THURSDAY, MAY 23, 1901.

NATIVE RACES AS IMPERIAL PROBLEMS.

The Natives of South Africa; Their Economic and Social Condition. Edited by the South African Native Races Committee. Pp. xv+360. (London: John Murray, 1901.) Price 12*s.* net.

BY far the most serious of all the questions confronting us in South Africa is the question of the native races. The reason is not far to seek. Two at least of the African races are endowed with extraordinary vitality. The Australian aborigines are a people which will neither thrive in the presence of the white man nor be absorbed into his hosts. They are, therefore, bound to die out in the presence of civilisation, and, however much we may regret it from philanthropic or scientific motives, the political and social problems involved will sooner or later cease to exist. It is otherwise with the Negroes and the Bantu. These two prolific races show no signs of decay when brought in contact with civilisation. On the contrary, their intestine wars and savage practices being put an end to, they increase rapidly in number.

The Negro is not found in South Africa. There the bulk of the native population is Bantu. The remains of the earlier peoples, Vaalpens, Bushmen and Hottentots, are (save the last named) of no political importance. They are, indeed, of considerable scientific interest. The Vaalpens, a black pigmy race dwelling in caves and holes in the Northern Transvaal and the Bechuanaland Protectorate, have never yet been subjected to scientific investigation. They are said to practice cannibalism, and to be the true aborigines. The Bushmen, of larger, though for the most part still diminutive, stature, are, like them, savages of a low type. They display, it is true, some advance on the Vaalpens, and are specially noted for their extraordinary skill in drawing. They are of a yellowish-brown colour. In this and some other physical characteristics they resemble the Hottentots, who, it has been conjectured, are the result of a mixture in blood of the earliest Bantu immigrants with the Bushmen. For the most part the Hottentots have come under the influence of civilisation, though there are communities of them still practising their own customs. The Bushmen are hunters. They have hardly yet taken the first step towards civilisation, in the shape either of agriculture or of herdsmanship. The Hottentots, on the other hand, are a pastoral people, while the Bantu in all their branches both keep cattle and are acquainted with rudimentary agriculture.

The Bantu are divided by Prof. Keane into three groups. The first consists of the Zulus and the tribes connected with them, such as the Ama-Xosa, the Matabele and the Kafirs. The second consists of the principal inhabitants of the Orange River Colony, the Transvaal, Basutoland and Bechuanaland, namely, the Basuto and Bechuana. The third includes the Amatonga, the Swazis, the Fingoes, the Mashona, Makalaka and other tribes, representing, according to Prof. Keane, "the first wave of Bantu immigration." This of course assumes that the Hottentots are not to be credited with Bantu blood, but are an offshoot of some other African stock.

In consequence of their overwhelming political and social importance, the work before us, though bearing a wider title, relates almost entirely to the Bantu. It is in substance a plea for a full official inquiry into the circumstances of the native races, with a view to framing a sound policy in dealing with them. We are first presented with a short account of the various peoples which, though taken from the best sources, shows very clearly how defective our knowledge is. In this account an estimate of the populations and a general outline of native laws and customs are included. We are next told on what terms we hold the different provinces of British South Africa. This is important, because our titles to all the provinces are not the same. The most extreme advocate of the right of the white man to the lordship of the world would probably admit there was a distinction to be drawn between cases in which we hold by right of conquest, either directly from the natives themselves or from those who had conquered them, and cases in which we simply administer the country by invitation of the natives. In the latter it is evident that every principle of justice requires us to treat the land as still their property and, regarding them as the true owners of the country, to administer it for their benefit.

These preliminary matters, necessary for the understanding, or at least for the setting in proper perspective, of what follows, having been disposed of, we approach the main subject of the book—the relations of the native population to their white rulers and to the white colonists in general. They are considered under the heads of (1) land tenure; (2) labour supply, occupations and wages; (3) the law of master and servant; (4) the compound system; (5) savings banks and labour agencies; (6) the pass laws; (7) education; (8) taxation; (9) franchise; and (10) the sale and supply of intoxicating liquors. It is not my intention to follow the writers in their review of these matters. Deeply interesting as they are, their interest is rather political and philanthropic than scientific, and so far it is foreign to this journal. It must suffice here to say that these chapters have been compiled with care from information supplied largely at first hand by correspondents (of whom a list is given) and by official and other documents; they are marked by sanity and moderation, and are written with the object, not of dogmatising on questions bristling with difficulty, but of collecting and presenting information.

The importance as well as the difficulty of the problems involved is evident. The total native population is estimated by the editors at about five times the numerical strength of that of the whites, and it is rapidly increasing. The natives are not allowed to indulge as they once did in intertribal wars, which would not only give them occupation but keep down their numbers. They are not at present fit for continuous labour. The habit of work is a growth of civilisation, and cannot be imposed as you put a coat of paint on a door. Generations are required to raise a people from savagery. It is no wonder, therefore, that the increase of their numbers and their idleness are sources of anxiety to the intrusive colonists. Various expedients have been tried. The Boer policy was first massacre, then slavery, cruelty and oppression. Nor have our own people always been guiltless in this respect. The results have been lamentable alike to the natives and

to the Europeans. With the abolition of slavery a more humane policy on the part of the Government was inaugurated. But neither the Home Government nor the Colonial Governments have been invariably wise or consistent. Though on the whole their efforts have been honestly directed to the benefit of the natives, the conflicting interests of natives and colonists have often caused, and still cause, grave difficulties. The experiment has been made in Cape Colony and, to a more limited extent, in Natal, where the native question is more acute, of admitting natives who fulfil certain stringent conditions to the franchise. The numbers admitted are not yet large, but it is obvious that the principle thus introduced may involve consequences which cannot at present be foreseen.

Accordingly, the editors are abundantly justified in their belief that the time is opportune to consider our policy towards the native races throughout British South Africa. The information elicited by their inquiries is not exhaustive; it is only preliminary. One of the chief results has been the discovery how little we know about the natives and their needs. This is a point which the editors press again and again. In August last they presented a memorial to H. M. Secretary of State for the Colonies, urging the expediency of inquiries on the laws, customs, land tenure and tribal system of the natives, and on the other points dealt with in these pages. At that very time, as the readers of NATURE know, the Anthropological Institute and the Folklore Society were independently presenting a joint memorial making a similar request. The history of Christian missions, the history of every attempt by Europeans to rule a savage or barbarous people, is full of failures and bloodshed attributable to imperfect comprehension of native customs and ways of thought. So long as the missionary societies and the Colonial Office agree in ignoring the necessity of anthropological studies these failures will be repeated. In 1881, however, the Cape Government awoke to the desirability of ascertaining and recording some facts concerning native customs. A Commission was appointed, and its Report is, so far as it goes, an extremely valuable document. "There is urgent need," say the editors of the present volume, "of a similar inquiry covering the other territories of South Africa under British rule." When this protracted war has ended we shall have to make new laws in the Transvaal and the Orange River Colony to control the relations of the black men to the white, and of the black amongst themselves. We cannot legislate without first knowing the existing facts. A Commission of Inquiry would therefore seem inevitable. If it be determined on, it is to be hoped that scientific assistance will be called in, with a view to rendering the results complete and trustworthy, and, further, that it will be found possible to extend the area of its inquisition to Bechuanaland and to Rhodesia. That such an inquiry, if adequate in scope and properly directed, will incidentally be of high value to various departments of science (notably, but not exclusively, to anthropology) is an additional reason for the appointment of the Commission. In the pages of "The Natives of South Africa" scientific considerations are not adduced; but even without them the book is a powerful plea for inquiry, and one which may be heartily commended to all who are interested in the serious questions it presents for solution.

The Committee have given an interesting and useful appendix of selections from their correspondents' replies, and three maps showing the distribution of population in Cape Colony and Natal. Quite as necessary as either of these maps is one or more showing the locations of the different tribes in all the territories. These should have been given. Many of the tribes can certainly be located. If all cannot be, the defects would have been a striking illustration of the state of our ignorance.

E. SIDNEY HARTLAND.

PROGRESS IN THE COMING CENTURY.

Twentieth Century Inventions: a Forecast. By George Sutherland, M.A. Pp. xvi+286. (London: Longmans and Co., 1901.) Price 4*s.* 6*d.* net.

THE *rôle* of prophet of the industrial development of the discoveries of science is one not lightly to be assumed, especially if it is the aim of the prophecy to cover so long a period as a hundred years. Mr. Sutherland has, nevertheless, had the temerity to attempt this task, and to approach it in the spirit of the man of science deducing logical conclusions from definite data rather than in that of the writer of fiction giving free rein to his imagination. We are not sure whether, when a century is concerned, the imaginative method, if kept within proper bounds, is not almost as satisfactory as the other. The predictions of the novelist are often fantastic and wild; but if he is likely to overshoot the bounds of probability his more cautious brother prophet is almost certain to fall short of them. The system of the logical prophet has, indeed, an inherent defect—it can only foretell the development and further application of knowledge that has already been acquired, and cannot take into consideration the possibility of the discovery of new facts. Yet it is by discovery as much as by invention, if we may draw a distinction between the two, that progress has taken place in the past, and it is to be hoped, for the sake of science, that the same will be true in the future. No prophet writing in 1801 on the same lines as Mr. Sutherland could have foretold the present development of electric traction, for he could not have foreseen the discovery of electro-magnetic induction made by Faraday thirty years later. He might, however, have predicted the modern railway systems, because the essential principles of these systems were already known. It would be easy to multiply instances, but we think it is evident from what we have said that Mr. Sutherland's prophecy must in some respects fall short of the truth, unless, indeed, the coming century is to be devoid of discoveries.

But if Mr. Sutherland's system is open to objection on the grounds that have been stated above, it has also much to recommend it. It would be idle to devote time to the serious consideration of extravagant predictions of the purely imaginative writer whose prophecies must be judged by their consistency and their power to interest. With the forecast in the book before us it is different; it is well considered and carefully thought out, and affords material for thoughtful, and very possibly useful, reflection. It is of interest to all those who are engaged in helping onward modern industrial development to pause occasionally and look somewhat far ahead to see in what direction that development is tending. Those who wish

to take such a journey into the future cannot do better than make it under Mr. Sutherland's guidance. He points out clearly, and in many cases we think rightly, what are likely to prove the most important inventions in the twentieth century. It is, perhaps, necessary to state that the author counts inventions as belonging to the period during which they come to fruition rather than to that in which the original idea is first conceived; some such limitation is certainly necessary, otherwise there will never be wanting those who will be ready to prove that there is nothing new under the sun, and that the germ of the *Turbinia* was contained in Noah's Ark.

A great deal of space is justly given to the generation, storage and distribution of power. This is becoming one of the most pressing problems of the immediate future, as is evidenced by the number of big power schemes now on foot. We already see the new industries requiring much energy congregating around large sources of water-power. This source has only just begun to be seriously tapped, and for a time, at least, we can regard it as an almost inexhaustible supply of cheap power. But as progress goes on, as these industries develop and increase, water-power will no longer remain so cheap, for land will get more valuable in the neighbourhood of suitable waterfalls, and the available power will be, sooner or later, all in use even though the falls possess so large a reserve as Niagara. We shall then have to turn to other sources as yet untouched; it is to the winds and the waves that we shall go for help, according to Mr. Sutherland. Such sources as these, however, are intermittent and can only be useful when a thoroughly satisfactory means of storing power has been found. For this we must look to the electric accumulator, especially as the electrical seems to be the most suitable method of transmitting power. The author enters into detail at considerable length concerning the inventions by means of which the wind and wave power will be "cabin'd, cribb'd, confin'd," and here we must confess we do not think him so convincing. Throughout the book there is a tendency to enter into too minute details; it will be long before many of the problems are seriously attacked, and by the time they are it is probable that we shall have better means of attacking them than are now at our command.

Transport, both by sea and land, is another very pressing question. It is being very generally recognised that some method of relieving the congestion of the towns must be found, and it is probable that this will be most readily effected by increasing the ease of locomotion, though the transmission of power, by taking the work to the labourer in place of bringing the labourer to the work, will no doubt be a great help. Mr. Sutherland's schemes for increased facility of transport by road and rail are, many of them, suggestive and will be read with interest.

Space forbids our following Mr. Sutherland further into the coming century. We are inclined to disagree with his predictions concerning the future of music, art and many of the minor applications of electricity. We do not, for example, believe that wireless telegraphy will ever be used for lighting (and we suppose laying) the morning fire, that the housemaid of the future may not have to come down to a cold room. But, on the whole, the book takes a comprehensive and broad survey of the probable progress of invention, and is well worth careful reading.

VERTEBRATE HISTOGENESIS.

Lecithoblast und Angioblast der Wirbelthiere. By Wilhelm His. Abhandlungen der math.-phys. Classe der Kgl. Sächs. Gesell. der Wissenschaft, vol. xxvi. pp. 173–328; 102 figures. (Leipzig: 1900.) Price Mk. 8.

THIS memoir is the latest and largest of a series, published by the author in the *Transactions* of the Saxon Academy of Science. Its title indicates that it treats of histogenetic studies in those parts of the developing germ which are concerned in the formation of the blood-vessels and blood, and in the elaboration and assimilation of the yolk-mass. The table of contents at the close reveals a very much wider sphere of research than that suggested by the title. It is, indeed, a treatise on histogenesis. Prof. His himself describes it as a sort of histological testament. Like some other documents of the like name, it contains very varied provisions. Almost all the phenomena witnessed in the early development of the embryo are treated of at greater or less length, the first blood-vessels and blood and the changes undergone by the yolk and its components receiving special attention. The work is full of detailed observations, and these are described at the hand of a complex terminology.

Following the plan of certain of his previous studies, the author has departed from the usual custom of gathering the illustrations into plates. And there can be no question that the numerous woodcuts woven into the text add greatly to the usefulness of the memoir. If the work contain no strikingly novel or fundamental discovery, it may none the less be described as a valuable storehouse of exact observations for the use of future investigators.

One of Prof. His's most remarkable recent discoveries—originally published in an earlier study—is again dealt with in connection with the yolk-germ or lecithoblast. It is that, underlying the so-called amitotic or direct division of the yolk-nuclei or merocytes, there is a modification of ordinary mitosis, *i.e.* a pluripolar form. This identification is probably to be regarded as among the greatest real advances in cytology of recent years. For does it not bring the unknown and incomprehensible into relationship with the known?

It may, however, be doubted whether, as the author maintains, the products of pluripolar mitosis—if the process attain any particular complexity—are ever able to revert to the bipolar form; indeed, whether cells which have got entangled in this complex network are ever able to emerge therefrom as normal entities. Connected with this question there is also the curious amœboid mode of yolk-annexation by certain cells described and figured in the memoir. Rueckert demonstrated some years ago—and his observations have recently been fully confirmed by Beard—that a tendency to free themselves from the yolk is often one of the characteristics of cells undergoing pluripolar mitosis. Like the latter process, that recorded by His as yolk-annexation would therefore be classifiable as a degenerative phenomenon.

