Peninsula, may not improbably occur in Java, although definite evidence is not yet forthcoming.

THE question whether a certain number of fertilised female house-flies (*Musca domestica*) pass the winter in a dormant condition, to revive and produce progeny in the spring, according to a note by Mr. E. A. Austen, of the British Museum, in the February number of *The Entomologist's Monthly Magazine*, still awaits

a definite answer. An American observer, Dr. H. Skinner, has, indeed, committed himself to the statement that house-flies pass the winter only in the pupa-stage, but this is not in accord with the views of Messrs. Newstead and Jepson in this country. The point is of considerable importance in connection with the crusade against house-flies as disseminators of disease.

To the Journal of the East Africa and Uganda Natural History Society for December, 1913, Mr. R. B. Woosnam, Game Warden for British East Africa, communicates an important article on the relation of game animals to disease in Africa, with special reference to the proposal to clear off such game animals in certain parts of East Africa with a view of stamping out tsetse-fly disease and other maladies. The theory hitherto largely favoured by experts is that game animals alone serve as "reservoirs" for the trypanosomes, and other blood-parasites, by which such diseases are caused; but the author points out that not only is there a strong probability, but likewise a practical certainty, that other animals serve in a similar capacity. And this being so, the futility of attempting to kill off all the game animals in certain districts is self-apparent. In the opinion of the author, a far more hopeful plan is to rely on the possibility of producing or accelerating immunity to the diseases in question in the animals liable to be infected. "If," writes Mr. Woosnam, "wild animals can acquire an immunity in nature and domestic native cattle can also acquire immunity [which in certain instances they undoubtedly do], is it not possible that the greatest success may eventually result from an artificially produced immunity?"

In a valuable report on the effect of water on the cultivation of cotton (Egyptian Ministry of Finance Survey Department, Paper No. 31, 1913), Messrs. Hughes and Hurst, who were assisted in their field work by Messrs. Bolland and Ferrar, give details of a series of experiments made with a view of eliminating other factors in an estimate of the influence upon the cotton yield of the level of saturation in the soil. Their general conclusion is that with the subsoil water at a low level fairly heavy watering gives greater yields than very light watering, which may easily be pushed so far as seriously to affect the yield. They find, however, that fairly heavy watering delays the ripening of the crop, and they point out that too wide an interpretation is not to be placed on the results obtained from the experiments, the chief importance of which lies in the methods adopted, especially the arrangement of the experimental plots in such a manner as approximately to eliminate the effect of factors which varied from point to point of the fields.

It would appear, from investigations by Mr. W. R. Dunlop (*West Indian Bulletin*, vol. xiii., No. 4), that certain groups of varieties of sugar-canes possess differentiating characteristics as regards their stomata, and that if the general morphological and anatomical characters of the varieties be taken into consideration, each one variety can be identified by its leaf alone. The stomatal density per unit of area is one of the chief characteristics, though in the investigation under review the range of variation has not been determined with sufficient accuracy to permit more than the classification of the varieties examined into groups as regards stomatal densities. The relation of the ratio of the total stomatal area to the entire surface of the leaf, and the susceptibility of any variety to drought is discussed, and actual observation has shown that a variety possessing a high stomatal area with other hydrophyllous characters appears to be unsuited for cultivation in areas of low rainfall and humidity. Whether any general relation exists between sucrose content of varieties and stomatal characteristics has yet to be determined, but such observations would appear to provide a useful guide in future selection of sugar-cane for drought resistance.

One of the useful articles in the recently published Journal of the Scottish Meteorological Society (vol. xvi) is a somewhat laborious investigation of "A Possible Two-hourly Period in the Diurnal Variation of the Barometer," by Mr. M. M'Callum Fairgrieve. The paper was suggested by certain departures from a smooth curve every alternate hour, shown by the result given by Dr. Chree in a paper on the barometric pressure at Castle O'er (Quart. Journ. Roy. Met. Soc., October, 1911). Mr. Fairgrieve examined long series of observations at some of the Meteorological Office observatories, and other places, and found that a two-hourly oscillation was very apparent at certain places, while at others there was little indication of any such variation. The author finds it difficult to assign a proper explanation of the results obtained, whether physical or instrumental, but suggests that it is obviously of importance that the point should be cleared up.

It is well known that while the number of regular solids is limited, a similar limitation extends to "polytopes" in multi-dimensional space, the cube, regular tetrahedron and octahedron being the only types which can be extended indefinitely to the higher dimensions. There are, however, certain semi-regular polyhedra which play an important part in crystallography. We have now received papers from Dr. P. H. Schoute, reprinted from the transactions of the Cambridge Mathematical Congress, and Dr. E. L. Elte (Amsterdam Proceedings, 1912), dealing with the different degrees of regularity and characteristics of the various semi-regular polytopes in multi-dimensional space. While these interesting problems are being competently treated by mathematicians, the popular fallacy of "*the fourth*" dimension seems as hard to eradicate as ever. Prof. Samuel M. Barton's article in *The Popular Science Monthly* for October is correct enough in its geometrical facts, but the use of the word "fourth," for the more correct terms, "four" and "many," will be likely to militate against the usefulness that would accrue from an essay dealing professedly with "hyperspaces."

After conference with the American incandescent lamp manufacturers, the United States Bureau of Standards has issued a sixth edition of its circular containing standard specifications for such lamps. Although the specifications were originally intended for

the use of Government departments only, the public has made such large demands for them that an annual edition has appeared since the circular was first printed in 1907. Another circular for which the demand is likely to be extensive is that on copper wires, prepared at the request of the American Institute of Electrical Engineers. It contains nearly seventy pages of tables and other information about copper wire, brought thoroughly up to date, last year's work of Mr. G. L. Heath on the relation between the purity and temperature coefficient of resistance of wires being included.

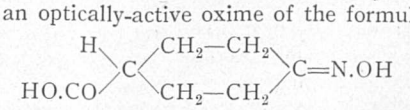
THE January number, which begins the career of the *Annales de Physique* as a separate publication, consists of ninety-six pages of the same size and style as the *Annales de Physique et de Chimie* have made us familiar with in the past. The annual volume is to extend to nearly 600 pages, and the price outside France is to be 28 francs. Profs. Lippmann and Bouty are the editors, and the first number is certainly a credit to them. It contains a communication by M. Violle on physical units to be adopted in France, a second by M. Brillouin on a relation between specific heat and radiation of a body independent of the quantum hypothesis, a third by M. Marcelin on the thickness of films spread on the surface of water, in which it is shown that the thickness of a camphor film may be as small as the diameter of a camphor molecule, and, lastly, the first part of a long paper by M. Croze describing experiments on the emission spectra of the commoner gases

A CIRCULAR (No. 43) has been issued by the Bureau of Standards at Washington with reference to the international metric carat of 200 mg., which was adopted on July 1 last by the United States customs service as the unit for determining the import duties on precious stones. Tables of equivalents are included in the circular, which will be useful to diamond dealers in converting from the old unit to the new and *vice versâ*. The value adopted for the old carat is 205·3 mg., which is the average weight of the various carats previously in use in the United States. This is precisely the same value as that of the old carat hitherto used in the United Kingdom, which is to be displaced on April 1 next by the metric carat of 200 mg., in accordance with the Order in Council of October 14 last. The tables would accordingly be useful also to British jewellers for conversion purposes; they are much more complete and practicable than those issued by some American firms of gem dealers in the form of "folders," and are followed by some valuable hints on the care and use of balances and weights for weighing precious stones.

THE July to December, 1912, number of *Isis*, the publication of the Dresden Society for Natural Knowledge, contains a paper by Mr. H. Dember on the relationship between atmospheric electricity and wireless telegraphy. The theory has been advanced that electric waves suffer reflection from an ionised layer in the upper atmosphere, and that the development of this layer by day causes the difference between day and night wireless phenomena discovered by Marconi. The author's object was to secure direct evidence of such ionisation. As ultra-violet light is rapidly absorbed by the earth's atmosphere, he pursued his inquiries in Switzerland, near Arolla, at considerable heights, the one 2000, the other 3400 metres, above sea-level. The ionising action of sunlight, it is argued, must increase equally the number of negative and of positive ions. The latter normally preponderate in number, thus sunlight must tend to increase the ratio borne by the number of negative to the number of positive ions. The free ionic charges in the atmosphere were observed in the usual way with Ebert's apparatus, while the ultra-violet radiation was simultaneously measured by a simple apparatus designed by the author. The results of the observations, which were made on five days in August and September, 1911, are illustrated by figures, which show on the whole a parallelism between the variations of the ultra-violet radiation and the magnitude of the ratio of the ionic negative to the ionic positive charges. The author allows that the observed effect, even at 3400 metres, was probably due in large part to a vertical current or convection of ions produced at greater heights in the atmosphere. The same paper describes some interesting observations on the absorption of sunlight of various wave-lengths made in August, 1912, in the Italian Alps, with a new apparatus. The results are discussed in reference to Lord Rayleigh's theory of atmospheric action.

THE "Wratten and Wainwright Division" of Kodak, Limited, have just issued a fifty-page pamphlet on reproduction work with dry plates. They make out a very strong case for the use of panchromatic gelatine plates in direct screen negative making for three-colour work, claiming not only that gelatine is as good as collodion, but that it is much preferable, when the photographer has become accustomed to it. But the plate must have a fine grain, be very sensitive to red and green, and give great density and contrast, characteristics which are found in the Wratten process panchromatic plate, which is rendered colour sensitive by "bathing," that is, immersion in the dye solution after the plate is coated. The pamphlet is intended for the guidance of the block-maker, and gives detailed suggestions with regard to each step in the process. We learn that the laws of geometrical projection are good and sufficient guides for regulating screen-distance, so that after the innumerable pages that have been written on this subject, the whole matter may, for practical purposes, be expressed in a line or two. The reason why greens are so difficult to reproduce is fully explained. A choice of six pairs of colour filters for two-colour work is given, and there are several other items of interest, even to those who regard such matters from a merely theoretical point of view.

MUCH interest was aroused by the preparation in 1910 of an optically-active oxime of the formula



The preparation of this compound afforded the first concrete evidence that the three bonds of the nitrogen atom were not in a plane, and so provided a solid foundation for the theory which Hantzsch and Werner had put forward in 1890 to account for the isomerism

of certain oximes of the aromatic series. In the January issue of the Chemical Society's Journal, Dr. W. H. Mills and Miss Bain describe an extension of these experiments, in which they have succeeded in isolating active salts of the semicarbazone,

$$>C{=}N.NH.CO.NH_2,$$

and benzoylphenylhydrazone,

$$>C{=}N.N(C_6H_5).CO.C_6H_5,$$

of the same ketone. The resolution of the former compound was effected by means of morphine, that of the latter by means of quinine. The rotatory powers were transient, but of large magnitude, $[M]_D$ 30 to 40° for the semicarbazone, and as high as $[M]_D$ 238° for the hydrazone. The experiments strongly support the hypothesis that "the three valencies of the doubly-linked nitrogen atom do not lie in one plane, but are directed along the three edges of a trihedral angle."

THE control system of the Panama Canal locks is described in *Engineering* for February 20. The control houses contain horizontal control boards—the board at Gatun is 64 ft. long—on which are arranged all the control handles and indicators, the board taking the form of a miniature representation of the locks. Indicators are provided showing the opening of the various valves, the height of water in the locks, &c. Small model leaves show each gate in plan, and working models of the chain fenders are also provided at the proper places. All the indicators and models follow and reproduce the conditions in the full-size lock exactly, except in certain cases, when an "open" or "closed" indication suffices. The form of indication system adopted is of interest. Step movements such as are obtainable with ratchets, &c., were ruled out as inadequate, and an electrical system involving the use of 732 small indicator motors has been developed. A complete synchronous indicator set consists of a transmitter, located at, and driven by, the operating machine, whether in the case of the sluice-valves or other gear, and a receiver and indicator worked thereby in the control house.

DIRECTORS of education and others responsible for the erection and fitting of new science laboratories would do well to study the new, excellently illustrated catalogue entitled "Laboratory Fittings and Furniture," published by Messrs. Reynolds and Branson, Ltd., of Leeds. The plans and photographs of recent laboratories, for the fitting and equipment of which this firm has been responsible, which are included in the catalogue, will prove useful guides for persons planning new laboratories, and the other particulars will be found arranged in a manner which makes reference very easy.

OUR ASTRONOMICAL COLUMN.

ASTRONOMICAL OCCURRENCES FOR MARCH :—

March 2. 11h. om. Saturn at quadrature to the Sun.
3. 21h. 36m. Jupiter in conjunction with Uranus (Jupiter 0° 9′ N.).
4. 14h. 39m. Saturn in conjunction with the Moon (Saturn 6° 47′ S.).
6. 14h. 44m. Mars in conjunction with the Moon (Mars 1° 49′ S.).
7. 20h. 6m. Neptune in conjunction with the Moon (Neptune 4° 35′ S.).
10. 4h. om. Mercury in inferior conjunction with the Sun.
11. 16h. 13m. Moon eclipsed, partly visible at Greenwich.
20. 23h. 11m. Sun enters sign of Aries; spring commences.
21. 14h. 58m. Uranus in conjunction with the Moon (Uranus 2° 32′ N.).
,, 20h. 39m. Jupiter in conjunction with the Moon (Jupiter 2° 26′ N.).
22. 6h. om. Mars at greatest heliocentric latitude N.
,, 13h. om. Mercury stationary.
24. 4h. 16m. Mercury in conjunction with the Moon (Mercury 1° 8′ N.).
27. 9h. 55m. Venus in conjunction with the Moon (Venus 4° 16′ S.).

A FAINT COMPANION TO CAPELLA.—An interesting discovery has been made by Dr. R. Furuhjelm (*Astronomische Nachrichten*, No. 4715), who has found that Capella, a spectroscopic double star, is accompanied by a faint companion (phot. mag. 10·6) at a very great distance. The absolute positions of the stars, according to the Helsingfors Catalogue plates are as follows :—

	α 1900·0			δ 1900·0			Epoch
	h.	m.	s.	°	′	″	
Capella ...	5	9	18·09	+45	53	49·1	1895·42
The faint star	5	10	1·26	+45	44	23·9	

The companion is distant from Capella by 12′ 3·3″, and the position angle is 141° 20′. The discovery was made by comparing the proper motions of the stars in the neighbourhood of Capella determined from photographs of the region taken at two different epochs at Helsingfors. Dr. Furuhjelm's proper motion for the faint star gave the values 0·422″ in the direction 170·9°, while the values for Capella as determined by Boss were 0·438″ in the direction 168·7°. Other stars in the vicinity have no such physical relationship.

THE SOLAR SYSTEM.—The following neat empirical formula connecting certain elements of the known planetary satellites is given by M. F. Ollive in a modest little note communicated to the French Academy of Sciences (*Comptes rendus*, vol. clvii., No. 26, p. 1501). Let R′ represent the mean distance of the satellite from the planet around which it gravitates, v' its orbital velocity, R the mean distance of the planet from the sun, and r its mean radius, then, M. Ollive states, $r^3 = kRR'v'^2$. In c.g.s. units the constant $k = 4{\cdot}313 \times 10^{-8}$.

The data for the twenty-six known satellites in the solar system necessary for calculating the planetary radii are tabulated, together with the deduced ratio of the radius of the planet to that of the earth compared with the measured values. The formula gives the radius of the earth with great accuracy, the ratio deduced/measured being 1·0001, according to our calculation; for Mars also the deduced radii are almost identical *inter se*, and with the measured value. For Jupiter and Saturn, whilst the deduced values are highly consistent among themselves, except that given by Saturn's ninth and most distant satellite, they are slightly in excess (approx. 6 per cent. and 2 per cent. respectively) of the measured radii. For Uranus and Neptune the formula gives results roughly 50 per cent. and 100 per cent. too high respectively.

PERIODICITIES IN PROMINENCES AND SUN-SPOTS COMPARED.—In this column in November last (vol. xcii., No. 2297, p. 302) reference was made to Mr. T. Royds's investigation on prominence periodicities by the periodogram method. In a recent Kodaikanal Observatory Bulletin (No. 34) he undertakes the task

of trying to find out whether the well-established sun-spot periodicities, other than that of eleven years, exists or not in prominences. He limits himself to periodicities up to eleven years in this communication, and studies them by the periodogram method as before. The data used are those published by the Italian observers, and deal with all prominences more than 30″ in height recorded since 1871. A brief summary of his conclusions is as follows. The prominence periodogram is very similar to that of spots for the same time interval. Between two years and eleven years there are no periodicities present in prominences which can be proved to be absent from sun-spots and *vice versâ*. The eleven-year period is the predominant feature of the prominence periodogram, and its maxima occur about one year later than in sun-spots. The maxima of its first subperiod, 5·56 years, are not delayed in prominences. Periods between seven and eight years of considerable intensity in prominences have been shown to be present also in spots, but they are not permanently active. As regards shorter periods, that of thirteen months in prominences is not present in spots, and one of 8½ months in spots is stated to disappear for a time and then reappear. In December last (NATURE, vol. xcii., No. 2301, p. 411) reference was made to Prof. A. A. Michelson's determinations of sun-spot periodicities by the harmonic analyser, but he could not find any periodicity other than that of eleven years.