The task undertaken in these histogenetic studies was an immense one—even for an investigator of the energy and talents of Prof. His—covering, or attempting to do so, a large portion of the field of developmental mechanics. How is it that certain structures arise at certain, usually

predestined, times in particular places, and only there and out of certain cells alone? The simplest answer, and that long made the basis of almost all embryological research, has been that out of three primary layers of cells the embryo and all its parts take their origin. The working out of the details has largely been the labour of embryological investigation of the past fifty years.

The wealth of observation contained in the present memoir furnishes ample evidence that after all progress has been exceedingly slow.

We still do not know why a certain cell becomes a gland-cell, another a ganglion-cell: why one cell gives rise to a smooth muscle-fibre, while a neighbour forms voluntary muscle. The prolonged researches of Prof. His, often of far-reaching import, and always carried out with exceeding care, afford typical instances of investigation on the lines of development by epigenesis. The author himself states that as a solution of all, or even many, of the great problems of histogenesis they have disappointed his hopes.

It would appear to be quite possible that numbers of embryological problems incapable of any fundamental solution may exist. The range of human mental vision may have been reached with the limitations of microscopic lenses. However that may be, it is daily becoming more apparent that epigenesis with the three layers of the germ furnishes no explanation of developmental phenomena.

"There is no coming into being!"—"Es giebt kein Werden"—wrote Haller long ago. And this is emphasised by Weismann when he informs us that an epigenesis is an impossibility. But there is an evolution or unfolding. Development, even in lowly forms of animal life, is a complicated study. With three germ-layers as its basis no advance in its interpretation is possible. Nothing like all the cells present at the close of the egg-cleavage are destined to share in the formation of the future embryo. Many of them—often the majority of them—are merely larval or transient in character. Still others, the greater number of those remaining, are charged with the duties of handing on the "stirp," in Galton's sense, to future generations.

The chain of life from generation to generation is of exceeding intricacy. The unravelling of the tangle and the true interpretation of the many important links in it both serve to increase the magnitude of the embryologist's task. The day is not yet when this approaches completion.

OUR BOOK SHELF.

The Scientific Memoirs of Thomas Henry Huxley. Vol. iii. Edited by Sir Michael Foster and E. Ray Lankester. Pp. xi + 622. With thirty plates, maps and text illustrations. (London: Macmillan and Co., Ltd., 1901.) Price 30*s.* net.

THIS magnificent volume will be to the working naturalist the most welcome of the three now published. It contains 38 memoirs, papers and addresses, covering, in all, 608 pp., as against 50 with 508, and 37 with 591 for volumes i. and ii. respectively. It embodies the scientific work of Huxley at his best. As memorable may be cited the great memoir on the bird's palate, which marked an epoch in comparative osteology; and that on the ossicula auditus, in which recent research has discovered a hidden treasure, and of which one of the leading conclusions, viz. that of the primary nature of the union between the hyoid and the columella auris, has but lately been shown (long opposition notwithstanding) to be developmentally confirmed. Particularly noteworthy are the series of memoirs and papers upon the Dinosauria, and the series of addresses and philosophic memoirs on the ethnology, archæology and distribution of mankind in various parts of the globe, which will ever rank among their author's best achievements.

As regards the general get-up of the book, the editors have spared no pains to render perfect their labour of loyal devotion. One or two of the plates are, perhaps, a little lacking in sharpness—printed, in the copy before us, a little lightly—but all that is important is definable.

It is with a feeling of considerable relief that we note the incorporation of the Geological Survey memoir upon the Structure of the Belemnitidæ; for this, in respect to certain details, contains the most accurate description to-day available, and will ever hold its original high place in the literature of zoology. Our expression of relief is due to the fact that this great essay, together with five of those afore-mentioned in anthropology, the two papers upon the lowly plant organisms which close the present volume, and one or two other items, were entirely omitted in the first-published table of "contents," put into circulation on the announcement of the work. The reason for this is not difficult of demonstration, and while we would convey to the editors our gratitude for having, as their labour advanced, made perfect the definitive list up to the period embraced by the present volume, we would remind them that, so far as the said "contents" table affects the volume to come, the great Survey Memoir on the Elgin Crocodilia, the Rede Lecture on Animal Forms, delivered at Cambridge in 1883 and duly reported at some length in our own pages (NATURE, vol. xxviii. p. 187), with the "Further Notes on Hyperodapedon" (*Quart. Journ. Geol. Soc.*, vol. xliii., which was the last zoological paper that issued from Huxley's hands, were similarly not included.

In the production of this monumental series of volumes, publishers and editors are incurring a debt of gratitude on the part of the present and future generations, and carrying out a labour of love in a spirit becoming in its dignity the original memoirs themselves.

Fact and Fable. By Effie Johnson. Illustrated by Olive Allen. Pp. 117. (London: Chapman and Hall, Ltd., 1901.) Price 6*s.*

THIS is a pleasingly-written and attractive little book, containing a series of short tales and sketches, the first and largest of which relates a boy's visit to an ant-hill, his adventures, and what he found there. Another tale relates the adventures of a young bee; while most of the others consist of allegorical or symbolical presentations of various phases of human life. As the authoress admits, the descriptions of the events in ants' nests are taken from different species, and the large queen is a Termite. But the story may serve to interest young readers in ant-life and lead them to read other books on the subject.

Science and Mediæval Thought. By Prof. T. Clifford Allbutt, F.R.S. Pp. 116. (London: C. J. Clay and Sons, 1901.) 2*s.* 6*d.* net.

THE brilliant character of the Harveian oration delivered before the Royal College of Physicians last October by Prof. Clifford Allbutt could be judged by the abridgment which we published a few days after the delivery of the address (vol. lxii. p. 630, October 25, 1900). The complete address is given in the volume before us, with a few additions and notes, and we cordially commend it to every one who desires to read an inspiring account of the evolution of mediæval into modern thought.

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.*]

On a Form of Artificial Submarine Cable.

IN order to illustrate the effect which capacity has on the sending of arbitrary electrical disturbances along a conductor, Mr. C. F. Varley, about the year 1860, devised an artificial submarine cable equivalent in its action to a real cable long enough to reach from England to Australia. For obvious reasons such a device would be a most instructive piece of lecture-table apparatus.

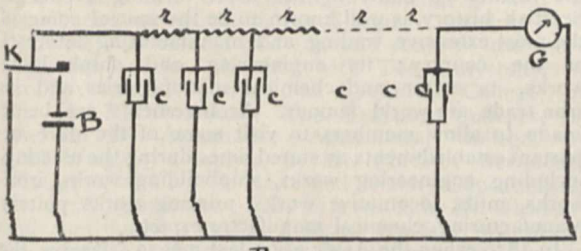
The so-called "K.R. Law" of Lord Kelvin states that the time-lag in signalling over a cable is proportional to the capacity of the dielectric sheathing per unit length, to the resistance (also per unit length), and to the square of the length.

Thus in order that the time-lag of an artificial cable shall be great, both the resistance and capacity must be great. The first of these two conditions is, of course, easily fulfilled, but if the ordinary tin-foil type of condenser is used as the capacity, both the bulk and cost of the apparatus is very considerable.

For this reason very few artificial cables have been made after Varley's plan. I have recently made an artificial cable, giving about six seconds time-lag, which is entirely free from the disadvantages just mentioned, and for this reason I trust that it may commend itself to teachers of physics as a piece of demonstration apparatus.

In an actual cable the capacity is distributed uniformly along the length of the line, but in an artificial cable of great equivalent length the capacity must be distributed non-uniformly in some such way as that shown in the accompanying figure.

In it B is the battery, K a double key so connected as to put the cable either to the ungrounded pole of the battery or to



earth, *r r* are a number of high resistances which play the part of the conducting core of the cable, and *c c* are the capacities which play the part of the insulating sheath of the cable. G is the galvanometer, one side of which is connected to earth, and forms the receiving end of the apparatus.

This is substantially the arrangement which Varley used, the only difference between his artificial cable and mine being that I have substituted light, easily made electrolytic capacities for the bulky, expensive commercial capacities used by him.

As is well known, the polarisation capacity of platinum electrodes in dilute sulphuric acid is very great. Unlike true dielectric capacity, it is not independent of the charging potential, its value increasing with the charging potential and reaching a value as high as 500 micro-farads per square inch of electrode surface.

Even though the capacity of such a cell is not a fixed quantity we may make use of its great value in constructing an artificial cable, though, of course, we are then obliged to use a battery at the sending end having an E.M.F. less than the maximum polarisation of the electrolytic cell.

The capacities I used were made by fusing platinum wire into the ends of little cells made of glass tubing. These were filled with water and a piece of platinum foil was corked into each so as to dip a few millimetres into the water.

I made thirty-six such cells and mounted them on a board in which holes were drilled to allow the platinum wires to project through so that they might dip into a trough filled with mercury which was connected to earth. These thirty-six cells were divided into twelve sets of three cells in parallel, and each of the twelve sets were connected in the positions *c c* of the figure. The resistances *r r* aggregated about a million ohms.

The advantage of mounting the cells on the board as described is that the action of the cable when the platinum wires are in the mercury (and hence the capacities in, as shown in the figure) can be rapidly compared with the action when the capacities are out. In the latter case the apparatus represents an overhead line of resistance equal to that of the cable.

With the apparatus as described the galvanometer responds as soon as the key is closed in case the capacities are out, but if they are in there is a time-lag of about six seconds.

A. TROWBRIDGE.

Physical Laboratory of the University of Wisconsin, U.S.A.

Electro-Chemistry.

MY attention has lately been directed to your review of my book on "Practical Electro-chemistry" (April 18, p. 582). I desire to thank you for noticing a modest effort at length. Your reviewer is in error in supposing that the series system of copper refining is now of any commercial importance. The process was founded on a delusion and is dead. The working up of anode sludge, mentioned by your reviewer, is a purely chemical question and does not fall within the scope of the book. I note with interest that a method has been devised for refining tin, but I do not anticipate its general adoption; gold and silver being absent from crude tin it is hardly to be expected that the anode sludge obtained in the process of refining will be worth exploitation. The electrolysis of chlorides to produce chlorates is an important branch of electro-chemical industry, and omissions of details in my book, quite fairly remarked by your reviewer, are due less to indolence on my part than to the impossibility of obtaining authentic information. Manufacturers, even in the United States, where a liberal spirit prevails, are chary of allowing entry to their works. A somewhat persevering inquiry at Niagara convinced me of this reluctance. But in spite of this difficulty I am well assured that the competent chemist, equipped with a sound knowledge of the principles of electrolysis, need not fear to engage in the practice of this the latest and most promising of industries.

BERTRAM BLOUNT.

Westminster.

WITH reference to Mr. Blount's letter—if the "series system" of copper refining was "founded on a delusion" it appears to have been a fairly successful delusion. If Mr. Blount consults "The Mineral Industry" for 1899 he will see that the Baltimore Copper Smelting and Rolling Co., which uses this system, turned out between 60 and 70 million pounds of refined copper in 1898. The Nichols Chemical Co., N.Y., whose daily output of refined copper amounts to 60 tons, also employs this method (or did in November 1899).

Mr. Blount further states that gold and silver are absent from tin and therefore "it is not to be expected that the *anode sludge* obtained in the process will be worth exploitation." Mr. Blount is probably thinking of Cornish tin, but Mr. Claus's process has been devised for purifying South American tin, some of which contains considerable quantities of gold and silver, *e.g.* an *anode sludge* analysed for Mr. Claus contained 698 ozs. silver and ½ oz. gold per ton (1 ton of *anode sludge* would be obtained from about 10 tons of crude metal). In another analysis the crude anode gave 7 ozs. silver and 1 oz. gold per ton.

I am still of the opinion that Mr. Blount would have considerably added to the value of his book had he described in detail the working up of a "typical" anode sludge. The successful treatment of the sludge is extremely important to the practical electro-chemist, and if a description of it is outside the scope of a book devoted to electro-chemistry, I fail to see in what book it should be described.

In the third place I did not accuse Mr. Blount of being "indolent"; if he were so he would not sit down and write a book of nearly 400 pages. An author must of necessity use his own judgment, as to what he will include and what he will reject, in writing a book. It does not, however, follow that the reviewer will agree with him.

F. MOLLWO PERKIN.

Specimens of "Aecidium berberidis."

THERE is a barberry bush near where I live which usually bears on its leaves a number of cluster cups (*Aecidium berberidis*). They are just appearing.

Perhaps some of your readers might care for a few specimens. If so, and if they would communicate with me, I should be pleased to send them a supply.

J. LEWTON BRAIN.

Swanton Morley, Dereham, May 20.

THE BRITISH ASSOCIATION MEETING.

THERE is every indication that the coming meeting at Glasgow will be an unusually large one, and the local committee is putting forth every effort to make it a success in every way.

The last meeting in Glasgow was in 1876, under the presidency of Dr. Andrews, F.R.S., professor of chemistry, Queen's College, Belfast, and the attendance was 2774. At that date the population of Glasgow was about 500,000, and now it is considerably more than 760,000, or, including the neighbouring burghs, about one million. But the expectation of a large meeting is based, not only on the increased population, but also on the increased attention paid locally to scientific pursuits and to the circumstance that an International Exhibition of Industry, Science and Art is being held in the Kelvingrove Park, adjacent to the University Buildings, where all the sectional meetings are to take place.

Four very important additions have been made to the buildings of the University since the Association last met in Glasgow. The Bute Hall is to be used as a reception room, and from its position and size it lends itself admirably to that purpose. Large and commodious anatomical rooms have been completed, and separate handsome buildings for botany and engineering are expected to be finished in time for the meetings. Thus, in the class-rooms of the University, there will be ample room for all the section meetings and conferences. The first general meeting will be held at 8.30 p.m. on Wednesday, September 11, in the St. Andrews Hall, when the president-elect, Prof. Arthur W. Rücker, Sec.R.S., will deliver the opening address. In the same hall, which will accommodate considerably more than 3000 persons, the Friday evening lecture will be delivered by Prof. William Ramsay, F.R.S., and the Monday evening lecture by Mr. Francis Darwin, F.R.S. The Saturday evening lecture to workmen will be delivered in the City Hall by Mr. H. J. Mackinder.

On Thursday evening, September 12, the Corporation of the City of Glasgow will give a conversazione and reception to the members in the City Chambers, and on Tuesday evening, September 17, the Executive Council of the International Exhibition will give a conversazione and reception in the Fine Art Galleries within the Exhibition grounds. This building is considered to be one of the finest in this country and consists of a central court, 125 feet by 56 feet, with two courts, each 102 feet by 60 feet, east and west of the hall; also twelve galleries averaging 100 feet by 28 feet, aranged in two floors around the courts. The collection embraces the following divisions :—

(1) Oil-paintings of the nineteenth century.
(2) Water-colour paintings of the nineteenth century.
(3) Sculpture and architecture.
(4) Works in black and white.
(5) Photography.
(6) Art objects.
(7) Scottish archæology and history.

The conversazione in the Art Galleries will therefore be of special interest.

The Royal Scottish Society of Painters in Water Colours will give a conversazione on September 18, and the Faculty of Physicians and Surgeons will give a dinner to the medical members of the Association on September 16; and other public bodies in the city are expected to cooperate in a similar manner. Lord Overtoun has kindly offered to entertain the members at a garden party at his seat at Overtoun, Dumbartonshire, probably on the afternoon of Monday, September 16; and another garden party will be held in the Botanic Gardens on the afternoon of Friday, September 13.

Excursions are limited this year to Saturday as, by resolution of the general committee, the local committee has been requested not to arrange for any whole day excursions on Thursday, September 19. On Saturday, September 14, there will be excursions to :—

1. Loch Lomond, where the party will be entertained to luncheon by the kind invitation of the Duke of Montrose, Lord Overtoun, Sir James Colquhoun of Luss, Mr. Crum Ewing of Strathleven, Dr. Jacks of Crosslet, Mr. Campbell of Tullichewan, and others.

2. The Roman Camp at Ardoch, Doune Castle and Dunblane Cathedral, where the party will be entertained by Sir James Bell, Bart.

3. Craignethan Castle (Tillitudlem), Lanark and Falls of Clyde, where the party will be entertained to luncheon by the Right Hon. the Earl of Home.

4. Stirling, where the party will be entertained to luncheon by the Town Council of Stirling.

The Howieton Fishery Company has kindly agreed to allow the excursionists to inspect the interesting fish ponds at Sauchie.

5. Paisley, including visits to the Abbey, Coats Memorial Church and Paisley Thread Works, where the party will be entertained by Sir Thomas Glen Coats.

Other excursions are in contemplation, including a sail down the river; but the arrangements have not yet been completed.

A large number of the clubs and libraries in Glasgow have kindly agreed to admit non-resident members as honorary members on presentation of their membership tickets. Full particulars of these will be given to members in the reception-room.

Glasgow, being situated in a district rendered famous by the genius of romance, and still more famous as the theatre of many of the most thrilling events in Scottish history, is well known to be the seat of some of the most extensive trading and manufacturing interests of the country; its engineering and shipbuilding works, its cotton and chemical manufactories and its iron trade are world famous. Arrangements are being made to allow members to visit some of the more important establishments at stated times during the meeting, including engineering works, shipbuilding works, ironworks, mills, locomotive works, printing works, pottery manufacturing, chemical manufactories, &c.

In 1876, when the Association last met in Glasgow, the local committee prepared three handbooks, which have remained until the present day as valuable books of reference for men of science and other students of the fauna, flora and geological features of the Clyde district. Following this precedent, the local committee for this coming meeting is also preparing three handbooks. The first is to deal with the general industries of Glasgow and the Clyde, and will deal with, among other subjects :—

(1) Mining and Quarrying, by Mr. G. R. Thompson; (2) Metallurgy, by Prof. A. H. Sexton; (3) Mechanical Engineering, by Dr. H. Dyer; (4) Marine Engineering and Ship-Building, by Dr. R. Caird; (5) Transport, by Mr. D. T. Sandeman; (6) Textile and Allied Industries, by Mr. Robert Macintyre; (7) Chemical Industries, by Prof. G. G. Henderson; (8) Pottery, Glass, etc., by Mr. James Fleming; (9) Municipal Enterprise and the Clyde Trust, by Mr. John S. Samuel. Principal Angus Maclean, Technical School, Paisley, is the editor of this volume.

The second handbook, on the fauna and flora of the Clyde valley, is under the general editorship of Dr. M. Laurie and Mr. G. F. Scott-Elliott. For the flora part of the handbook the main contributions are : (1) Introduction, by Mr. G. F. Scott-Elliott; (2) History of Botany, by Prof. F. O. Bower, F.R.S.; (3) Phytoplankton, by Mr. V. H. Blackman and Mr. G. Murray, F.R.S.; (4) Freshwater Algæ, by Messrs. T. Paterson, J. M. Taylor and W. W. West; (5) Diatoms, by Messrs.

T. Comber and T. Paterson; (6) Marine Algæ, by Mrs. Robertson, Messrs. E. M. Holmes and L. Batters; (7) Characeæ, by Mr. P. Ewing; (8) Lichens, by Mr. G. F. Scott-Elliott; (9) Fungi (microscopic), by Mr. D. A. Boyd; (10) Fungi (hymenœnycetas), by Mr. W. Stewart; (11) Fungi (gastromycetas), by Mr. R. B. Johnstone; (12) Hepaticæ (Liverworts), by Mr. P. Ewing; (13) Musci, by Mr. J. Murray; (14) Filices (Ferns), by Mr. W. Stewart; (15) Phanerogams, by Mr. P. Ewing.

The geological part of the handbook which is edited by Dr. Malcolm Laurie has, among others, the following contributions:—Introduction, by Mr. John Horne, F.R.S.; Metamorphic Rocks, by Mr. Peter Machair; Silurian formation, by Mr. John Horne, F.R.S.; Graptolites, by Prof. Lapworth, F.R.S.; Coals, by Mr. James Thomson; Old Red Sandstone, by Mr. J. G. Goodchild; Carboniferous Formation, by Mr. J. B. Murdoch; Plants, by Mr. R. Kidston; Corals, by Mr. James Thomson; Ostracoda, by Prof. R. Jones and Mr. T. Kirby; Brachiopoda and Gastropoda, by Mr. James Neilson; Fishes, by Dr. R. H. Traquair; Permian Rocks and Glacial Clays, by Mr. John Smith; Drift Beds and Raised Beaches, by Mr. James Steele and Mr. Thomas Scott; Rocks and Minerals, by Messrs. J. Sommerville, G. R. Thompson and J. G. Goodchild. Mr. Wm. Armour, C.E., is preparing a special geological map of the Clyde Valley for this part of the handbook.

The third handbook is to deal with (*a*) archæology of Glasgow, (*b*) educational institutions of Glasgow, and (*c*) the medical and charitable institutions of Glasgow. The contributors to part (*a*) are Mr. Robert Renwick, Town Clerk Depute of Glasgow; Mr. J. Neilson, procurator fiscal; and Mr. P. MacGregor Chalmers, who is contributing an article on the Glasgow Cathedral. Dr. J. G. Kerr is editing part (*b*), and some of the more important articles will deal with The University, by Mr. W. Innes-Addison; The Technical College, by Mr. H. F. Stockdale; The Training Colleges, by Mr. G. W. Alexander; Agricultural College, by Prof. Wright; Libraries, by Mr. Barrett; Secondary Education, by Dr. J. G. Kerr; and Primary Education, by Mr. G. W. Alexander. Part (*c*) is edited by Dr. Dickson; and contributions on the different medical institutions are given by experts such as Dr. Dalzell, Dr. Lindsay Steven, Dr. Alex. Napier, Dr. F. Fergus, Dr. Finlayson, Dr. Chalmers, and others. Prof. Magnus Maclean is the editor of this volume.

Messrs. Bartholomew are getting ready a specially prepared map. This map, along with one of the handbooks, will be presented to each member who attends the meeting, and copies of the other two handbooks may be purchased by members at a reduced price.

A large number of members from different parts of the United Kingdom have already indicated their intention of being present, and a number of foreigners have also sent in their names, including representative mathematicians, engineers, physicists, botanists and zoologists from Europe and America.

It has been agreed between the different railway companies that return tickets at single fare and a quarter will be issued, from all the principal stations in the kingdom to Glasgow, to members of the British Association, on surrender of a certificate signed by the secretary of the Association to be obtained in the beginning of September from the hon. local secretaries, 30, George Square, Glasgow. The tickets will be valid from *the day before the first meeting until the day after the last meeting.*

The following are the presidents of sections:—Section A (Mathematical and Physical Science), Major P. A. MacMahon, F.R.S.; B (Chemistry), Prof. P. Frankland, F.R.S.; C (Geology), John Horne, F.R.S.; D (Zoology), Prof. J. Cossar Ewart, F.R.S.; E (Geography), Dr. H. R. Mill; F (Economic Science and Statistics), Sir Robert Giffen, F.R.S.; G (Engineering), Col. R. E. Crompton; H (Anthropology), Prof. D. J. Cunningham, F.R.S.; I (Physiology), Prof. J. G. McKendrick, F.R.S.; K (Botany), Prof. J. B. Balfour, F.R.S.; L (Educational Science), Rt. Hon. Sir John E. Gorst, F.R.S.

It is not anticipated that there will be any difficulty in accommodating the members at Glasgow. There are a large number of comfortable hotels and the committee is preparing a list of such hotels, as well as of suitable lodgings and furnished apartments. Many Glasgow citizens have also indicated their desire to offer private hospitality to members. The Secretarium will probably be in Queen Margaret Hall, which is situated within five minutes walk of the University.

MAGNUS MACLEAN.

THE RECENT TOTAL SOLAR ECLIPSE.

THE several parties of observers who journeyed so far to see the eclipse on Saturday last were not, it appears, favoured with such good weather conditions as obtained during the previous two eclipses in India and Spain. No detailed accounts of the results are yet to hand, but from several brief telegrams in the daily Press we may gather a summary of the general observations made.

Mauritius.—The observers at the Government Royal Alfred Observatory at Mauritius appear to have had the greatest success. Even here the partial phases were only incompletely determined owing to clouds, the first contact being quite lost; the last three contacts were, however, determined fairly well. The party at this station consisted of twenty-two observers. With respect to the total eclipse itself, fifty-two photographs of the corona were obtained with the Mauritius photoheliograph, the Greenwich coronograph, the Newbegin telescope and several smaller cameras. In addition, forty-one photographs of the partial phase were taken for determining the diameter and place of the moon as a control over the ephemeris data, and eighteen photographs of the spectrum of the eclipsed sun's surroundings.

Drawings were made with a 6-inch telescope, and a kinematographic record of the eclipse also obtained.

Mr. Claxton had organised a comprehensive scheme of meteorological observations. The general report from this station is that the corona was of the expected minimum type, but fainter, more yellow and diffused than that observed in Spain last year.

Sumatra.—The expeditions to the Eastern Archipelago did not have a clear sky during totality. The instruments from Greenwich, in charge of Messrs. Dyson and Atkinson, were set up on the volcanic island of Auer Gedang, about six miles from the coast of Sumatra, on the central line of totality. Here the sky was covered with heavy rainclouds during the morning, rendering the prospect anything but hopeful. A slight improvement took place as the time of eclipse drew near, but unfortunately the sky never quite cleared. The form of the corona was observed, and the planets Mercury and Venus seen. Totality lasted 6 min. 21 sec.

The Dutch party in the same neighbourhood—at Karang Sago—were somewhat more successful, although there the sky was throughout covered with thin clouds.

Successful photographs are reported to have been obtained of the corona with different telescopes, and photographs of the spectra of the corona and chromosphere with two spectrographs. Several other branches of investigation, including photographs with the prismatic camera, measurements of polarisation of coronal light and determination of heat radiation of the corona, were unsuccessful.

The observations at the inland station of Solok were an almost total failure.

At Singapore the eclipse was very well seen, totality occurring about 12.51 p.m. An interesting series of observations of the temperature variations were made there. The reading before eclipse in full sun was 143°, which fell during totality to 81°, which was 2 degrees below the normal shade temperature.

RECENT WORK OF THE U.S. WEATHER BUREAU.[1]

THE Report of the Weather Bureau for the year ended June 30, 1899, which appeared at the end of last year, extends over two volumes. The first, which includes the usual administrative report and the climatological statistics of the United States Weather Service, is a volume of the ordinary dimensions, while the second and special volume, being part vi. of the whole report, is devoted to Prof. Bigelow's discussion of the United States' contribution to the international cloud observations. It is a bulky volume of no less than 787 quarto pages.

Glancing at the first volume, attention is turned naturally to those points in which the practice of the United States Weather Office differs from that adopted in this country, and the first point to be noticed is that from March 1899 the period covered by the night forecasts was increased to forty-eight hours, and that the extension of period has worked successfully, whereas the limit of the British forecasts is twenty-four hours. It is true that the British Isles occupy a remarkably difficult position on a weather map. They are not only at the extreme west of Europe and catch the first effects of weather changes travelling eastward, but they are in a special manner the battle-field of the elements and are vexed with all the storms that belong to so-called temperate latitudes and western shores. These adverse circumstances in a British mind should provoke more daring enterprise rather than complacency with partial successes, yet we are still without telegraphic reports from Iceland, a recognised centre of atmospheric influence, and wireless telegraphy has not yet extended westward the available area of information.

The weather service in the United States is indeed a popular one. From a table in the report it appears that the total number of addresses in the United States supplied with forecasts and special warnings reached the astonishing figures of 24,467,106. With these no British statistics can be compared.

It would require too much space to enter into details of the climatological data, which include, amongst other things, means of hourly readings at 28 stations. It should, however, be remarked that the year under review was noteworthy for the establishment of a number of stations for the storm-warning service in the West Indies at the conclusion of the war with Spain, and for the extensive system of aërial investigation by means of kites at 17 stations. This work was continued until the middle of November, 1898, by which time 1217 ascensions of 1000 feet and above had been made.

The second volume, written by Prof. F. H. Bigelow, is devoted exclusively to the cloud observations made in accordance with international agreement between May 1, 1896, and July 1, 1897. It is a very interesting and valuable contribution to the study of meteorology by observation of clouds, and the discussion is very fully carried out. The observations were of two kinds—theodolite observations at Washington, by which observers could determine the actual heights and velocities of individual clouds, and nephoscope observations at 15 stations in the United States from which velocities were estimated by the somewhat precarious method of assuming the height of the particular type of cloud observed. The theodolite observations are printed in columns arranged according to the type of cloud observed, and occupy 93 pages of the volume. Their discussion leads directly to some very interesting results as to the variation of the velocities of clouds with height.

The nephoscope observations numbered some 23,000. In order to coordinate them the whole United States area is first divided into six districts, and the position of each station for each observation with regard to a centre of high or low atmospheric pressure is identified by assigning it to one of twenty subsidiary areas within a circle of 1500 kilometres surrounding the centre of high or low pressure, as the case may be. In this way the distribution of velocity round the centres of "high" and "low" areas for each cloud level can be set out and the gradual change in distribution from the surface wind to the regular easterly march of the cirrus at about 10 kilometres height is traced.