THE TEACHING OF ANTHROPOLOGY AT THE UNIVERSITIES.

A JOINT committee of the Royal Anthropological Institute and Section H of the British Association, of which Sir Richard Temple is chairman, has had under consideration the steps desirable to give practical effect to the conclusions resulting from the discussion, which took place at the meeting of the British Association at Birmingham last September, on the practical application of anthropological teaching in universities. It will be remembered that it was held at Birmingham that increased facilities should be offered at our universities for training those who, in after life as officials, business men, missionaries, and the like, will be brought into close contact with the peoples of the Empire, whose civilisation is alien to our own. After careful consideration, the joint committee is of opinion that such facilities can best be offered by the collaboration of the Royal Anthropological Institute, the British Association, and the universities, with the support and the cooperation of the Government, the Foreign Office, the India Office, the Colonial Office, and the Civil Service Commissioners, and that it would be well for the organisation to take the form of encouraging the existing schools of anthropology in the universities and the formation of such schools, where none exist, with their indispensable adjuncts of laboratories, libraries, and museums.

In furtherance of the scheme thus elaborated a conference was summoned by the joint committee at the Drapers' Hall, by courtesy of the Master and Wardens of the Drapers' Company, on Thursday, February 19, under the chairmanship of the Earl of Selborne, K.G. Letters supporting the proposals of the conference were received from, among others, the Colonial Secretary, Lord Cromer, Sir Richard Martin, Sir Robert Blair, Sir George Grierson, Sir Joseph Larmor, M.P., Sir John Rhys, Sir Ernest Trevelyan, and the Right Honourable Ameer Ali. An encouraging feature was the presence of an official representative of the Colonial Office.

The following resolution was moved by Sir Henry Craik, M.P., seconded by Sir Everard im Thurn (Royal Geographical Society), and carried unanimously:—"That this conference approves the findings and views of the joint committee, and is of the opinion that, in the highest interests of the Empire, it is necessary so to extend and complete the organisation of the teaching of anthropology at the universities of Great Britain, that those who are about to spend their lives in the East, or in parts of the Empire inhabited by non-European races, shall at the outset of their career possess or have the opportunity of acquiring a sound and accurate knowledge of the habits, customs, social and religious ideas and ideals of the Eastern and non-European races subject to his Majesty the King-Emperor."

A second resolution, moved by Sir Hercules Read (British Museum), and seconded by Dr. T. H. Warren (Oxford University), was as follows:—"That this conference hereby authorises the chairman and members of the joint committee of the British Association for the Advancement of Science and the Royal Anthropological Institute, to represent to the Prime Minister, the Right Hon. Herbert Henry Asquith, K.C., M.P., the opinions of this conference as set forth in the preceding resolution, and to move him to appoint an Inter-departmental Committee for the purpose of advising as to the form in which the sympathy and support of his Majesty's Government can be best expressed." The resolution was carried unanimously.

All the speakers to the resolutions strongly endorsed the findings of the joint committee, and pointed out how seriously handicapped were young men in every walk of life, who went abroad without any anthropological training, amongst alien peoples, and it was only by the painful process of committing mistakes that they were enabled to get an insight into the habits and customs of those with whom they came into daily contact. The Hon. J. G. Jenkins (London Chamber of Commerce) bore testimony to the wastage of millions of pounds sterling in trade owing to this fact, as the mistakes constantly made by the untrained men, who were sent out by commercial firms, were made at the expense of the firms; in the case also of the untrained missionary, he stated that during his first years abroad ground was lost and good influence retarded until he began to get a knowledge of the people, finally, from his own experience as a Minister in the Government of South Australia, he laid strong emphasis on the necessity for State aid in the anthropological training of the youth of the Empire.

As Prof. Arthur Keith pointed out, the Royal Anthropological Institute has spent more than thirty years in collecting information, so that the knowledge is available, but it is the dissemination of this knowledge that is necessary, and to achieve this object the institute had been trying for the last twenty years to induce the Imperial Government to help by means of financial support.

Dr. J. G. Frazer (British Science Guild) mentioned that it was largely due to the lack of anthropological training that the recent outbreak occurred in Somaliland, and this is not the first occasion on which loss of life and money has been attributed to the same cause.

In the interests of the Empire it is earnestly to to be hoped that Dr. Warren will prove a true prophet and official support will be given in a matter of such vital importance, and that a scientific system of anthropological training will be the outcome of the conference, and thereby crown with success the labours of the joint committee and of its indefatigable secretary.

COLOUR VISION AMONG CRUSTACEA.

WHETHER the lower animals have colour-perception is a question that has long been discussed without conclusive evidence being forthcoming. Paul Bert and the late Lord Avebury may be cited amongst those who claimed by their experiments proof of a colour-sense in Daphnia, whilst other investigators, among the most recent being C. Hess, conclude that what appear to us as colours are to these lower Crustacea only degrees of brightness; that, in fact, these animals are in the position of a colour-blind man, and choose what are to him and them the brightest part of the spectrum.

A recent issue of the *Biologisches Centralblatt* (vol. xxxiii., No. 9, 1913) contains an interesting and careful piece of experimental evidence on the behaviour of Daphnia and of Artemia to white and to monochromatic light. By the aid of a specially devised mode of illumination (a 100 candle Osram lamp and fluid light-filters or coloured glass screens) Dr. von Fritsch and Herr Rupelwieser have been able to make a more critical test of the responses of these Crustacea than was possible to most of their predecessors in this line of research. Working with white light (whether vertically or horizontally) these authors find that Daphnia remains evenly distributed under the influence of a medium light-intensity, but that it moves away from the source of light if the brightness of this is raised, and towards the light if the intensity is lowered. In this respect the work of the authors merely confirms similar observations already published.

If now a blue screen be interposed the Daphnia, in spite of the lowered intensity, move away from the light. On the other hand, if a yellow screen is used the Daphnia move towards the light, although its intensity is greater and is such as would ordinarily induce a negative reaction. On these and other grounds the authors conclude that Daphnia has a colour-sense and not merely a perception of varying degrees of light intensity. Red, yellow, and green rays attract Daphnia; blue-green, blue and violet rays repel Daphnia.

The whole question has been dealt with more fully by the late Lord Avebury in his "Senses of Animals" (International Science Series, vol. lxv., 1889) than the German authors give that distinguished naturalist credit for, and indeed they refer only to his earlier paper (1881). Both the German and the English authors arrive at similar conclusions, though Lord Avebury used a method of choice which was not employed by these most recent workers.

One further point of interest is the varying degrees of response given by strains of the same species and of different species of Daphnia. For example, in testing the effects of coloured light upon the eye, a very definite response was at first found to occur in red light, and quite another in blue light; but when the observers tried to repeat this effect on another batch of Daphnia, they were unsuccessful in obtaining a strain which responded so well as the first, until after six months' trials. *Daphnia magna* was found to give more consistent results than the common *Daphnia pulex*. F. W. G.

ORNITHOLOGICAL NOTES.

AT the conclusion of a note on the food and feeding habits of the pheasant, published in the Journal of the Land Agents' Society for December, 1913, Mr. W. E. Collinge states that the greater portion of the food of these birds consists of injurious insects and the seeds of weeds, the statement being based on the examination of the contents of the crops and stomachs of no fewer than 183 birds. Pheasants daily wander over large areas of land in search of food, and—altogether apart from their value as game—merit protection on the part of all persons interested in agriculture. Although they occasionally snip the leaves of root crops, especially in very dry weather, most of the damage of this nature laid to their charge is really caused by wood-pigeons.

The difficult question as to whether "willow-tits," as typified by *Parus borealis*, are really entitled to specific distinction from "marsh-tits" (*P. palustris*), is discussed by Mr. Collingwood Ingram in *The Zoologist* for November, 1913, in connection with their respective French representatives. Provisionally, the author considers it expedient to recognise this distinction, the marsh-tits being characterised by the steely-blue sheen on the crown, whereas in the willow-tits this is replaced by dull brownish or sooty black.

The list of casual visitors to the British Isles has been augmented by the capture on October 3, 1913, of a specimen of the dusky warbler (*Phylloscopus fuscatus*) on Auskerry, in the Orkneys. The capture was recorded by Mr. Eagle Clarke in the *Scottish Naturalist* for the same year (pp. 271–3), and is more fully noticed in *British Birds* for January, 1914 (pp. 220–3). The species breeds in eastern Siberia, and visits southern China, northern India, Burma, &c., in winter.