In further discussion of the velocities at the different cloud levels, the general easterly drift at different levels is allowed for, and the residual vectors of velocity are plotted in diagrams to show the circulation components in "highs" and "lows" at the different cloud levels.

The same data enable the barometric gradients to be calculated, and the interesting results follow that the circulation phenomena are most vigorous in the middle group of cloud levels, viz. the Strato-cumulus to Alto-stratus group, and that there is no experimental evidence to show that there is an overflow of air from the upper part of a cyclonic area causing a higher pressure around it, as has been generally assumed.

The application of these results to the several districts of the United States in different typical states of weather is represented in 66 maps of the movement of the air at different levels over the United States. This completes the primary reduction of the observations. The remainder of the volume is occupied with the application of the inductive results obtained. First a section is devoted to the diurnal variation of the barometer. The diurnal variation of winds (taken from European stations) and of cloud motions at the alto cumulus, cirro cumulus and cirrus levels, taken from the cloud observations, is compared with the diurnal variation of magnetic force as part of a discussion of a possible relation between diurnal variation of barometric pressure and magnetic force. Without expressing an opinion upon Prof. Bigelow's own views, which have given rise to some controversy, it may be said that this discussion is very suggestive in view of the ideas which have recently been developed from Prof. Thomson's suggestion of "bodies smaller than atoms," Arrhenius and others, of the possible reception of particles from the sun carrying electrical charges which can move with the upper atmosphere.

Prof. Bigelow next deals with the general theory of atmospheric circulation in relation to the light thrown upon the subject by the cloud observations. He commences the discussion by a general review of his mathematico-meteorological troops. All the numerical, thermodynamical and hydrodynamical formulæ available for meteorological warfare are paraded for inspection by the reader, and they are clothed in a new uniform on account of the need for a standard system of notation for meteorology. The uniform does not always quite fit. "Pounds $\times$ (foot)^2" seems to require some sort of inversion before it can appropriately clothe pressure. But that is a small matter. The array of formulæ is very imposing, not to say repellent, and this part of meteorology needs a uniform that is less oppressive for the civilian meteorologist. But Prof. Bigelow's investigation moves generally upon sound lines. His criticism of Ferrel's solution of the problem of the local cyclone is sound, and his diagram (chart 69) representing the alternation of high and low areas as resulting from the play of pressure due to the action of two opposing streams of air is a very useful representa-

[1] United States Department of Agriculture. Report of the Chief of the Weather Bureau, 1898-9.

tion of the origin of the conspicuous barometric changes which are characteristic of middle latitudes.

The general scheme of Prof. Bigelow's contribution is to identify and describe the actual motion of the air. There is no doubt that the identification of the stream lines in the atmosphere is a most important step towards a dynamical theory of atmospheric phenomena. When these relations, which are, of course, strictly kinematical, have been satisfactorily established by observation and experiment, the transition to the dynamical explanation will be more practicable than any attempt to calculate the state of motion of the air *a priori* from assumed dynamical causes and conditions. The procedure from the observation and accurate identification of the actual motion, even if it be complicated, to the forces which produce it has for precedent the solution of the problem of planetary motion, and it is most interesting to see a similar process shaping itself in the less amenable department of winds and clouds.

Further applications of the observations are contained in chapters xii. to xiv., wherein the observations of cumulus and nimbus clouds, incorporated with kite and balloon observations, are used to throw light on the successive stages of change which take place in air as it rises from the surface; and the reductions necessary for pressure and temperature to enable an observer, with the assistance of cloud observations, to draw up a weather map for the 3500 foot level or the 10,000 foot level are discussed, while in chapter xiv. the heat necessary to convert an "adiabatic atmosphere" into the atmosphere in its existing state is computed.

The latter part of the book is technical and based upon mathematical reasoning, and the style is by no means easy. The earlier part is observational, except that of course formulæ are employed for reduction of the direction and magnitude of the motion of the clouds from the observed data. The whole work is admirably illustrated by large numbers of well executed charts upon which a great deal of the discussion is based.

It is too voluminous and important a work to criticise here in detail. What is most conspicuous about it is the easy coordination and correlation of so many different lines of meteorological research to form a definite idea of the real course of atmospheric changes. It is possible, and even probable, that the generalisations have gone a little further than the extent of the observations warrant at present, but the discussions show in what an important manner the general study of meteorology is affected by cloud measurements, and it suggests ideas which are certainly capable of confirmation, or possibly contradiction, by further observations. They make the reader feel that observations of the height and motions of the clouds are a matter, not merely of statistical interest, but may lead to the solution of most important problems in the physics of the atmosphere and may throw light even on the obscure phenomena of terrestrial magnetism.

The Weather Bureau is much to be congratulated upon the production of a volume at once so practical and so scientific amongst its official publications.

A CANADIAN GEOLOGICAL EXPLORER.

SOME few weeks back it was announced in NATURE that Dr. Robert Bell, F.R.S., of Ottawa had been appointed director of the Geological Survey of Canada. It is an interesting coincidence that Mr. Charles Hallock has recently written and dedicated to the National Geographical Society of Washington, D.C., a paper dealing with his explorations. This American recognition of a Canadian geological explorer is so remarkable that we desire to call attention to it, especially as it gives an idea of the new director's life work, the extensiveness of which will astonish many. Mr. Hallock, who has been acquainted with Dr. Robert Bell for thirty years, is only able to give us a very brief review of what has been accomplished by this exceptionally able and energetic geologist, for the account is a short one, but we feel that it is of such general interest that the following few facts may be stated.

Dr. Robert Bell commenced his career at fifteen. At that age, and in the year 1857, he joined the Geological Survey under the late Sir W. E. Logan, then director, and served for three years as assistant to the principal members of the staff. Since then he has continued in the same work, but has acted as chief member of the various parties.

His surveys include portions of nearly every part of Canada. Beginning in the east, they comprise the "Gaspé Peninsula from Percé to Rimouski and from the St. Lawrence to the Baie des Chaleurs, and thence to Quebec, the eastern townships, the Saquenay and Lake St. John Region, the north shore of the Gulf of St. Lawrence, the west coast and the interior of Newfoundland and parts of Nova Scotia and New Brunswick." Dr. Bell has coasted round the eastern, or Atlantic, the northern and the western coasts of the Labrador peninsula, and also round some of the islands lying off the the coast. He has calculated that the peninsula is 560,000 English square miles, a region greater than the combined areas of Great Britain and Ireland, France, Germany, Belgium and Holland.

In the summer of 1897 he visited Baffinland and surveyed most of its southern coast, besides exploring the interior, where there are many large lakes. It is worth mentioning here that only one of these lakes had before been seen by a white man. This great island of Baffinland is 1000 miles in length, and is only exceeded by Greenland and Australia in size.

The large island at the north end of Hudson Bay he has also explored, and has surveyed to a great extent the whole of the east coast of the Bay, from the Straits to the head of James Bay, also parts of the west coast of this vast inland sea, which was termed by him "the Mediterranean of North America."

Surveys have been made of the rivers flowing into James Bay. The Noddaway is the largest, and its great west tributary has been named the Bell River, after attention had been drawn to it by this eminent explorer. The rivers flowing into the Hudson Bay which he has surveyed comprise the Hayes, Steel and Hill, the great Nelson, with some of its tributaries, which drains the country as far as the Rocky Mountains, and the Great and Little Churchill rivers.

Coming further south we find his work comprises the Ottawa River from source to mouth, with its great tributary the Gatineau, and various neighbouring streams, the Montreal River and country north and south of it, and the country north of Lake Huron, including a great number of rivers and the mining district of Sudbury. The lake-peninsula of Ontario has been geologically examined by him, while he has surveyed the rivers on the north side of Lake Ontario, the Nipigon Lake, which is the most northern of the great lakes of the St. Lawrence, and also the rivers and their lakes and the country north of this to the Albany.

To the west of Lake Superior the wooded country to the prairies has been explored, and the international boundary line from this lake to the Lake of the Woods geologically examined by him. In 1881 he published a map of this last-named lake, the first ever made.

Still further west a track-survey of most of the shores of Lake Winnipeg was completed. Lake Manitoba was explored, and, further west still, the Assinniboine, Swan and Qu'Appelle Rivers and extensive portions of the North and South Saskatchewan River. A good track-survey has, further, been made of Lac la Biche and its river as far as the Athabasca River, and also of that river itself as far north as the Athabasca Lake.

On the steamship expeditions sent out by the Canadian Government to Hudson Strait and Bay, Dr. Bell not only acted as geologist and naturalist, but on the *Neptune* and *Alert* expeditions as medical officer as well.

The above is only a brief outline of the places Dr. Bell has visited and the work he has done, for no mention has been made of the time he has spent at the Great Slave Lake. This lake is 300 miles long and is a distance of 3000 miles from Ottawa, so no small journey! For the past few years, however, it has been possible to go a great part of the way by train and steamer. Here attention may be drawn to the fact that the work on the prairies and plains was accomplished before any treaties had been made with the Indians, and before the organisation of the mounted police. In those days, that part of the country was scarcely, if at all, settled, except further north, where it was practically only known to the Hudson's Bay Company's people. The buffalo was very plentiful then, and it may be surmised that the adventures of Dr. Bell were many and exciting. Taking into account all the discomfort from exposure and fatigue, the want of food, and the usual hardships connected with exploring, we may safely say that in the forty-four years of Dr. Bell's annual expeditions, he has had more adventures, more experiences of every description, and seen more of the fauna and flora of North America than any other white man living, besides having been brought into close contact with the real wild Indians, the Eskimos and the Hudson's Bay Company's people, and thus getting a thorough insight into their manners and customs.

During this time not only has he made geological, geographical and topographical surveys, but has collected a great quantity of zoological and botanical specimens, taken many photographs of these far-away parts, and made observations in a great many varied directions, greatly interesting himself in the folk-lore of the Indian tribes and the Eskimos. Dr. Bell has been called by Mr. George Johnson, the official Dominion Statistician, "the place-name father of Canada," for as his work has been so much in unknown parts he has had to give a great number of names.

In spite of the exposure and hardships he has had to experience, Dr. Bell is in perfect health and as keen and untiring about work as ever. He attributes his health to the care he has always taken of himself when camping out, always endeavouring to have a dry comfortable bed of brush or some substitute every night, trying to be as short a time as possible in wet clothes and missing as few meals as he could. It has been his habit to "live off the country and to go light," therefore he never carried any camp equipments. His food was of the simplest, being the same as that of the voyageur, with fish and game when it was to be had and with no alcoholic drinks.

Dr. Bell is of a very quiet and retiring disposition and has kept himself so much in the background that few know of the vast extent of his work. He has been the means of immense areas being mapped and divided into territories and provinces, and when we try to realise the greatness of Canada, the sizes of the rivers, lakes and plains which have been surveyed by him, the extent of land which this one man has journeyed over, we are amazed at the greatness of the work accomplished. He has published about 190 reports on various scientific subjects, but, except for short accounts like that written by Mr. Hallock, no record has been published of all his explorations, for, although often asked, Dr. Bell has never given a detailed account of his travels or attempted to extend and publish his own notes, probably owing to pressure of work and his natural reticence.

We are very grateful to Mr. Hallock for giving us an insight into what Dr. Bell has done, and wish Dr. Bell much success in his position as director of the Canadian Geological Survey.

SIR COURTENAY BOYLE, K.C.B.

BY the death of Sir Courtenay Boyle, K.C.B., which took place very suddenly on Sunday last, the country has lost a distinguished public servant and science a very warm friend and powerful supporter.

He was born in 1845, and educated at Charterhouse and Christ Church. At Oxford he became a noted cricketer, playing for the University from 1865 to 1867. In 1868 he began his official life as private secretary to Lord Spencer, then Viceroy of Ireland, an office which he held a second time from 1868–1873. After serving for twelve years as a Local Government Board inspector, in 1886 he entered the Board of Trade as assistant secretary in the Railway Department, in succession to Sir H. Calcraft, who had become permanent secretary to the Board. In 1893, when Sir H. Calcraft retired, Sir Courtenay Boyle, who a year previously had been made K.C.B., succeeded him as permanent secretary. For the past fifteen years he was intimately connected with legislation of the most important character. As assistant secretary he was responsible, along with Lord Balfour, for revising the rates and charges of the railway companies of the United Kingdom. The consolidation of the statutes relating to merchant shipping was his work, and he had much to do with the Conciliation Act of 1896.

But it was in connection with legislation to regulate the supply of electricity for light and power that he was first brought closely into relation with physical science. The position of the electric industries has changed enormously since 1886; earlier legislation had, in many respects, been hostile to their growth. Sir Courtenay's efforts were all in favour of progress, and even those who think that in some respects the progress might have been greater will admit that the difficulties to be overcome were considerable, and that the permanent secretary was always ready to give any reasonable suggestion a fair and courteous consideration. Those who in 1890-91 served with him on the committee which formulated the legal definitions of the ohm, the ampere and the volt, can testify to his care and skill; he was excellent in the chair, possibly in consequence of the fact that he made no claim to be considered an expert on the subject under discussion, but brought a trained business intellect to bear on the problem of putting into a practical form the results of scientific inquiries.

Nor were his sympathies confined to the applications of science. In the recent somewhat acute controversies respecting the magnetic observatories and electric traction, he made it clear to all that he appreciated the importance of a scientific investigation which for the present does not promise direct practical applications; and the satisfactory solution of the difficulty is due in great measure to his tact and patience.

His connection with the National Physical Laboratory was most close and intimate. He was a member of Lord Rayleigh's Committee, and took part in the discussions which led up to the foundation of the Laboratory. As permanent secretary of the Board of Trade he was an *ex-officio* member of the General Board and Executive Committee; he also served on the Finance Committee and various subcommittees, and at all of these he was a most regular and useful attendant. In Lord Rayleigh's absence he usually acted as chairman, and in that position showed a very thorough grasp of the details of the work.

In the difficult discussions which arose as to the site of the Laboratory, his counsel and support were of the highest value; he gave his time freely to the work he had undertaken, and was always ready to discuss fully with the officers of the Royal Society, or the director, the proper course to follow.

He had formed high hopes of the position which the

Laboratory might take and of its future progress, and he had it in his power greatly to help the realisation of those hopes. His death is a serious blow to the new institution—a blow the consequences of which can with difficulty be repaired. R. T. G.

THE NATIONAL ANTARCTIC EXPEDITION.

WE print below a letter which Prof. Poulton has addressed to the Fellows of the Royal Society in regard to the Antarctic expedition. In it he gives a history of the circumstances which have caused Prof. J. W. Gregory to resign the leadership of the scientific staff. The reason for this, to follow the Professor's words, is that since he left England in February changes have been made in his position in regard to the naval commander of the expedition which deprived him of any guarantee that the scientific work would not be subordinated to naval adventure, "an object admirable in itself, but not the one for which I understood this expedition to be organised." The history of the negotiations before and since the beginning of the present year—the date of the letter in which these words occur—show that when Prof. Gregory accepted the leadership of the scientific work (late in 1899), much stress had been laid on the scientific aspect of the expedition, and that the alterations made since the beginning of the present year have increased the authority of the naval commander.

At a special meeting of the Royal Society in February 1898, when the advantages of an Antarctic expedition were fully discussed, Sir John Murray, in an admirable summary of matters requiring further study, enumerated not only the depth, the deposits and the biology of the South Polar Ocean, but also the meteorology, magnetism, geology, and ice-sheet of the region; and laid special stress on the importance of landing a party to remain over at least one winter in order to study the latter points. Dr. Neumayer, Sir Joseph Hooker, Sir A. Geikie and the Duke of Argyll all enlarged on the importance of one or more of the second group. The same were mentioned by members of the deputation, which Mr. Balfour received in June 1899, and in his reply he acknowledged their importance. It is, therefore, not surprising that Prof. Gregory expected the leader of the scientific staff to be allowed a very free hand, and it certainly seems that the negotiations, described by Prof. Poulton, have tended to deprive him of initiative and to place him more completely under the authority of the naval commander. Yet this expedition will afford a great opportunity not only for geographical discovery, but also for increasing scientific knowledge; and for some most important things in the latter a prolonged stay on land is absolutely necessary. Chief among these, in addition to magnetic work, are the following:—The Antarctic land is covered by an ice-sheet greater than that of Greenland, and certainly not less than even the one which some glacialists assert to have formerly existed in Northern Europe. In that land also, as in no other place, we have a chance of obtaining the key to some curious problems in the zoology and botany, past and present, of other continental masses in the southern hemisphere. For both these problems a prolonged residence is required, and an expert who, like Prof. Gregory, is as familiar with ice and its work as he is with palæontological questions.

We may hope then that those representatives of science on the Joint Antarctic Committee whom Prof. Poulton accuses will be able to demonstrate that he is wrong and Prof. Gregory needlessly apprehensive, that Commander Scott possesses such experience in Polar exploration and has such familiarity with the branches of science which we have mentioned as to warrant a man of Prof. Gregory's age and standing in placing himself absolutely under his orders, and that the *Discovery* is a King's ship in so full and real a sense that such entire subjection, even to signing articles, is imperative. Until their explanation is before us we cannot be expected to express a final opinion on the merits of the dispute, and this we shall no doubt obtain very shortly; for those whom Prof. Poulton has accused of running the risk of subordinating scientific investigation to geographical discovery can hardly afford to let judgment go by default.

To the Fellows of the Royal Society.

THE resignation of the man who is, before all others, fitted to be the Scientific Leader of the National Antarctic Expedition will lead the Fellows of the Society to expect some statement of the causes which have produced a result so disastrous to the interests of science. The following statement gives an account of the efforts which have been made to prevent the injury which has occurred.

In the autumn of 1899 Captain Tizard, F.R.S., and I were appointed as the representatives of the Council of the Royal Society on an Antarctic Executive Committee of four, Sir Clements Markham (Chairman) and Sir R. Vesey Hamilton being the representatives of the Royal Geographical Society's Council. Our functions were defined under various heads in a printed form previously agreed upon. No. 2 instructed us to submit a programme of the Expedition for approval to the Joint Antarctic Committee (consisting of sixteen representatives of each Council), "such a programme to include (*a*) A general plan of the operations of the Expedition, including instructions to the Commander, so far as this can be laid down beforehand. (*b*) The composition of the executive and scientific staff to be employed, the duties, preparation and accommodation for, and pay of, the several members." No. 4 instructed us "To make the appointments of the several members of the executive and scientific staff, subject to the final approval of the Joint Committee." The word "civilian" was nowhere employed. The four members of the Executive Committee were placed on the Joint Committee and all Sub-Committees.

Before the first meeting of the Executive Committee Captain Tizard and I were seen by Prof. Rücker, who informed us that one of the first points which the Council of the Royal Society desired us to raise was the relation in power and status between the Commander and the Scientific Leader. In the German Expedition, which was to start about the same time, the Scientific Director had absolute power, and we were asked to consider the possibility of such an arrangement in the English Expedition.

At one of our first meetings, I think the very first, I raised this question and supported the German arrangement. The other three members, who were all naval experts, convinced me that English law required the Captain to be supreme in all questions relating to the safety of his ship and crew. Since that time I have never disputed this point, but always maintained that the scientific chief should be head of the scientific work of all kinds, including the geographical, and that the captain should be instructed to carry out his wishes so far as they were consistent with the safety of ship and crew.

We then considered the appointment of Scientific Leader and decided to nominate Prof. J. W. Gregory, then of the British Museum of Natural History. In suggesting his name to my colleagues I was influenced by his proved success in organisation and in the management of men in a most difficult expedition (British East Africa in 1893), by the wide grasp of science which enabled him to bring back valuable observations and collections in so many departments. His ice experience in Spitzbergen and Alpine regions was also of the highest importance, together with the fact that his chief subject was Geology, a science which pursued in the Antarctic Continent would almost certainly yield results of especial significance. In addition to all these qualifications Prof. Gregory's wide and varied knowledge of the earth rendered his opinion as to the lines of work which would be most likely to lead to marked success extremely valuable in such an Expedition. No one was more competent to state the probable structure of the Antarctic Continent and its relation to that of the earth. This opinion of Prof. Gregory's qualifications for the position of scientific leader of an Antarctic expedition is I know widely held among British scientific men. In their wide combination and united as they are to tried capacity as a leader they are unique, and an expedition with Prof. Gregory for its scientific chief, with as free a hand as English law would permit, was bound to yield great results.

The Committee deputed me to ask Prof. Gregory if he would consent to be nominated. In doing so I carefully explained that he could not have the full powers of the German scientific leader. He consented to consider the offer favourably, but wished for a more definite statement of his position and powers, and for a programme of the Expedition. Shortly after this he was appointed Professor of Geology at Melbourne, and left England. On the voyage he wrote a long letter to the Executive Committee (dated January 19, 1900), which he posted to me at Port Said. In it he said, "I have heard so many rumours as to what is wanted, that I cannot be sure whether I correctly understand the views and wishes of the Executive Committee: I therefore write mainly for the sake of correction, so that I may avoid any misstatements in communicating with the Council of Melbourne University, when the proposal from the Committee reaches me." The plan drafted by Prof. Gregory in this letter included the provision of a landing party with house, observing huts, dog-stable, &c., and he argued that its organisation should be placed "in the hands of the scientific staff," but that, under any circumstances, the Scientific Leader should have the opportunity of controlling a small independent party on land. This letter was read by all the members of the Executive Committee, and, on June 15, at the close of the meeting, the Secretary despatched a cable to Prof. Gregory containing the information "Your letter of January 19 has been received and approved." As soon as Prof. Gregory received this he sent a decoded copy to Sir Clements Markham, who did not correct it. Indeed, at this period Sir Clements Markham frequently expressed opinions which implied that he contemplated the establishment of a landing party independent of the ship. Prof. Gregory applied for and received from the Council of Melbourne University permission to take the appointment on the lines of his letter of January 19.

Prof. Gregory's name was very warmly received by the Joint Committee and he was appointed Scientific Head on February 14, 1900: the words "Formally appointed, wire when fully able to decide," being cabled to him a few days later by Sir Clements Markham.

Lieutenant Robert F. Scott, Torpedo Lieutenant of H.M.S. *Majestic*, was appointed Commander of the Expedition by the Joint Committee on May 25, 1900.

In June 1900 my attention was called to a statement in the Press describing Prof. Gregory as "Head of the Civilian Scientific Staff." Feeling confident that the word "civilian" was not employed in the resolution accepted by the Joint Committee I wrote to Sir Clements Markham on the subject. In his absence the Secretary replied, "The words 'Head of the Civilian Scientific Staff' are the exact words of the resolution passed by the Joint Committee appointing Prof. Gregory, and I know Sir Clements himself was very anxious to have the word 'civilian' in, so that no difficulty might arise between Prof. Gregory and the Commander of the Expedition, since the Civilians would not be the only scientific men on board." The word "civilian" does certainly occur in the minutes of the meeting. On the other hand, Sir Clements Markham was not present on that occasion (February 14, 1900); the word "civilian" did not occur in the instructions issued to the Executive Committee, and was not used in my letter to Sir Clements (February 15) describing the result of the meeting and asking him to cable. The words I used, "leader of the Scientific Staff," were not commented upon in his reply (February 16), stating that the cable should be sent. The word "civilian" was not used by Dr. W. T. Blanford writing to convey the unanimous recommendation of the Geological Sub Committee that Prof. Gregory should be "chief of the Scientific Staff of the Expedition." Prof. Herdman, who seconded the resolution on February 14, and I who proposed it, both remember the words "Scientific Leader of the Expedition." I have not been able to recover a copy of the notice convening the meeting, in which the agenda were put down. It would, however, have been unreasonable for the Joint Committee to have accepted the word "civilian" when it had no information before it which justified the expectation that naval officers would be lent by the Admiralty.

At the meeting of the British Association at Bradford I explained the situation to Prof. Rücker, who agreed with me that it was full of danger, on account of the reasons alleged for the use of the word "civilian," viz. in order to discriminate between the science under Prof. Gregory and that under the Commander. He agreed with me that the coordination of all the science of the Expedition ought to be in the hands of the scientific chief who had been selected because his reputation was a guarantee that all interests would be properly looked after. Sir Michael Foster, to whom I mentioned the matter at a later date, quite agreed with this opinion, but was unwilling to contest the use of the term "civilian." Furthermore, when I raised the question at a meeting of the Representatives of the Royal Society on the Joint Committee, it appeared that the term was actually preferred by certain influential naval authorities who were present, so that it was impossible to resist it without dividing those who desired to give Prof. Gregory such a measure of freedom of action as he was prepared to accept.

At the meeting (November 20, 1900) of the Joint Committee following the conversations with Prof. Rücker and Sir Michael Foster, a Report from the Executive Committee and Submission and Estimate from Captain Scott were read and received, with certain modifications. I indicated to the Secretaries of the Royal Society, who were sitting opposite to me, that this was a favourable opportunity to raise the question of the powers of the Scientific Director over the whole of the science of the Expedition. They were, however, unwilling to do so, hoping, I believe, that all difficulties would be smoothed away by personal negotiations between Captain Scott and Prof. Gregory, who was expected home in a fortnight.

For nearly two months these negotiations proceeded between Prof. Gregory on the one side and Captain Scott and Sir Clements Markham on the other, and between Sir Clements Markham and me.

The principles held were irreconcilable, and it only remained to appeal to the Joint Committee for a decision.

On January 9, 1901, Prof. Gregory wrote to Prof. Rücker, explaining the failure of the negotiations, and on January 28 he addressed a letter to the Royal Society's Representatives on the Joint Committee, from which I select the following paragraphs:—

"I landed at Liverpool on December 5, and went straight to Dundee to meet Captain Scott, and showed him a copy of my letter of January 19 [1900]. As he returned it to me next day without comment I believed that he understood and accepted the general conditions therein stated. On January 7, in order to settle the exact terms of our mutual relations, I submitted to Captain Scott a draft of the instructions I expected to receive from the Joint Committee, and which I had previously shown to Prof. Poulton. To my surprise Sir Clements Markham and Captain Scott expressed disapproval of these instructions, practically on the ground that there could be only one leader of the Expedition, and that that leader must be Captain Scott.

"My colleagues and myself were characterised as civilian scientific experts, accompanying the expedition to undertake investigations in those branches of science with which the ship's officers were unfamiliar, and it was proposed, that to maintain Captain Scott's complete control, all the scientific men should be required to sign articles.

"According to this theory the position of the scientific staff is accessory and subordinate. The contentions of Sir Clements Markham and Captain Scott would completely alter the position which I was invited to take and which alone I am prepared to accept. Were I to accompany the expedition on those terms there would be no guarantee to prevent the scientific work from being subordinated to naval adventure, an object admirable in itself, but not the one for which I understood this expedition to be organised."

The Executive Committee met on January 30 and drafted instructions on lines approved by Sir Clements Markham. They were opposed by my colleague Captain Tizard, but in my absence through illness were passed by two votes to one.

A few days later the draft instructions were considered by the Royal Society's Representatives, who appointed Sir Joseph Hooker, Sir William Wharton and Sir Archibald Geikie to suggest amendments. They carefully considered the draft and suggested several alterations, the most important of these being the instructions to the commander, (1) not to winter in the ice, (2) to establish between two named points on the coast a landing party with three years' stores, under the control of Prof. Gregory.

The Royal Society's Representatives again met and unanimously approved these amendments, which were submitted together with the draft instructions to the meeting of the Joint Committee on February 8. The Representatives of the Royal Geographical Society objected that they had not had the same opportunity of considering the instructions at a separate meet-

ing, and that the amendments were sprung upon them. The meeting was accordingly adjourned until February 12, the very day before Prof. Gregory sailed. During the prolonged discussion which took place the authorities on magnetism were unanimous in affirming that a station on land was essential in order to obtain the full value of the observations made on the ship.

Sir Clements Markham threatened that the Council of the R.G.S. would not accept the amended instructions, whereupon Sir Michael Foster drew attention to the letter which Sir Clements had written at the time when the Joint Committee was proposed.

The amendments were finally approved by 16 votes to 6, and Sir Archibald Geikie and I were deputed to explain to Prof. Gregory, who was in attendance, that he was to be landed in control of a small party, if a safe and suitable place could be found, and to ask if he would accept these conditions. We reported his consent to the meeting, which was then adjourned for the consideration of other details.

Two of the Representatives of the R.G.S., Sir Anthony Hoskins and Sir Vesey Hamilton, resigned shortly afterwards, explaining that they could not agree with the action of the Committee. The R.G.S. had however the right, which it subsequently exercised, of appointing new members.

At the adjourned meeting, on February 19, the question of the ship wintering was discussed at length. Those who had practical experience of the Antarctic urged us strongly not to take the responsibility of permitting the ship to winter in the ice. Sir Joseph Hooker's statement of the danger was especially impressive, and the meeting decided in accordance with his opinion.

At the same meeting Major L. Darwin proposed to modify the conditions accepted by Prof. Gregory, by adding to them the additional consideration that he should only be landed if the time of the ship should not be too greatly diverted from geographical exploration. I protested strongly against any modification at this stage. Sir Michael Foster opposed me, and, after the close of the meeting, there was a somewhat sharp though friendly expression of conflicting opinions, he maintaining that there should be "give and take," I that we were already pledged to Prof. Gregory, that the arrangement was as it stood a compromise—the minimum Prof. Gregory would accept—by no means the one which scientific men, not belonging to the Navy, would have preferred.