In *British Birds* for December last Mr. G. R. Humphreys records the breeding of the rosy tern, *Sterna dougalli*, during the past summer in Ireland, where these birds have hitherto been supposed to be extremely rare. In the breeding-place referred to by the author they were, however, met with in comparatively large numbers. The identification of the species is based on the examination of the parent birds with field-glasses, and on the colouring of the nestlings—notably of the legs—which is stated to be very markedly distinct from that of other terns at the same age.

Further particulars with regard to the number of birds "ringed" during the past season in this country and records of their recapture are given by Mr. H. F. Witherby in the above-mentioned issue of *British Birds*. The total number is 14,843, against 11,483 in 1912, and 2171 in 1909. The present percentage of recaptures (Mr. Witherby uses the word "recoveries," which suggests a meaning different from the one intended) is 3·3 per cent., on a total of more than 30,000; but as many of such recaptured birds afford no data of any importance, the percentage yielding information of scientific value falls short of three.

To vol. xxxv. (pp. 209–23) of Notes from the Leyden Museum, Dr. E. D. van Oort communicates further particulars with regard to the recapture of birds ringed in Holland. Perhaps the most interesting items relate to a couple of spoonbills, one of which was shot in the Azores and the other in Portugal.

The bird-life of the coast in the neighbourhood of Bergen forms the subject of an article, illustrated by very interesting photographs of nests and nesting-sites, by Mr. O. J. Lie-Pettersen, in the November number of *Naturen*.

Bird-Lore for November and December, 1913, is a highly attractive issue of an ever-popular journal, the two coloured plates of well-known American birds being well worth the price of the whole part. An editorial article alludes to the striking advances which have been made in the protection of American birds during the past year, while other articles mention the work done by the various Audubon societies, these being supplemented by the reports of local agents.

A remarkable difference in the plumage of male

hybrids between the common pheasant and Reeves's pheasant, according as to whether the first or second species was the male parent, and *vice versâ*, is recorded by Mr. J. C. Phillips, in *The American Naturalist* for November, 1913. So different, indeed, are these two types of hybrids, that they might well be regarded as distinct species. In the cross with the Reeves as male parent that species impressed its characters much more strongly on the hybrids than was the case with the opposite cross. As the progeny of such a cross are generally sterile, the crossing could not be further continued.

The biological survey division of the U.S. Department of Agriculture has issued, as Bulletin No. 43, a useful list of literature relating to the food of birds published by the members of the survey between the years 1885 and 1911. Also, as Circulars Nos. 92 and 93, proposed regulations for the protection of migratory birds, with a popular explanation of their scope and probable effect. The scheme includes uniformity in protection of migratory game and insectivorous birds in the several States; protection of birds in spring, while *en route* to their nesting grounds and while mating; uniformity in protection of migratory birds at night; establishment of protected migration routes along three great rivers in the central United States; complete protection for five years for the smaller shore-birds and species which have been greatly reduced in numbers; and reduction of the open season on migratory game-birds, to the extent, in most cases, of not more than from 25 to 50 per cent.

In Nos. 2 and 3 (issued together) of the *Austral Avian Record*, Mr. G. M. Mathews proposes no fewer than twenty-one new generic names for Australasian birds, in addition to certain others to replace inadmissible ones. In this "splitting" are included the genera Sula, hitherto taken to comprise all the gannets, and Phæthon, the accepted term for all the tropic-birds. Other species and races are named in No. 4 of the same volume.

Under the somewhat too generalised title of "Notes upon Some Rare New Zealand Birds," Mr. Symington Grieve communicates to vol. xix., No. 4, of the Proceedings of the Royal Physical Society of Edinburgh, an important article on the history, habits, distribution, and distinctive characters of the various species of Apteryx. Most of these birds are now very scarce, and it is believed that *A. haasti* has either been already exterminated, or is on the verge of extinction. The author alludes to all the species under the name of "kiwi," but, we believe, the Maoris restrict that title to certain species, designating the others "rowa."

To the number of *The Emu* for October, 1913, Mr. A. J. Campbell communicates an account, illustrated by three beautifully coloured plates, of an unrivalled collection of Australian birds'-eggs, brought together by Mr. H. L. White, of Beltrees, near the upper part of the Hunter River. Out of a total of between 800 and 900 species and subspecies recognised in the "Official Check-list of the Birds of Australia," Mr. White possesses the eggs of no fewer than 800, thus lacking only about 8 per cent. of the whole. It may be added that the Beltrees Estate, comprising about 200,000 acres, is a close sanctuary for birds, where many species are increasing in number.

In a paper on fossil feathers, published in No. 7 of vol. xxi. of *The Journal of Geology*, Dr. R. W. Shufeldt states that several specimens described as such have subsequently proved to be ferns. The authors figure a number of specimens or more or less well-marked impressions of feathers, from those of Archæopteryx upwards. R. L.

THE INDIAN MUSEUM AND SCIENCE CONGRESS.

CALCUTTA was the scene last month of a celebration of considerable importance to all who are interested in the progress of science in the East. The trustees of the Indian Museum resolved to commemorate in a fitting manner the centenary of the premier museum in Asia, and a short account of its proceedings will no doubt be of interest to those who were not privileged to take part in them.

The celebrations happily coincided in time with the first Indian Science Congress, the meetings of which were appropriately held in the rooms of the Asiatic Society on January 15–17.

At the opening meeting of the congress, the Hon. Justice Sir Asutosh Mukerji presided. Sir A. Mukerji, in his opening address, said that more than two years ago Prof. MacMahon, of Canning College, Lucknow, and Prof. Simonsen, of the Presidency College, Madras, brought forward a proposal for the foundation of an Indian Association for the Advancement of Science. The object and scope of the proposed institution were stated to be similar to those of the British Association, namely, to give a stronger impulse and a more systematic direction to scientific inquiry, to promote the intercourse of societies and individuals interested in science in different parts of the country, to obtain a more general attention to the objects of pure and applied science, and the removal of any disadvantages of a public kind which may impede its progress. The proposal was widely circulated, and met with a favourable reception. It was felt by many men of experience that the pressure of heavy official duties, the climatic conditions which prevail in the country, and the long distances which have to be traversed, constitute practical difficulties in the immediate formation of a peripatetic association designed to meet periodically in turn in all the different centres of scientific activity. The call to scientific workers met with a generous response, as was amply indicated by the presence at the congress of many notable investigators from all parts of the Indian Empire.

The reading of papers commenced at the conclusion of the address, and in the course of the congress a number of important communications were made in various departments of science. The chairmen of the various sections were:—*Chemistry*, Prof. P. S. MacMahon; *Physics*, Prof. V. H. Jackson; *Zoology*, Dr. J. R. Henderson; *Geology*, Dr. H. H. Hayden; *Botany*, Mr. C. C. Calder; *Ethnography*, Mr. L. K. Anantha Krishna Iyer. Mr. D. Hooper, of the Indian Museum, was honorary secretary and treasurer of the congress.

The centenary celebrations of the Indian Museum commenced on the afternoon of January 15, by a reception of delegates at the rooms of the Asiatic Society. His Excellency Lord Carmichael, Governor of Bengal, who took a keen interest both in the museum celebrations and in the congress, was present as chairman of the centenary committee, and took the chief part in receiving the delegates.

The Indian Museum owes its inception to the Asiatic Society of Bengal, which was founded by Sir William Jones in 1784. Donations of various kinds having gradually accumulated in the society's premises, Dr. N. Wallich, the Danish botanist of Serampore, wrote, on February 2, 1814, a letter to the society strongly advocating the formation of a museum. This proposal was forthwith accepted. The scope of the museum was defined in the widest terms, and contributions throwing light on the history or science of the East were solicited. The museum thus inaugurated made rapid progress, and the specimens brought to-

gether were housed until 1875 in the rooms still occupied by the Asiatic Society of Bengal. In 1875 the collections were transferred by the society to the fine building which had been erected for their reception on Chowringhee, the main thoroughfare of Calcutta. Since then, through the labours of distinguished superintendents, viz., Dr. John Anderson, Mr. J. Wood-Mason, Lieut.-Col. A. Alcock, and Dr. N. Annandale, progress has been rapid and continuous. Considerable extensions to the original building have been found necessary, and, thanks to the unrivalled Oriental collections and to a very complete library, the museum is not only a great educational institution, but also an important centre for research, especially in zoology and geology.

The celebrations terminated in a very successful conversazione held in the Indian Museum on January 17. The company present included their Excellencies Lord and Lady Carmichael, and a representative selection of the European and Indian communities of Calcutta, as well as the delegates and the members of the Science Congress. An extremely interesting series of exhibits had been arranged by the officers of the museum, comprising archæological, art, botanical, ethnological, geological, and zoological specimens, and brief reference may be made to some of the more important of these.

Prominent among the archæological exhibits was one to illustrate the evolution of the Buddha image, commencing with the Gandhara or Indo-Greek school, and continuing with the later types from Mathura, Amarawati, Sarnath, Bengal, Tibet, and Further India. The botany and ethnology of the Abor country, visited by a punitive expedition in 1911–12, were illustrated by specimens exhibited by Messrs. Hooper, Kemp, and Coggin Brown. The geological series lent by the Geological Survey of India comprised characteristic Indian fossils exhibited by Dr. G. E. Pilgrim.

The zoological exhibits, which were very numerous, attracted a large share of attention. Prominent among them was a series of deep-sea animals dredged by the R.I.M.S. *Investigator*, exhibited by Major Lloyd and Captains Seymour Sewell and T. L. Bomford, and comprising fish, crustacea, mollusca, echinoderms, and corals. Remarkable fresh-water invertebrates recently discovered in India were exhibited by Dr. Annandale and Messrs. Kemp, Gravely, and Agharkar, and included the very interesting medusa (*Limnocnida indica*), discovered three years ago in the upper waters of the River Kistna in the Western Ghats. Recently discovered Indian fresh-water fishes and specimens of the fresh-water sting-rays of the Ganges were shown by Dr. Chaudhuri. Dr. Annandale exhibited a series of specimens to illustrate a paper which he read before the Science Congress on convergence in aquatic animals. Convergence in skeletal structure was shown between different fresh-water sponges, and in the special form of spicules in different families of sponges, while the same phenomenon was also illustrated in the degeneracy of calcareous plates in the stalked barnacles, in the form of shell between the marine oysters and the fresh-water family Aetheriidæ, in degeneration of the eyes in the Indian electric rays, in the independent evolution of pigmentation of the ventral surface in different deep-sea rays, in general form between certain carp of the Himalayas and Tibet and the Salmonidæ, and in the independent evolution of adhesive suckers in different tadpoles and fishes inhabiting rapid-running streams. Mr. Kemp exhibited zoological specimens from the Abor country, the expedition to which he accompanied in the capacity of naturalist, among them being the Peripatus (*Typhloperipatus williamsoni*), which he discovered, the first representative of the group to be met with north of the Isthmus of Kra in the Malay Peninsula. A small but interesting collection of type-specimens of Asiatic squirrels containing the type of *Funambulus layardi*, Blyth, mounted in the Asiatic Society's Museum seventy years ago, was exhibited to prove that it is possible to preserve mammal skins in Calcutta for an indefinite period, if proper precautions are taken.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

BIRMINGHAM.—The trustees of the John Feeney bequest have granted to the University the sum of 1000*l.* in aid of research and instruction in wireless telegraphy. The money is to be applied to the erection of a wireless telegraphic installation on the University buildings at Edgbaston.

CAMBRIDGE.—Dr. Hobson, Sadleirian professor of pure mathematics, has been nominated to represent the University on the occasion of the celebration on June 29–30 and July 1 of the three hundredth anniversary of the foundation of the University of Groningen.

The Vice-Chancellor announces that Mrs. A. M. Babington has expressed the wish to defray the cost of the gallery which is being built to house the exhibit of local antiquities. This gallery, which will be known as the "Babington Gallery," is being erected to the memory of the donor's husband, Prof. Babington, of St. John's College, and professor of botany in the University. It was Prof. Babington who, in the early forties of last century, initiated the Cambridge Antiquarian Museum, which forty years afterwards ceded to the University. The extent of Mrs. Babington's benefaction will amount to 1550*l.*

The University Buildings Syndicate has had under consideration the question of providing a central electric power station to supply the numerous science and other buildings on either side of Downing Street. At the present moment there is an assortment of engines supplying these various laboratories, but the system has many inconveniences, and is costly and extravagant. The syndicate wishes to be authorised to expend a sum not exceeding 3000*l.* in providing a power station in connection with the engineering laboratory, and also to enter into a contract with the Cambridge Electric Supply Company for the supply of electricity for a period of ten years.

The next combined examination for fifty-three entrance scholarships and a large number of exhibitions, at Pembroke, Gonville and Caius, Jesus, Christ's, St. John's, and Emmanuel Colleges, will be held on Tuesday, December 1, 1914, and following days. Mathematics, classics, natural sciences, and history will be the subjects of examination at all the above-mentioned colleges. Most of the colleges allow candidates who intend to study mechanical science to compete for scholarships and exhibitions by taking the papers set in mathematics and natural sciences. Forms of application for admission to the examination at the respective colleges may be obtained from the masters of the several colleges, from any of whom further information respecting the scholarships and exhibitions and other matters connected with the colleges may be obtained.

MR. S. HEY, secretary to the Education Committee of Newcastle-upon-Tyne, has been appointed director of education for Manchester in succession to the late Mr. C. H. Wyatt.

IT is announced in *Science* of February 13 that Bowdoin College has received a bequest of 100,000*l.* for the general fund of the college from the estate of the late Mr. Edwin B. Smith, former assistant attorney-general of the United States, who died in New York on January 5. It is stated in the same issue of our contemporary that, through the will of the

late Mrs. Elizabeth Mattox, of Terre Haute, the sum of 9000*l.* will be added to the general endowment of De Pauw University; and that Mrs. W. P. Herrick, widow of the late Mr. W. P. Herrick, has given to the University of Colorado 1000*l.*, to be used as an aid fund for worthy students.

A BILL was read a second time in the House of Commons on February 20 to amend the law in respect of the employment of children and their attendance at school. The principal changes in the law proposed are the grant of optional powers to local education authorities to extend the age of leaving school from fourteen years to fifteen; no exception from school attendance to be allowed for children under thirteen years; the abolition of the existing half-time system; the grant to local education authorities of power to require attendance at continuation classes; and the prohibition of street trading by boys under fifteen and girls under eighteen. The subject of the continuation-school system was referred to by Lord Haldane in replying to the toast of "His Majesty's Ministers," at the dinner of the City of London Solicitor's Company on the same date. He said the old days of apprenticeship which did so much for us have long since gone by. Continental nations, and in a less degree the United States, are substituting for apprenticeship a very formidable thing—training in the trade continuation schools. A British workman finishes his education at thirteen. In many parts of the Continent that training is now going on until sixteen, seventeen, and eighteen; and not a training merely in general education, but in the chief point of the calling which the workman is going to exercise in the future. We shall have to face this in six or seven years from now. The London County Council is awake to the national peril, and that is true of other great cities in the United Kingdom. Lord Haldane is a firm believer in our capacity to keep our lead, but only if we think ahead and act ahead. We cannot afford to be inattentive to these things, and be slack as to the consequences. A national awakening will come, and it is our duty to see that it does not come too late.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, February 19.—Sir William Crookes, president, in the chair.—Prof. G. Elliot **Smith**: The brain of primitive man, with special reference to the cranial cast and skull of Eoanthropus ("the Piltdown man"). The small brain of Eoanthropus, though definitely human in its characters, represents a more primitive and generalised type than that of the genus Homo. Nevertheless, it can be regarded as a very close approximation to the kind of brain possessed by the earliest representatives of the real Homo, and as the type from which the brains of the different primitive kinds of men—Mousterian, Tasmanian (and Australian), Bushman, negro, &c., no less than those of the other modern human races have been derived, as the result of more or less well-defined specialisations in varying directions. From the features of its brain Pithecanthropus must be included in the family Hominidæ, but it and Eoanthropus can be looked upon as divergent specialisations of the original genus of the family. Pithecanthropus represents the unprogressive branch which survived into Pleistocene times before it became extinct; Eoanthropus the progressive phylum from which the genus Homo was derived. Special attention is devoted to the study of the temporal region of the brain, which in all of these fossil men (not excluding Pithecanthropus) reveals features of great morphological interest. The opinion is expressed that the increased size of the brain (as a whole) which is distinctive of the Hominidæ, among the Primates, is ultimately related to the acquisition of the power of articulate speech, and that the very earliest representatives of the family must have possessed in some slight degree the definite faculty of intercommunication one with another by means of vocal sounds. The development of asymmetry of the brain was necessarily incidental to the acquisition of human characteristics, and must have been already present in the original Hominidæ.—Prof. A. J. **Ewart**: Oxidases.—Dr. J. W. W. **Stephens**: A new malarial parasite of man. The blood-slide in which this parasite occurred came from Pachmari, Central Provinces, India. The peculiarities of the parasite are:—(1) It is extremely amœboid. Thin processes extend across the cell or occur as long tails to more or less ring-shaped bodies. These processes may be several in number, giving the parasite fantastic shapes. (2) The cytoplasm is always scanty; the amœboid processes are delicate; the parasite has but little bulk. (3) The nuclear chromatin is out of proportion to the bulk of the parasite. It takes the form of bars, rods, strands, curves, forks, patches, &c. Abundance of and marked irregularity in the distribution of the chromatin masses are characteristic of this parasite. It differs from the hitherto described parasites of malaria. The author proposes to call the parasite *Plasmodium tenue*.—S. B. **Schryver**: Investigations dealing with the phenomena of "clot" formations. Part ii., The formation of a gel from cholate solutions having many properties analogous to those of cell membranes.—Dorothy J. **Lloyd**: The influence of the position of the cut upon regeneration in *Gunda ulvae*. In 1889, Hallez published a paper in which he stated that the difference in the regeneration of Triclads and Polyclads lay in the fact that the former could regenerate a head from the oral surface of a cut made at any level, while the latter could only do so if the regenerating fragment contained the cerebral ganglia. Experiments made with *G. ulvae*, a marine Triclad occurring in large numbers at Plymouth, show that this generalisation is not justifiable. *G. ulvae* is found to differ from most Triclads and to correspond to Polyclads in its mode of regeneration.