At that meeting Major Darwin did not succeed, but his suggestion in somewhat different words was again brought forward at the next meeting on March 5. Just before the meeting Sir Archibald Geikie told me that he intended to support the proposed changes "in the interests of peace," and that Mr. Teall, and Mr. George Murray, Prof. Gregory's representative, also approved them. Resistance was hopeless; I could only protest against any alteration of the conditions offered and accepted, requesting that my name and the names of those who agreed with me (Mr. J. Y. Buchanan and Captain Tizard) should be recorded.

I wrote to Prof. Gregory a full account of what had happened, carefully explaining that his representative and many of his friends supported the changes, that I had confidence that the proposal was made to enable the Geographical Society to accept the instructions and that it was not intended to prevent and I believed would not prevent his being landed.

In spite of the incorporation of Major Darwin's changes the R.G.S. Council refused to accept the instructions, but addressed a letter signed by their President, dated March 18, to the members of the Joint Committee stating that they were compelled, "as trustees for the money subscribed through their Society and for the funds voted by their Society, to regard the above scientific objects [viz. those to be carried out by a landing party] as subsidiary to the two primary objects of the Expedition—namely, exploration and magnetic observations." In view of the unanimous witness of all experts that the landing party was *essential* for full success in the magnetic work this statement is sufficiently remarkable.

The letter went on to inform us that the President, Sir Leopold McClintock, and Sir George Goldie had interviewed the officers of the Royal Society and had reported to the R.G.S. Council which now suggested that the Joint Committee should recommend a small Committee of six, three to be appointed by each Council, to deal finally with the Instructions. The Council of the R.G.S. agreed to accept the decision of this Committee provided the Council of the Royal Society agreed to do the same.

It has been stated in various directions that the Geographical Society produced new evidence (based upon the experience of Borchgrevink and the intentions of the German leader) which had not been laid before the Joint Committee, and thus induced the officers of the Royal Society to agree to a new Committee. To this it may be replied that these sources of information had been open to the Joint Committe, and that, if anything new had arisen, it was reasonable to refer it to the old Committee rather than to a new one appointed *ad hoc*. Furthermore, the letter of the Royal Geographical Society referred to above clearly indicated that the real intention was to escape from the conditions proposed to and accepted by the scientific leader.

The Joint Committee met on April 26, and was addressed in favour of the course proposed by the R.G.S. Council by Sir George Goldie. Nothing was said which could diminish the conviction that the R.G.S. Council and that of the R.S. in weakly consenting to nominate a fresh Committee had struck a disastrous blow at all future cooperation between scientific bodies in this country.

What reply could the Officers make if they were asked to advise the Council of the Royal Society to cooperate with that of the Royal Geographical Society on any future occasion?

I felt justified in asking what guarantee was there that the Council of the Royal Geographical Society would accept the finding of the Committee of six, when it had refused to accept that of a Committee which included all the officers and almost every expert in Arctic and Antarctic Exploration from both Societies. In reply Sir Michael Foster, in spite of the promise of firmness held out by his attitude on February 12, when Sir Clements Markham threatened that his Council would repudiate the finding of the Joint Committee, maintained that they had only acted within their rights, and that the Royal Society Council claimed the right to do the same if it had not agreed with the decision.

At this point it will be convenient to give a list of the Representatives of the Royal Society on the Joint Antarctic Committee, the Representatives of the Royal Geographical Society being equally significant in relation to the Council of their own Society. They are the President, the Treasurer, the Senior Secretary, the Junior Secretary, Mr. A. Buchan, Mr. J. Y. Buchanan, Captain Creak, Sir J. Evans, Sir A. Geikie, Prof. Herdman, Sir J. D. Hooker, Prof. Poulton, Mr. P. L. Sclater, Mr. J. J. H. Teall, Captain Tizard, and Admiral Sir W. J. L. Wharton.

If the reports of Joint Committees of such magnitude and weight are to be thrown over with the approval of the Councils of both Societies because a majority of one Council does not agree with the conclusions, men will rightly hesitate before consenting to devote an immense amount of time and trouble to the work of the Society, and the efficiency of the Royal Society will be greatly diminished.

The considerations set forth above indicate the future injuries which are likely to be inflicted on our Society by this surrender. At the meeting on April 26 I was more concerned with the immediate and pressing injury, and therefore urged that the Royal Society was a trustee for the interests of science and that we had pledged ourselves to secure certain powers to the Scientific Director, that it was better the Expedition should not start (a contingency contemplated as possible by Sir George Goldie, but not a serious danger, I believe, even though the Royal Society had stood firm and appealed to the Government, not on the subject-matter in dispute, but on the refusal of the Royal Geographical Society to work with the recognised methods of cooperation) than that the Royal Society should betray its trust, that the Fellows of the Society would not support the Officers in thus yielding to the Royal Geographical Society, and that I should feel bound to explain my position to the Society. Sir Archibald Geikie and Mr. J. Y. Buchanan also strongly objected to the surrender, which was then confirmed by a large majority of those present.

We were told by Sir George Goldie that the three Representatives of the Royal Geographical Society on the new Committee would be Sir Leopold McClintock, Mr. Mackenzie, and Sir George himself; by Sir Michael Foster that the Royal Society Council would appoint three non-experts, viz. Lord Lister, Lord Lindley and the Treasurer, who could pronounce without bias upon the whole of the evidence. My colleague, Captain Tizard, with whom I had worked with the most complete

sympathy and agreement through the whole course of the negotiations, supported the formation of the new Committee because of Sir Michael's assurance that all evidence would be sifted and because of his faith in the validity of the evidence he had to give. Others probably voted in the affirmative for the same reason.

Without asking for evidence from Sir Joseph Hooker, Sir W. Wharton, Sir George Nares, Sir A. Geikie, Captain Creak, Captain Tizard, or Mr. Buchanan, the new Committee proceeded to cable to Melbourne the modifications which have led Prof. Gregory to resign.

In bringing a condensed account of the negotiations before the Fellows of the Royal Society I desire to call attention to certain special difficulties which the Society has had to encounter in the struggle.

(1) The fact that nearly the whole of the money voluntarily subscribed was obtained through members of the Geographical Society and from its funds.

(2) The fact that Sir Clements Markham, President of the Royal Geographical Society, a man of remarkable energy, resource and resolution, was the chief antagonist of the amendments passed by the Joint Committee.

(3) The fact that the Junior Secretary and Sir John Evans were absent from England during the most critical period.

(4) Prof. Gregory's appointment to the Chair at Melbourne, involving his absence from England during a large part of the negotiations.

Making all allowance for these difficulties, I believe that the majority of the Fellows will consider that the claims of the Scientific Chief in an Expedition undertaken to do scientific work have not received from the Royal Society that unflinching, undivided and resolute support which they would have expected and desired. EDWARD B. POULTON.

Oxford, May 15.

NOTES.

WE understand that the council of the Society of Arts has awarded the Albert Medal for the present year to the King, and that His Majesty has graciously consented to accept the award. The grounds of the award are principally the services the King has rendered to the Society, and through it to the arts, manufactures and commerce of the country, by acting as its president for thirty-eight years; but reference is also made to the active interest he has long taken in international exhibitions and the actual work which he did as president of the British Commission for several foreign exhibitions, and also as president of the series of exhibitions held at South Kensington, the last of which was the Indian and Colonial Exhibition.

DR. LAVERAN, the French surgeon who first investigated the peculiar micro-organisms in the red blood corpuscles of malarious patients, has been elected a member of the Paris Academy of Sciences.

THE Report of the Royal Commission upon the British exhibits at the Paris International Exhibition last year has been presented to the King, and some of the observations in it will have to be given serious consideration before the country is represented at any future exhibition of the same character. Indifference to progress abroad and want of combination among manufacturers are two reasons given for the comparatively poor display of British exhibits. It is pointed out that our position has changed since the earlier exhibitions; for foreign industries have made gigantic strides, and in many branches of manufacture have become formidable rivals to our own in the markets of the world. On this account the industrial interests of the country as a whole gain nothing from an exhibition unless they are represented upon equal terms with foreign industries. "We are of opinion," reports the Commission, "that the voluntary system can no longer be relied upon to secure an adequate representation of British industry, and that in any future international exhibition in which it may be decided to take part, it will be necessary to have recourse to the principle of selection, which has been largely adopted by foreign Powers. . . . The contrast between the orderly, symmetrical appearance of the foreign spaces in certain groups with the undignified collection of show cases of different sizes and design which filled the British space was little less than painful." Commenting upon the causes of this conspicuous defect, the Commission says:—"As a rule a British manufacturer will only exhibit if he can select his own goods and display them in his own way and in his own show-case. He is impatient of advice; he will not submit to dictation; he will not share his show-case with others; nor will he join with others to adopt a uniform plan of arrangement. For this reason it is exceedingly difficult to organise collective exhibits. We were strongly impressed from the beginning with the advantages which such exhibits possess. They save space, they avoid the duplication of similar objects, and, in the case of many industries, they ensure a higher level of excellence than any single firm can hope to attain. We endeavoured to persuade exhibitors to adopt the principle, but our efforts met with so little success that we had to abandon the attempt." This is another example of the want of enterprise among British manufacturers, and the narrow spirit in which our commercial affairs are managed. There can be little hope of national progress until broader views are taken of our industrial responsibilities.

THIS week we have the announcement of what may be safely called the most munificent gift of our time by a private individual to the cause of education in this country. Mr. Andrew Carnegie, the American millionaire, has come forward with a proposal to provide free University education to the youth, both male and female, of Scotland, and offers to place the sum of two millions of pounds in the hands of trustees who shall be charged with the duty of making payment to the Universities of Scotland of the fees of students of Scottish birth. There can be but one opinion regarding the large-heartedness which prompts so magnificent a benefaction, and the whole nation will hope that a sound result may be obtained through so noble a gift. Its terms have as yet been too baldly stated to justify critical analysis of its probable effect, but touching, as it does profoundly, the educational system of the country, the form it will ultimately take is a matter of the utmost moment. Two obvious criticisms evoked by the bare statement that has been made public may, without detracting from the generous intention of the donor, be noted. In the first place, the consequence of the gift as adumbrated must be that secondary education will, in Scotland, alone be unendowed. The gift would be a step towards the realisation of the dream, many times dreamed of old, of education free from bottom to top. This may or may not be a sound policy, but it demands discussion upon its merits and apart from the compulsion of the gift of an individual. What is in Scotland to-day will be required in England to-morrow. Secondly, the gift is no endowment of the Scottish Universities, but it may, on the contrary, be an embarrassment to them. It means the creation of some sixteen hundred bursaries, each of the value of nine pounds, in each of the Universities. This will not bring an influx of sixteen hundred students to each University, but, if Mr. Carnegie's intention be realised, we take it there will be a considerable increase in the number—sufficient, indeed, to swamp the existing equipment for teaching, for the strengthening of which their fees may be inadequate. Whilst it is earnestly to be wished that this large sum of money may be secured to the cause of education, it is to be hoped that those with whom Mr. Carnegie may take counsel will use their influence to harmonise

his evident intention to benefit the masses with the real educational needs of the country and with the work of the Universities.

THE anniversary meeting of the Royal Geographical Society was held on Monday, when the president, Sir Clements Markham, K.C.B., distributed the medals and prizes for the encouragement of geographical science and discovery. The founder's medal was awarded to the Duke of the Abruzzi for his expedition to Mount St. Elias in North-West America, and towards the North Pole by the Franz Josef Land route. The patron's medal was awarded to Dr. A. Donaldson Smith, for his African explorations and surveys. Other awards were the Murchison award for 1901 to Mr. John Coles, for his services to geography and to the Society as map curator and instructor during a period of twenty-two years. The Gill memorial for 1901 to Captain Cagni, for his journey over the frozen ocean to latitude 86° 33′ N. The Back grant for 1901 to Sub-Lieutenant W. Colbeck, R.N.R., for the survey work which he did in Victoria Land, and during the voyage of the *Southern Cross*. The Cuthbert Peek grant for 1901 to Mr. L. C. Bernacchi, for his series of scientific observations taken in Victoria Land and the Ross Sea. After the presentation of the medals the president delivered an address, in the course of which he referred to the recent international conference in Christiania for the exploration of the ocean, and to the equipment and the arrangements connected with the National Antarctic Expedition. After mentioning the matters dealt with in another column and sketching the programme of work to be done by the expedition, the president said it was necessary that there should be a second ship ready to proceed south in November, 1902, in the possible contingency of any accident or of the detention of the *Discovery*. It was also very desirable that there should be sufficient funds for a third year. But the first of these objects was essential. A whaler might be bought or hired, and she would have to be manned and provisioned. The cost would be about 15,000*l*., towards which amount 5000*l*. had been promised by one donor and 500*l*. by another.

The annual conversazione of the Institution of Electrical Engineers will be held at the Natural History Museum, South Kensington, on Friday, June 14.

MR. R. W. DANA has been appointed secretary to the Institution of Naval Architects, to succeed Mr. G. Holmes, who has accepted a position under Government.

AT the annual meeting of the African Trade Section of the Liverpool Chamber of Commerce held on Monday, Mr. Alfred L. Jones, the president, remarked that all West African people had lent themselves heartily to support the great effort of the Liverpool School of Tropical Medicine, which the Chamber of Commerce initiated. Mr. Chamberlain has written a letter in which he expresses pleasure "that through the generosity of a Glasgow citizen, and by the action of Major Ross, who is prepared to give his services without remuneration, the Liverpool School of Tropical Medicines has been able to arrange that Major Ross should proceed to West Africa for the purpose of endeavouring to effect the extermination of the Anopheles mosquito in a selected town. It is understood that Major Ross proposes to select a town for the experiment either in Sierra Leone or the Gold Coast, and the Governors of these colonies have been requested to afford him all the assistance in their power."

AT the Royal Institution to-day Prof. Dewar will deliver the first of a course of three lectures on "The Chemistry of Carbon." On Tuesday, May 28, Prof. William Knight will begin a course of two lectures on "The Philosophical Undertones of Modern Poetry" (the Tyndall Lectures), and on Saturday, June 1, Prof. J. B. Farmer will deliver the first of three lectures on "The Biological Characters of Epiphytic Plants." The Friday evening discourse on May 24 will be delivered by Mr. R. T. Glazebrook, on "The Aims of the National Physical Laboratory," on May 31 by Mr. A. H. Savage Landor, on "With the Allies in China," and on June 7 by Prof. R. Meldola, on "Mimetic Insects."