Geological Society, February 4.—Dr. Aubrey Strahan, president, in the chair.—C. T. **Trechmann**: The lithology and composition of Durham Magnesian Limestones. The formation maintains a highly dolomitic character, with important exceptions. Those portions which show a calcareous composition may be regarded as the result of one of three main causes:—(1) Original conditions of sedimentation, during which dolomitic deposition was arrested temporarily; (2) escape from secondary dolomitisation; (3) calcareous segregation. Evidence is brought forward in favour of the view of direct sedimentation of dolomite from the waters of the Permian sea. The question of the secondary dolomitisation of the Shell-Limestone reef is discussed. The dedolomitisation of the formation is due to the mechanical washing-away of powdery dolomitic material through the interstices of the rock. No evidence of any leaching-out of magnesium carbonate from the rock was found. The nature and distribution of the true cellular rock is discussed, and modes of origin are suggested. A summary of the general conditions of deposition of the Durham Permian, from the Marl Slate upwards to the Salt Measures, is given.—H. **Bolton**: The occurrence of a giant dragon-fly in the Radstock Coal Measures. The structure of a wing-fragment found upon the Tyning waste-heap at Radstock Colliery (Somerset), is described. The fragment consists of the proximal third of a left fore-wing. It is 64 mm. long and 40 mm. broad, the complete wing

having an estimated length of 190 mm., or 7·5 in.; the whole insect (with wings extended) must have had a span of more than 400 mm., or 16 in. The anterior wing-margin is tuberculated proximally, and more distally bears a closely set series of pointed spines directed outwards towards the wing-apex. The hinder wing-margin is also spinous, the spines possibly serving to interlock the fore and hind wings during flight. The characters of the costa and subcosta on the anterior portion of the wing, and of the cubital and anal veins on the hinder part, show the relationship of the insect to the family Meganeuridæ. The wing is referred to the genus Meganeura as a new species.

EDINBURGH.

Royal Society, January 19.—Prof. Geikie, president, in the chair.—Prof. R. J. A. **Berry** and Dr. A. W. D. **Robertson**: The place in nature of the Tasmanian aboriginal as deduced from a study of his calvaria. Part ii., His relation to the Australian aboriginal. Among the main conclusions of this prolonged study of more than a hundred skulls may be mentioned the following. The Australians and Tasmanians are the descendants of a common Late Pliocene or Early Quaternary stock, which may be called, with Sergi, *Homo tasmanianus*; the Tasmanian aboriginal was the almost unchanged offspring of this type, but the Australian aboriginal is a cross between the primitive *Homo tasmanianus* and some other unknown race, and is therefore a hybrid; both races have evolved on their own lines, and in their own way; both have attained morphologically to a higher stage in the evolutionary scale than is usually supposed; neither have any direct relationship with *Homo primigenius* as represented by the crania of the Spy-Neanderthal men; the range of variability is, in the Australian, as great as in any other impure race; but in the Tasmanian it is as small as in any other known or supposed pure race.—L. W. G. **Buchner**: A study of the curvatures of the Tasmanian aboriginal cranium. This detailed craniometrical investigation led to the same conclusion come to by the authors of the previous paper on quite other grounds, namely, that the range of variation is so small as to warrant the belief that the Tasmanian is a pure race.—E. M. **Anderson**: The path of a ray of light in a rotating homogeneous and isotropic solid. By an interesting geometrical demonstration the paths are shown to be circles for rays travelling in planes at right angles to the axis of rotation.—T. J. **Evans**: The anatomy of a new species of Bathydoris and the affinities of the genus (Scottish National Antarctic Expedition). This species, dredged in 1410 fathoms off Coats Land, differs from the five known species in having only two gills, which are intermediate in condition between a typical Dorid rosette of plumes and a Tectibranch gill.—Prof. **Carlgren**: The genus Porponia and related genera (Scottish National Antarctic Expedition). The detailed examination of the many specimens which were dredged off Coats Land in a depth of 1410 fathoms showed that Porponia belongs to an elementary group of Actinians, or even to the Protactiniæ, but is in no way closely related to the Zoanthidæ, as Hertwig suggested in his *Challenger* report. With Porponia in the family Endocœlactidæ, Prof. Carlgren associates Halcurias and the new genus Synhalcurias, created for the species *Ilyanthopsis longifilis*.

PARIS.

Academy of Sciences, February 9.—M. P. Appell in the chair.—P. **Appell** and J. Kampé de **Fériet**: The convergence of series proceeding according to Hermite polynomials or more general polynomials.—Fred **Wallerant**: The crystallographic properties of dichlorobenzene.—Gaston **Bonnier** and Jean **Friedel**: Anatomical remarks on some types of carpophores.—O. **Lehmann**: A sudden change in the form of liquid crystals, caused by a molecular transformation.—Jean **Boccardi**: The diurnal variations of latitude.—A. **Véronnet**: The sun and its heat. Its contraction and its duration.—Ch. **Gravier**: Simplification of the method of obtaining a photographic negative.—Eugène **Darmois** and Maurice **Leblanc**, jun.: The working of the alternating arc in mercury vapour. An extension of the results published in an earlier paper. The current consumption is satisfactory, but the power factor is low. The present paper deals with the influence on the power factor of variations in the current dimensions, of free surface of the electrodes, length of arc, pressure of mercury vapour, and shape of the tube.—MM. **Hanriot** and **Lahure**: Increasing and decreasing hardening of metals.—R. **Marcelin**: The influence of temperature on the velocities of transformation of physico-chemical systems.—G. **Vavon**: The reaction velocity of catalytic hydrogenation in presence of platinum black. The velocity of fixation of hydrogen by limonene in presence of platinum black depends upon the quantity of platinum present and also upon its condition. The latter can be modified by heating the metal to various temperatures.—Léon **Guillet**: New researches on the transformation points and the structure of nickel-chrome steels. The first series of alloys studied contained about 0·2 per cent. carbon, 2 per cent. nickel, and chromium varying from 0·06 per cent. to 10·2 per cent. The second series contained 4 per cent. nickel, chromium varying from 0 to 13·9 per cent. Details are given of the transformation temperatures, microscopic structure, resilience, and hardness for sixteen alloys.—Paul **Pascal** and A. **Jouniaux**: The density of some metals in the liquid state. The densities of fused tin, lead, zinc, antimony, aluminium, and copper were taken at temperatures between their melting points and 1300° C. by means of a loaded fused quartz bulb. Formulæ are given for the expansion of these six metals in the fused state. The curve of specific volumes of tin shows a marked inflection at 620° C.—Alberto Betim Paes **Leme**: The zeolites of the river Peixe, Brazil.—Jean **Daniel**: The descendants of beans which have presented a case of xenia (influence of the embryo on the teguments of the seed).—Jakob **Eriksson** and Carl **Hammarlund**: Attempts to immunise the hollyhock against the disease of mildew (*Puccinia malvacearum*). The introduction of a fungicide (copper sulphate) into the soil arrests or reduces the vitality of the fungus living in the latent state in the interior of the plant.—P. **Choux**: The genus Tanulepis at Madagascar.—Jules **Amar**: Fatigue cardiograms.—A. **Javal**: The variations of the electrical conductivity of the fluids of the organism. The variations in the electrical conductivity of blood serum, pleural liquid, cephalo-rachidian fluid, and other fluids from the body are in close relation with the amount of chlorides present.—Louis **Joubin**: Two cases of incubation in Antarctic Nemertians.—Jacques **Pellegrin**: The freshwater Atherinideæ of Madagascar.—Edouard **Chatton**: Autogenesis of the nematocysts in Polykrikos.—MM. **Azëma** and **Jamot**: The geology of Ouadaï.—De Montessus de **Ballore**: The distribution of earthquakes on the globe.

February 16.—M. P. Appell in the chair.—E. **Jungfleisch** and Ph. **Landrieu**: Researches on the acid salts of the dibasic acids. The dextrorotatory camphorates. Various metallic *d*-camphorates. From a study of the *d*-camphorates of sodium, lithium, ammonium, barium, strontium, calcium, manganese, cobalt, and piperidine, the conclusions are drawn that the neutral camphorates are very stable in presence of water and do not undergo dissociation; the acid camphorates in presence of water give the free acid and the dimetallic camphorate.—A. **Laveran** and G.

Franchini: The natural infection of the rat and mouse by *Herpetomonas pattoni* by means of parasitic rat fleas. The experiments carried out under natural conditions of attack by the rat fleas are favourable to the view that the trypanosomes of vertebrates and Leishmania have the flagellæ of invertebrates for their origin.—André **Blondel**: The influence of the mounting of triphase transformers on the transport of energy at high voltages. A discussion of the best way of protection of the system against third harmonics.—V. **Grignard** and E. **Bellet**: The constitution of liquid and gaseous cyanogen chlorides. A study of the reactions of the gaseous and liquid cyanogen chlorides with various organo-magnesium halides suggests that the gaseous chloride probably possesses the carbamine constitution, C≡N.Cl, the liquid chloride the nitrile constitution Cl–C≡N.—Ed. **Imbeaux**: A new system of electrical funicular haulage of boats.—Serge **Bernstein**: The best approximation of analytical functions possessing complex singularities.—Harris **Hancock**: The generalised Eulerian function.—J. **Andrade**: Study of new methods of compensation of chronometers and some thermal adjustments. Three distinct methods of adjustment are described.—P. **Dosne**: The registration of radio-telegrams by means of Poulsen's telegraphone. The apparatus comprises an ordinary wireless receiver with a crystal detector and telephone, a microphone, and a Poulsen telegraphone.—Ch. **Leenhardt** and A. **Boutaric**: The heat of fusion of hydrated salts and hydrates in general. As a first approximation the heat of fusion of a hydrate is equal to the heat of fusion of the water it contains.—G. **Reboul**: The selective action of metals in the photo-electric effect. The experiment consisted in measuring the negative emissions produced by the total radiation of a source of ultra-violet light falling on plates of different metals, and also measuring the emissions when the light had passed through a thin film of silver. For eight metals out of ten, the results are in qualitative agreement with the values calculated from Lindemann's formula. Aluminium and zinc are exceptional in their behaviour under these conditions.—Georges **Claude**: The influence of the diameter on the difference of potential at the electrodes of neon tubes. Observation relating to the aurora borealis. For tubes varying from 5·6 to 67 mm. in diameter, the fall of potential in volts per metre of tube is inversely proportional to the diameter. For the 67 mm. tube, the drop in volts is less than corresponds to its diameter, and the author suggests that in very wide tubes the fall of potential becomes very small. This has a bearing on the phenomenon of the aurora, in which the discharges are of enormous sectional area.—C. **Cloarec**: The spontaneous alteration of liquid surfaces.—M. **Swyngedauw**: The resonance of the third harmonics in triphase current alternatives.—André **Kling** and A. **Lassieur**: The physico-chemical estimation of sulphates. The conductivity method proposed by Dutoit for the estimation of sulphates is shown to be inexact.—E. **Tassilly**: The velocity of diazotation of some amines.—A. **Ariès**: The laws of displacement of chemical equilibrium.—M. **Barre**: Some double chromates.—S. **Wologdine** and B. **Penkiewitsch**: The heat of formation of manganese sulphide. The combination of finely divided manganese and sulphur was brought about by an aluminium-potassium chlorate fuse in an atmosphere of nitrogen. The mean result was 723 calories per gram of MnS formed.—A. **Colani**: The preparation of molybdenum metaphosphate, $Mo(PO_3)_3$.—Jacques **Joannis**: The catalytic influence of kaolin on the combination of hydrogen and oxygen. In the presence of kaolin, the combination of hydrogen and oxygen commences at 230° C.—E. E. **Blaise**: Syntheses by means of the mixed zinc organometallic derivatives. The 1 : 4-acyclic ketones. Succinyl chloride reacts with zinc alkyl iodides as though it possessed an unsymmetrical constitution, but starting with mixed cyctoacetals, the reaction gives rise to di*cyclo*acetals; from the latter 1 : 4-diketones can be obtained. The preparation of dipropionylethane by this method is described in detail.—Marcel **Godchot**: The synthesis of a methyl*cyclo*pentenone.—W. **Russell**: The survival of plant tissues after freezing. The death of a plant through frost rarely takes place suddenly, and appears to take place cell by cell.—V. **Lubimenko**: Researches on the pigments of the chromoleucites.—A. **Pézard**: The experimental development of the spurs and growth of the comb in hens. The extirpation of the ovary causes a growth in the spurs and diminution in the size of the comb.—Henri **Bierry** and Mlle. Lucie **Fandard**: Protein sugar and virtual sugar.—A. **Trillat** and M. **Fouassier**: Removal and separation of micro-organisms in suspension in water under the influence of an air current. Some organisms, such as *B. prodigiosus*, are readily carried away by an air current from a suspension in water; others, such as *B. subtilis*, are not removed. This property has been applied successfully to microbial separations.—W. J. **Penfold** and H. **Violle**: Sensibility of the organism to certain bacterial products caused by hæmolysis.—R. **Goupil**: Researches on the fatty matters formed by *Amylomyces rouxii*.—Jean **Groth**: The goniatite schists of Guadalmez.—J. **Repelin**: The secondary accidents which have affected the *massif* of Lare, near Sainte-Baume.

BOOKS RECEIVED.

Die Vögel. By A. Reichenow. Zwei Bände. Erster Band. Pp. viii+529. (Stuttgart: F. Enke.) 15 marks.

The Wonders of Bird-Life. By W. P. Westell. Pp. 128. (Manchester: Milner and Co.) 1*s*. net.

Transactions of the Geological Society of South Africa. Vol. xvi. Pp. 166+xxii plates. (Johannesburg.) 42*s*.

Proceedings of the Geological Society of South Africa. Pp. lxxviii+plates. (Johannesburg.)

Bill's School and Mine: a Collection of Essays on Education. By W. S. Franklin. Pp. vii+98. (South Bethlehem, Penn.: Franklin, Macnutt and Charles.) 50 cents.

Photo-chemistry. By Dr. S. E. Sheppard. Pp. x+461. (London: Longmans and Co.) 12*s*. 6*d*.

Library of Congress. Report of the Librarian of Congress and Report of the Superintendent of the Library Building and Grounds for the Fiscal Year ending June 30, 1913. Pp. 269. (Washington: Government Printing Office.)

Carnegie Endowment for International Peace. Division of Intercourse and Education. Some Roads towards Peace. A Report to the Trustees of the Endowment on Observations made in China and Japan in 1912. By C. W. Eliot. Pp. 88. (Washington, D.C.)

Ministerio da Agricultura, Industria e Commercio. Annuario publicato pelo Observatorio Nacional do Rio de Janeiro, 1914. Anno xxx. Pp. vii+360. (Rio de Janeiro.)

Plane and Spherical Trigonometry (with Five-Place Tables). By Prof. R. E. Moritz. Pp. xvi+357+67+96. (New York: J. Wiley and Sons, Inc.; London: Chapman and Hall, Ltd.) 10*s*. 6*d*. net.

Fuel: Solid, Liquid, and Gaseous. By J. S. S. Brame. Pp. xv+372. (London: E. Arnold.) 12*s*. 6*d*. net.

Elasticità e Resistenza dei Corpi Pietrosi. Mattoni, Pietre, Malte e Calcestruzzi, Murature. By A. Montel. Pp. v+180. (Torino: S. Lattes and C.) 5 lire.

Conseil Permanent International pour l'Exploration

de la Mer. Bulletin Trimestriel des Résultats Acquis Pendant les Croisieres Périodiques et dans les Periodes Intermediaires. Publié par le Bureau du Conseil. Résumé des Observations sur le Plankton. 1902–8. Troisième Partie. Pp. 251–600+xxxviii–cv plates. (Copenhague: A. F. Host et Fils.)