THE *Times* announces the death, at St. Petersburg, of Dr. E. Bretschneider, one of the most distinguished students of Chinese history and knowledge of his time. For many years Dr. Bretschneider was physician to the Russian Legation at Peking, and took advantage of his exceptional position to devote himself to the investigation of Chinese archæology, history, language, geography, &c. One of his latest works is a "History of European Botanical Discoveries in China," and another one of the best maps of China available, both of them in English. Among other works from his pen are the following:—"On the Study and Value of Chinese Botanical Works"; "Fu-sang, or Who Discovered China"; "On the Knowledge possessed by the ancient Chinese of the Arabs and Arabian Colonies"; "Notes on Chinese Mediæval Travellers to the West"; "Archæological and Historical Researches in Peking and its Environs"; "Mediæval Researches from Eastern Asiatic Sources." Dr. Bretschneider was an honorary corresponding member of the Royal Geographical Society, as well as of many other societies.

AS already announced, the sixth annual congress of the South-Eastern Union of Scientific Societies will be held at Haslemere and Hindhead on June 6–8. An address will be given by the president-elect, Mr. G. A. Boulenger, F.R.S., and a number of interesting papers are down for reading, among them being the following:—Moisture in the atmosphere, the Hon. Rollo Russell; certain aspects of post-Darwinian work in zoology, Prof. G. B. Howes, F.R.S.; seedlings, Miss E. Sargent; the teaching of nature knowledge in elementary schools, Miss A. M. Buckton and Prof. A. D. Hall; habit and discipline in their influence on organisation, Dr. Jonathan Hutchinson, F.R.S.; an eclipse trip to Portugal in 1900, Mr. G. F. Chambers; cuckoos' eggs, Mr. Oswald H. Latter; and the origin of certain weeds, Mr. S. T. Dunn.

PROF. H. H. GIGLIOLI, of the Royal Zoological Museum, Florence, informs us that on April 13 the second annual meeting of the Zoological Union of Italy concluded its work at Naples. This Union was formed at Pavia last year and in the following September it held its first general meeting at Bologna, which proved to be quite a success as to the work performed and the large attendance. It became evident that the Union, the scope of which is to collect the scattered forces of students of zoology and to prepare the way for the foundation of a zoological journal worthy of Italian science, has responded to a wish generally felt in Italy. The Union now counts amongst its members nearly all the Italian professors of zoology and anatomy and many other students of those sciences. The meeting at Naples was even more numerous than that at Bologna, and many interesting communications were read. Bologna greeted the assembled zoologists with the memories of its old masters—Aldrovandi, Malpighi, Alessandrini and others; at Naples they were *fêted* by that great centre of zoological investigations, the Zoological Station, whose steam-launch, which bears the glorious name of *Johannes Müller*, gave the visitors practical examples of pelagic trawling and dredging, as the war steamer *Ercole* bore them to Capri. Rome has been chosen for the third congress, in 1902, "when," remarks Prof. Giglioli, "we shall be proud and happy to welcome any of our foreign colleagues who should choose to honour us with their presence."

WE are indebted to the president of the International Aëronautical Committee for the following preliminary results of the balloon ascents on April 19. The number of balloons was 19, of which 6 were manned, and the countries that participated in the investigation were Austria, France, Germany and Russia. The results of the manned ascents from Berlin and Vienna were remarkably coincident: Berlin, temperature at starting, 5°·6 C., and −25°·5 at an altitude of 5500 metres; Vienna, 5°·0 at starting, and −25°·0 at 5260 metres. The greatest heights attained by the unmanned balloons were: 10,500 metres at Strassburg, temperature −54°; 11,100 m. at Trappes (near Paris), temperature −62°; 11,848 m. at Chalais-Meudon, temperature −52°·8 C. The only instance in which an inversion of temperature was recorded appears to have been at Strassburg, but the balloon, which was made of paper, burst at an altitude of 1500 metres.

A GENERALISATION of Clairant's form in the theory of differential equations of the first order, based on certain considerations given by Raffy, is contained in a note by Signor Minea Chini in the *Rendiconto* del R. Istituto Lombardo, xxxiv. 8. In this note the author examines what are the types of differential equations of the first order in x, y whose general integrals are obtainable by replacing the differential coefficient p in the original differential equation by a previously determined function, (i.) of x, C, (ii.) of x, y, C, where C is an arbitrary constant.

A SHORT note on the propagation of *Filaria immites* by the agency of mosquito bites is contributed by Signor G. Noè to the *Atti* dei Lincei, x. 8. It has now been conclusively proved that the filariæ of the blood are transmitted from one host to another by mosquitoes which act as intermediate hosts. An experiment, in which a healthy dog was made to eat hundreds of Anopheles, both from infected regions and others infected in a laboratory, without itself becoming infected, excludes the possibility of the parasites being propagated otherwise than by punctures.

THE *Transactions and Annual Report* of the Manchester Microscopical Society for 1900 bears ample testimony to the flourishing state of that institution and the keenness of its members for hard work. The address of the president, Prof. S. J. Hickson, deals with the reproduction and life-history of the Protozoa, special attention being directed to recent investigations on that group and the alteration in our views thereby rendered necessary. It is now inexact to say that the Protozoa are, as a general rule, animals of simple constitution, many of them being, to a certain extent, specialised. Among other papers, Mr. M. L. Sykes contributes an exceedingly interesting article on smallpox and vaccination, and the mode of producing glycerine cultivations of vaccine lymph, which may be commended to the best attention of anti-vaccinationists.

THE two issues (Nos. 9 and 10) of the *Biologisches Centralblatt* for May contain articles dealing with the freshwater invertebrate fauna of Lake Baikal. In No. 9 Herr W. Zygoff discusses the sabellarian annelid from the lake described by Prof. J. Nusbaum in the same journal for January 1 as the first known freshwater member of its group under the name of *Dybowscella baicalensis*. It is pointed out that a North American freshwater form, *Manayunkia speciosa*, was described long ago by Leidy, and it is urged that the one inhabiting Lake Baikal is inseparable. In the following article Prof. Nusbaum disputes this identification, alleging that while Manayunkia is hermaphrodite, in Dybowscella the sexes are distinct. No. 10 contains a general article on the fauna of the lake by Herr A. Korotneff, in which a new freshwater polyzoan is described as *Echinella placoides*.

UNDER the title of "A Theory of the Origin and Evolution of the Australian Marsupials" Mr. B. A. Bensley, in the April number of the *American Naturalist*, publishes a further account of the result of his investigations into the history of that group. Starting with the well-known fact that the group simulates most of the placental orders, the inference is drawn that its evolution, or "radiation," has taken place within its present habitat. Reasons are then given for regarding the banded anteater (Myrmecobius) as a degraded type; and if this view be accepted, all the other types can be derived, both as regards their dentition and their feet, from the American opossums, the ancestors of which are regarded as the progenitors of the whole group. All the Australian marsupials thus appear to have had an arboreal ancestry; and when, in spite of the specialisation of certain forms, the primitive character of the whole group is borne in mind, it seems evident that the date of the "radiation" is comparatively recent. Hence the author is inclined to side with those who consider that marsupials first entered Australia during the Tertiary period, although he thinks their arrival was later than has previously been considered possible. As to whether their immigration was from the north or from the south he is undecided, although he states that "there is at least some justification for the view that it was from the northward," *i.e.* by way of Asia.

DURING his travels in Southern India (1816–20), with a view to the economic development of Pondicherry and other French possessions in the East, Leschenault de la Tour made a valuable collection of rocks, which are preserved in the Museum of Natural History in Paris. Some of the rocks, pyroxenic and scapolitic gneisses, were described in 1889 by Prof. A. Lacroix, but as their geological relations had not been determined, Mr. T. H. Holland, of the Geological Survey of India, has specially examined the entire collection in Paris, and has also investigated the area from which the rocks were obtained. His observations are recorded in an article on the geology of Salem, Madras Presidency (*Mem. Geol. Surv. India*, vol. xxx. part 2, 1900). The rocks which he describes are, in probable order of age, (1) fundamental biotite-gneisses; (2) schists; (3) pyroxene-granulites; and (4) younger igneous intrusions, including basic dykes, peridotites and "white elephant" rocks—masses of quartz having the characters of plutonic quartz and containing much liquid carbonic acid.

IN the May issue of the *Cambrian Natural Observer*, Mr. Arthur Mee directs attention to the state of the grave of the Rev. T. W. Webb, author of the classical "Celestial Objects for Common Telescopes," in the churchyard of Mitchel Troy, near Monmouth. There is no reference on the stone to indicate the invaluable work accomplished by Webb, and Mr. Mee suggests that some means be adopted of suitably recording the services rendered to astronomy by the deceased divine.

THE peculiar thermal properties of the alloys of nickel and steel discovered by M. C. E. Guillaume have already met with more than one application, the existence of an alloy with a practically negligible coefficient of expansion pointing to an ideal material for the construction of length standards for geodesic measurements. In the current number of the *Comptes rendus* is described a further application by M. Guillaume of this material. The secondary compensation error of a chronometer, discovered by Dent in 1833, is due to the fact that a chronometer adjusted for two fixed temperatures is not perfectly adjusted for any other temperature. In the present paper, it is shown that by the use of a suitable nickel-steel alloy it is possible to compensate perfectly the variations of elasticity of the spring with a balance of the ordinary form.

THE same number of the *Comptes rendus* contains an important communication by M. Jean Friedel to the theory of chlorophyll assimilation. It is usually held that three conditions are

necessary for the assimilation of carbon—the presence of chlorophyll, the existence of living protoplasm in contact with the chlorophyll, and light rays. The results of the experiments described in the present paper would appear to show that the second condition is not essential. A glycerine extract of the leaves, filtered first through paper and then through a Chamberland porcelain filter, and containing no trace of cells or even of protoplasmic débris, shows no assimilation in either light or darkness. The leaves of the same species dried at 100° C. gave a green powder containing no living matter, an extract also showing no assimilating power in the light. But a mixture of these two extracts exposed to the light readily absorbed carbon dioxide and gave off oxygen. From these experiments the author concludes that chlorophyll assimilation is accomplished without the intervention of living matter by a diastase which utilises the energy of the sun's rays, the chlorophyll acting as a sensitiser.

THE additions to the Zoological Society's Gardens during the past week include a Red Howler (*Mycetes seniculus*) from Colombia, presented by Commander A. Jolliffe; an Arctic Fox (*Canis lagopus*) from the Arctic Regions, presented by Dr. H. A. Allbutt; a Black-faced Kangaroo (*Macropus melanops*, ♀) from Tasmania, presented by Miss Amy Mitchell; two Barred Doves (*Geopelia striata*) from India, presented by Mr. W. A. D. Harding; an Allen's Porphyrio (*Hydrornia alleni*), captured at sea, presented by Miss V. I. Nielsen; a Rook (*Corvus frugilegus*), British, presented by Mr. A. Yates; a Spider Monkey (*Ateles*, sp. inc.), a Kinkajou (*Cercoleptes caudivolvulus*), a Feline Douroucouli (*Nyctipithecus vociferans*), a Corais Snake (*Coluber corais*) from South America, a Vulpine Phalanger (*Trichosurus vulpecula*), a Short-tailed Wallaby (*Macropus brachyurus*), two Quoy's Lizards (*Lygosoma quoyi*) from Australia, an —— Ibex (*Capra*, sp. inc.) from Persia, two Simony's Lizards (*Lacerta simonyi*) from the Canaries, six Tigrine Frogs (*Rana tigrina*) from the East Indies, three Schlagintweit's Frogs (*Rana cyanophlyctis*) from Southern Asia, five —— Skinks (*Eumeces skiltonensis*), four Changeable Tree Frogs (*Hyla versicolor*) from North America, a Californian Toad (*Bufo boreas*) from California, two Hamilton's Terrapins (*Damonia hamiltoni*), four Bungoma River Turtle (*Emyda granosa*) from India, deposited; two Common Teal (*Querquedula crecca*), a Shag *Phalacrocorax graculus*), European, purchased; a Japanese Deer (*Cervus sika*, ♀), born in the Gardens.

OUR ASTRONOMICAL COLUMN.

NEW VARIABLE STAR 71 (1901) AURIGÆ.—Mr. Stanley Williams announces in the *Astronomische Nachrichten*, Bd. 155, No. 3708, the discovery of variability in the star B.D. +42°·1295, the position of which is

R.A. = 5h. 18m. 19·5s
Decl. = +42° 18′·5 } (1855·0).

The magnitude variations have been measured from photographs taken with a portrait lens of 4·4 inches aperture, and the following are the elements deduced:—

Period, 0·7925d. = 19h. 1m. 12s.
Epoch max. 1901 March 3 (2415447), 13h. 0m. G.M.T.
Limits of variation, 8·75 mag. to 9·65 mag.
Max. to min., 14h. 13m.
Min. to max., 4h. 48m.
Ratio of increase to decrease = 0·34.

SPECTRUM OF ζ PUPPIS.—In *Harvard College Observatory Circular*, No. 55, Prof. E. C. Pickering gives the results of a new investigation by Mr. King of the spectrum of ζ Puppis with relation to the new lines of hydrogen found in that star some time ago. The lines occur also in δ and ε Orionis and the spectra of these stars have consequently been used in the reduction. The first line of the series corresponding to the red ordinary line has not yet been recorded, and the observed series consists of seven lines whose measured wave-lengths were 5413·6, 4542·4, 4200·7, 4026·0, 3924·0, 3860·8, 3815·7.

DEFINITIVE ORBIT OF COMET 1894 II. (GALE).—In the *Astronomical Journal* (vol. xxi. Nos. 496–7), Mr. H. A. Peck brings together all the available published observations of this comet from April to July 1894, and from their discussion computes the definitive elements referred to the mean equinox and ecliptic of 1894·0, which are the following:—

$$T = 1894 \text{ April } 13^{\text{d}}406912 + 0^{\text{d}}\cdot000395\delta\nu$$
$$\omega = 324^{\circ}\ 12'\ 22''\cdot52 + 1''\cdot2046\delta\nu$$
$$\Omega = 206\ 23\ 53\cdot04 - 0''\cdot5347\delta\nu$$
$$i = 86\ 59\ 18\cdot19 + 0''\cdot8478\delta\nu$$
$$q = 0\cdot9830931 + 0\cdot0000013398\nu$$
$$e = 0\cdot9911206 + 0\cdot0000028378\nu$$

$\delta\nu$ will most probably have some value between − 20″ and − 60″. For $\delta\nu = 40''$ the period of revolution would be 1143 years. The orbit of this comet appears to indicate peculiar relations to that of Jupiter. During the entire period of visibility, and for two or three years previous, the planet was near the orbit plane. A computation of the perturbations due to the major planets is now in progress.