Further Studies concerning the Methods of Calculating the Growth of Herrings. By E. Lea. Pp. 36. (Copenhague: A. F. Host et Fils.)

Rapports et Procès-Verbaux des Réunions. Vol. xviii. Rapports. Pp. 101. (Copenhague: A. F. Host et Fils.)

A Text-Book of Organic Chemistry. By Prof. A. F. Holleman. Edited by Dr. A. Jamieson Walker, assisted by Dr. O. E. Mott. Fourth English edition. Pp. xviii+621. (New York: J. Wiley and Sons, Inc.; London: Chapman and Hall, Ltd.) 10s. 6d. net.

DIARY OF SOCIETIES.

THURSDAY, FEBRUARY 26.

ROYAL SOCIETY, at 4.30.—The Diffraction of Light by Spheres of Small Relative Index: Lord Rayleigh.—(1) Studies of the Properties Operative in Solutions. XXXI. Sulphonic Acids and Sulphuric Acid as Hydrolytic Agents: A Discussion of the Constitution of Sulphuric and other Polybasic Acids and of the Nature of Acids. XXXII. The Influence of Sulphonates on the Hydrolytic Activity of Sulphonic Acids: A Contribution to the Discussion on the Influence of Neutral Salts: Prof. H. E. Armstrong and Prof. F. P. Worley.—Morphological Studies of Benzene Derivatives. V. The Correlation of Crystalline Form with Molecular Structure: A Verification of the Barlow Pope Conception of "Valency-Volume": Prof. H. E. Armstrong. R. T. Colgate, and E. H. Rodd.—The Magnetic Properties of Iron when Shielded from the Earth's Magnetism: Prof. E. Wilson.—The Occurrence of Ozone in the Upper Atmosphere: Dr. J. N. Pring.—(1) A Meteoric Iron from Winburg, Orange Free State; (2) The Electrification Produced during the Raising of a Cloud of Dust: W. A. D. Rudge.—The Electrical Ignition of Gaseous Mixtures: Prof. W. M. Thornton.

CONCRETE INSTITUTE, at 7.30.—Calculations and Details for Steel-frame Buildings from the Draughtsman's Standpoint: Cyril W. Cocking.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—Motor and Control Equipments for Electric Locomotives: F. Lydall.

SOCIETY OF DYERS AND COLOURISTS, at 8.—The Industrial Possibilities of Nitrocellulose: C. A. Higgins.—Notes on the Fading of Dyed Silk: A. Jones and G. W. Parr.

FRIDAY, FEBRUARY 27.

ROYAL INSTITUTION, at 9.—Surface Combustion: Prof. W. A. Bone.

SWEDENBORG SOCIETY, at 8.15.—The Body and the Soul in Swedenborg's Philosophy: Dr. L. de Beaumont-Klein.

INSTITUTION OF CIVIL ENGINEERS, at 8.—The Use of Reinforced Concrete in Connection with Dock and other Maritime Work: C. S. Meik.

PHYSICAL SOCIETY, at 8.30.—First Guthrie Lecture: Radiation of Gas Molecules Excited by Light: Prof. R. W. Wood.

SATURDAY, FEBRUARY 28.

ROYAL INSTITUTION, at 3.—Recent Discoveries in Physical Science: Sir J. J. Thomson.

ESSEX FIELD CLUB (at the Essex Museum, Stratford), at 6.—Some Notes on the Vegetation of Boulder-Clay Wastes in North Essex: G. Morris.—Oysters, Pliocene to Recent: A. Bell.—Scientific Surveys: Rev. C. H. Grinling.

MONDAY, MARCH 2.

SOCIETY OF CHEMICAL INDUSTRY, at 8.—The Bleaching of Chemical Pulp and Suggestions for a Standard Method in Test Cases: A. Baker and J. Jennison.—Blasting Gelatine, some Notes and Theories: W. A. Hargreaves.—An Application of Calcium Carbide to the Formation of Alloys: W. R. Hodgkinson.

ROYAL SOCIETY OF ARTS, at 8.—Artistic Lithography: J. Pennell.

SOCIETY OF ENGINEERS, at 7.30.—Esperanto: An International Language for Engineers: T. J. Gueritte.

ARISTOTELIAN SOCIETY, at 8.—The New Encyclopædists on Logic: Prof. J. Brough.

TUESDAY, MARCH 3.

ROYAL INSTITUTION, at 3.—Modern Ships. I. Smooth Water Sailing: Sir John H. Biles.

ZOOLOGICAL SOCIETY, at 8.30.—Report on the Freshwater Fishes Collected by the British Ornithologists' Union Expedition and the Wollaston Expedition in Dutch New Guinea: C. Tate Regan.—The Nests of Pseudoscorpiones; with Historical Notes on the Spinning-organs and Observations on the Building and Spinning of the Nests: H. Wallis Kew.—Spiders from the Montebello Islands: H. R. Hogg.—The Skull of a Pariasaurian Reptile, and on the Relationships of that Type: D. M. S. Watson.—The Structure and Life-history of a Tape-worm (*Ichthyotaenia filicollis* Rud.) parasitic in the Stickleback: F. J. Meggitt.—Trematode Parasites from Animals Dying in the Zoological Society's Gardens during 1911–12: Dr. W. Nicoll.

INSTITUTION OF PETROLEUM TECHNOLOGISTS, at 8.—Introductory Remarks by the President: Sir Boverton Redwood.—Geometry of the Anticline: Sir Thomas H. Holland.—The Educational Aims of the Institution of Petroleum Technologists: E. H. Cunningham-Craig.—Petroleum Technology as a Profession: Prof. Vivian B. Lewes.

INSTITUTION OF CIVIL ENGINEERS, at 8.—*Further Discussion:* Rail-steels for Electric Railways: W. Willox.—Rail-corrugation and its Causes: S. P. W. D'Alte Sellon.

ROYAL SOCIETY OF ARTS, at 4.30.—*Discussion:* The Montreal, Ottawa, and Georgian Bay Canal: Sir R. W. Perks.

WEDNESDAY, MARCH 4.

SOCIETY OF PUBLIC ANALYSTS, at 8.—The Composition and Analysis of Compound Liquorice Powder: A. E. Parkes and F. Major.—The Composition of the Saline Matter Adhering to Certain Wet Salted Skins: M. C. Lamb.—The Determination of Carbon Monoxide in Air: F. S. Sinnatt and B. J. Cramer.—A Suggested Simple Method for the Approximate Determination of "Stump" (Wood) Turpentine in American Gum Turpentine: L. M. Nash.—Dried Carica Papaya Juice: Dr. F. F. Shelley.

AËRONAUTICAL SOCIETY, at 8.30.—The Rational Design of Aëroplanes: A. R. Low.

ENTOMOLOGICAL SOCIETY, at 8.

ROYAL SOCIETY OF ARTS, at 8.—Travels in the Balkan Peninsula: H. C. Woods.

THURSDAY, MARCH 5

ROYAL SOCIETY, at 4.30.—*Probable Papers:* The Action of Light on Chlorophyll: H. Wager.—Formaldehyde as an Oxidation Product of Chlorophyll Extracts: C. H. Warner.—The Controlling Influence of Carbon Dioxide in the Maturation, Dormancy, and Germination of Seeds: F. Kidd.—The Functional Correlation between the Ovaries, Uterus and Mammary Glands in the Rabbit, with Observations on the Oestrous Cycle: J. Hammond and F. H. A. Marshall.—The Chromaffine System of Annelids and the Relation of this System to the Contractile Vascular System in the Leech, *Hirudo medicinalis*: Dr. J. F. Gaskell.

ROYAL INSTITUTION, at 3.—Heat and Cold: Prof. C. F. Jenkin.

CHILD STUDY SOCIETY, at 7.30.—The Sense of Humour in Children: Miss C. C. Graveson.

LINNEAN SOCIETY, at 8.—Results of Crossing *Euschistus variolarius* and *E. servus* with Reference to the Inheritance of an Exclusively Male Character: The Misses K. Foot and E. C. Strobell.—Short Cuts by Birds to Nectaries: C. F. M. Swynnerton.—Buprestidæ: Ch. Kerremans.—Platypodidæ and Ipidæ from the Seychelles: Lieut.-Col. Winn Sampson.—Scatopsidæ and Simuliidæ: Dr. G. Enderlein.—Heteroneuridæ—Milichiidæ: C. G. Lamb.

SATURDAY, MARCH 7.

ROYAL INSTITUTION, at 3.—Recent Discoveries in Physical Science: Sir J. J. Thomson.

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