THE UNIVERSITY OF LONDON.

THE presentation of prizes and degrees at the University of London on Wednesday, May 15, was the occasion of some noteworthy remarks upon the work and promise of the University. We give the Vice-Chancellor's address, together with parts of subsequent speeches.

Sir Henry Roscoe said,—"The past year has been one of loss and sorrow not only to the whole nation but also to this University. It has, however, I hope, been a year of some achievement. The death of her late Majesty, Queen Victoria, deprived us not only of our visitor but also of our foundress, and it is no small matter to have such a name to look back upon. For, although the earliest charter of the University bears date 1836, and was amongst the last of those issued by King William IV., yet no real start had been made in the work of the University previous to the accession of the Queen, and at the commencement of her reign she showed her interest by formally renewing the first charter of the University. This early interest never declined and, in 1870, when, after long delay, the University was granted by the Government a home of its own in Burlington-gardens, it was the Queen who personally opened the building on the presentation day of that year.

"The senate and graduates of the University presented a respectful address of condolence and congratulation to His Majesty, King Edward VII, on his accession, and the King in his gracious reply, which I will venture to read to you, was pleased to express his own continued interest in this University. His words were as follows:

"'I thank you for your loyal and dutiful address and for your sympathy with the grief of myself and my family for the death of my beloved mother.

"'The progress of your University, from its commencement almost at the date of her late Majesty's accession to its recent reorganisation as a teaching as well as an examining body, has been one of the most remarkable developments witnessed in a reign memorable for the spread of higher instruction among both sexes and all classes and races in my Empire.

"'You may feel assured of my hearty sympathy and good wishes and cooperation in the furtherance of your good work.'

"It will be in the recollection of many of you that, exactly a year ago to-day, it was the speaker of these words who, as Prince of Wales, sat on the right hand of this chair and spoke words of hope and good augury for the future upon our recent occupation of this newer and larger abode.

"But it is not only the death of the Queen that we have to regret. A most serious illness has, during the last few months—months of critical import for the University—made it impossible for our Chancellor to take any part in our work. He has, you will all be glad to hear, made a marvellous recovery, and he

has sent me a letter to read to you from which you will see the deep interest he continues to take in all our affairs. It will be no small pleasure to him to think that, in his absence, we have as our guest his old colleague and friend, Lord Rosebery.

"It has been the lot of our Chancellor for many years past to speak with hope deferred of the creation of a great teaching University in and for the metropolis. This year, if it is not exactly in my power to say that the reconstitution and re-organisation have been completed, yet this one can say, that it will be chiefly ourselves whom we shall have to blame—I mean the teachers, the schools, and even the senate of this University—if a great centre of learning and research does not grow up in London.

"For although, ladies and gentlemen, the old work of the University will be continued in the future as it has been in the past—even, I may hope, with increased prosperity—although the examination of all candidates, no matter what their origin or their means of knowledge, will continue with that absolute fairness and impartiality upon which the University has built up so great a reputation, yet we must not deceive ourselves. The most perfect examinational system conceivable can only, to quote the words of the reply from the throne, add to the 'higher instruction' of a nation. But this is not enough. If we are to meet successfully the constant changes of thought and manner of life to which a highly organised society is increasingly liable, our Universities must not be content with giving instruction or testing attainment, however high, but must make real contribution to the knowledge which alone in some form or other will be a guarantee of the stability of that society. Unless the University of London is known as a centre from which almost daily additions to our understanding of the world of thought and matter emanate, we shall not have justified our existence.

"But, ladies and gentlemen, how is this end to be attained? Such results cannot come from a few weeks' work, or without the expenditure of much energy and money. In the first instance it should be our object to reduce to a minimum the wastage of our forces by overlapping and friction between the various elements of the University already existing. The need for concentration in preliminary medical studies is one of the most urgent of these early steps, not merely—not even chiefly—because it is a waste to have the work in these junior departments spread over London with frequently inefficient or duplicated equipment, but largely because the relief that would come to the medical schools by concentrating these studies in two or three central institutions would place at the disposal of the authorities opportunities and space badly needed for conducting research in pathology, bacteriology and the other higher branches of medical and surgical science.

"Such a concentration, as has been suggested in the case of the Medical Faculty, will doubtless lead to difficult problems which will require, and, I am sure, will receive, the whole-hearted cooperation of the various schools and teaching institutions of the University for their successful solution.

"It will not be necessary, I hope, to remind you that it will be ultimately impossible for each school of the University to fulfil within its four walls all the functions that belong to a university such as we conceive it to be at the present day. There are parts of London in which certain kinds of study can be much more profitably pursued than in others. It would be foolish, for instance, to attempt to centralise the study of ancient literature and archæology in Surrey or even in South Kensington, whereas we have materials around us here without parallel for the study of natural history, or of the history of modern art, to say nothing of pure and applied science. As opportunity arises for the better equipment of this or that branch of learning, it should be our aim to inquire in what part of London this equipment can be placed so as best to make use of facilities already existing and so as best to attract the largest possible number of good students. If this be our policy, our University will in course of years become an Imperial University in an altogether new and fuller sense, and the reputation that it will win for itself in the world of thought will bring it those more solid rewards without the aid of which its successful working will be seriously endangered.

"But without the schools of the University we can do nothing, and I venture to take this, the first, opportunity of calling upon them here—to-day—to take their share in this movement and to believe that the best hope of success for each member of the body corporate will be found in the prosperity of the whole."

Lord Rosebery said, in the course of his remarks, "In my judgment the struggle of this coming century will not be so much one of brute force as of trained intelligence. In the diplomacy of the world, in the markets of the world, in your arrangements of legislation and of government, it will be intelligence that will win. There was a time, I do not doubt, not so long ago, when the nations of the world were satisfied with a very moderate degree of instruction and intelligence. The schoolmaster, we are told, was abroad—I think it was said by Lord Brougham and probably in this University—and he has been so much abroad that no nations are satisfied with the standard of education that prevailed 25 years ago. Every nation demands a more keen and more trained and, if I may use the adjective, a more versatile intelligence than that which was adequate for the business methods of the Empire in former days. In other words, we have to meet much keener competition in every department of life. I hope, though perhaps not with much confidence, that all our educational institutions in this country are recognising that fact, or are about to, and are preparing to furbish up their somewhat antiquated methods in some cases to meet the demands of modern civilisation and modern competition. That is what this University has done, and is doing; and that is why I am so happy to be here to-day and to give my modest and unasked for benediction to these proceedings."

Sir Michael Foster held that there must be in London a University devoted, not only to the spreading of knowledge, but also to the making of knowledge.

Lord Reay said that London could offer facilities for research in every domain second to none in the civilised world. They might look forward to an increasing number of students from every part of the Empire to make use of those resources. Modern requirements were constantly growing, and they could not cope with the demands made on them without the exercise of public spirit which was so brilliant in the United States of America.

THE LANGUAGE AND ORIGIN OF THE BASQUES.

THE Basques or Euskaldunak (*i.e.* "the Men"), as they call themselves, are a most remarkable people who have long been an interesting problem to ethnologists. The most anomalous point about the Basques is their language, which is as typically agglutinative as any Asiatic or American tongue. Ripley, in his fine book "The Races of Europe," points out that the verb habitually includes all pronouns, adverbs and other allied parts of speech; as an example of the appalling complexity possible as a result, Bladé gives fifty forms in the third person singular of the present indicative of the regular verb "to give" alone. Another often quoted example of the effect of such agglutination occurs in a reputed Basque word meaning "the lower field of the high hill of Azpicuelta," which runs,

Azpilcuelagaraycosaroyarenberecolarrea.

No wonder that the French peasants state that the devil studied the Basque language for seven years and learned only two words. Like many other undeveloped languages, the principle of abstraction or generalisation is but slightly developed; for example, as there is no general word for "sister" the Basques have to say "sister of the man" or "sister of the woman," &c. Owing to their isolation on both flanks of the Pyrenees, many primitive institutions persist among the Basques. In some places the eldest daughter takes precedence over all the sons in inheritance, which may be a relic of a former matriarchal family; communal ownership within the family is frequently practised. The remarkable custom now known as the couvade, in which the father takes to his bed on the birth of a child, was attributed to these people by Strabo, and it is believed by some not to have completely died out at the present day, though there is great difficulty in proving its existence, as G. Buschan points out in *Globus* (Bd. lxxix. p. 117). H. Schuchardt has recently (*Globus*, Bd. lxxix. p. 208) expressed his wonder that this statement has again been dragged from the realm of

fable. The same writer makes some remarks on misapprehensions respecting the Basque language.

Many wild theories have been promulgated as to the origin of the Basques, one of the most absurd being an attempt to relate them with a certain tribe in Central America. Several scholars have sought to affiliate the people with Lapps and Finns, and they have been supposed to be related to the ancient Egyptians, the ancient Phœnicians, the extinct Etruscans and to the Picts. The Basque language appears to be absolutely without connection with any of the so-called Turanian (Ural-Altaic) languages, since, as Keane shows in his "Man Past and Present" (p. 460), there is no longer any doubt as to the relationship of the Basque with the Berber language.

The anthropometrical evidence has given rise to much controversy. The French Basques have an average cephalic index (on the living) of 83, while the Spanish Basques average 78, according to Collignon, and 79 according to de Aranzadi in the graphic curve published by the latter anthropologist, who, by the bye, is himself a Basque; there are two distinct maxima, one at 76 and the other at 80, indicating, probably, that there are at least two elements in the group. The French Basques are on an average three-quarters of an inch shorter than their Spanish brethren, 1657 mm. (5ft. 5¼ins.) and 1638 mm. (5ft. 4½ins.) respectively. Both branches of the stock have a similar very characteristic head; the cranium is distinctly long even in the most brachycephalic subjects, and is enormously swollen in the temporal region, a character which is absolutely peculiar to this people, the forehead is high and straight and narrow below, the face is very elongated and has the shape of an inverted triangle, the chin being thin and pointed; the nose is correspondingly long and narrow.

Certain anthropologists have claimed that those Basques who live north of the Pyrenees more nearly represent the primitive stock, while the same has been asserted for those south of that range. De Aranzadi thinks that those Spanish Basques with dark hair and eyes and a rather narrow head and of middle stature are of true Iberian origin and are related to the Berbers. Those with darkish brown hair and greenish hazel eyes, a broad head and low stature are, according to him, of Ugrian or Finnish descent. G. Buschan, in a recent number of *Globus* (Bd. lxxix. p. 123), regards it as highly probable that the Basque race resulted from a crossing of the short-heads of the earliest prehistoric time, who probably wandered from Asia into Europe, with the long-headed indigenous Mediterranean race. The first of these two constituents he recognises as the race of Grenelle (French authors) or as the type of Sion or Disentis (His-Rütimeyer) or as the celts of Broca. Buschan has overlooked the fact that Canon Isaac Taylor, in his "Origin of the Aryans," had suggested this same explanation in 1890 and Beddoe had alluded to it in his "Anthropological History of Europe" in 1893. De Aranzadi recognises a third element with light hair, blue eyes, narrow head and tall stature, which is a later addition of Kymric or Germanic origin, and he suggests that this element is related to the accursed race of the Cagots who were isolated from their neighbours and had a separate church door for themselves.

Collignon, who has made many brilliant studies in the anthropology of France, draws attention to the very anomalous relation that exists between a cephalic index of 82·5, which is clearly brachycephalic, and a cranial length as great as 191 mm. He is of opinion that this permits us to look for the affinities of the Basque race more in the direction of the long-headed races; the Nordic, or Teutonic, being clearly out of the question, relationship must be sought among the Mediterranean group of peoples rather than in the direction of the brachycephals of France and of Central Europe. Collignon's view is that the Basque type is a variety of the Mediterranean race that has for a long period of time been geographically isolated, and the retention of a difficult and uncouth language has formed an equally efficient linguistic barrier. These factors induced in- and in-breeding, and a well-marked human variety has resulted. Collignon's contention that the French Basques more nearly represent the primitive stock is now generally admitted; the head of the Spanish Basques has been narrowed and their stature diminished by mixture with Spaniards who had been driven into the mountains by the Moorish invasion. Those who desire to learn more about this paradoxical people will find numerous references to the literature in the valuable appendix to Ripley's "Races of Europe," and additional titles are given by Buschan in *Globus* (Bd. lxxix. February 28, 1901). A. C. H.

THE DIAGNOSIS OF PLAGUE.[1]

I HAVE no doubt that the plague expert, who has seen epidemic plague in the East, will think it unnecessary on the part of a bacteriologist to ask, What is plague? for is not plague, as it occurs in China, India, at the Cape, and other parts weekly, nay, daily, by the score of cases, quite readily diagnosed by its clinical features and by its pathology? No one can have any doubt about this being so; that is to say, when plague appears in a locality in epidemic form, the diagnosis of any new case does not offer much difficulty; nor would there be experienced much difficulty in diagnosis by etiological, clinical, pathological and bacteriological methods of a case, or of cases, occurring in a ship coming from a plague-infected port: as, for instance, the cases that occurred in connection with a vessel which arrived about the middle of January in the port of Hull —cases which belonged to the pneumonic type, and which from the outset were, or ought to have been, at once diagnosed as such.

The difficulty in diagnosis commences when you have a single or a first case occurring, where either the etiological data are not satisfactory, or where the clinical history and symptoms are not distinct and not typical. The cases of two sailors recently examined illustrate these two difficulties.

The outcome of the bacteriological analysis of one sailor who arrived in London in October 1900 was that the case was plague. In the second case a plate made with a small droplet of pus from a swelling yielded, besides staphylococci and streptococci, a considerable number of colonies of the *bacillus pestis*. Tests by subcultures and animal experiments (both as subcutaneous and intra-peritoneal injections) proved this conclusively.

A third case is that of a boy that had recently occurred in one of the London hospitals. This much is certain, that the boy suffered from an illness the symptoms of which to a large degree were compatible with true plague; that etiologically no satisfactory evidence was forthcoming to elucidate the disease. The bacterioscopic evidence, which in certain respects supported the diagnosis plague, in another essential respect—animal experiment—negatived it; and I would particularly draw attention to the total absence of any microbes in the pus of the suppurating bubo of the boy in the later stages of his disease, and to the total absence of agglutinating action of his blood in the convalescent stage.

Apart from the difficulties in diagnosis of isolated cases, there are to be gathered, I think, several interesting and instructive facts from the cases hitherto mentioned.

In the first place, it is a fact that neither of the ship-borne cases mentioned above gave rise to infection in other persons, although during the whole journey they were freely intercommunicating with other members of the ship's crews. It will be no doubt said that *pestis ambulans*, the mild form with which, at any rate, one of those two cases compares, is known to possess only slight infectivity, and this infectivity might be referable only to the matter of the open and discharging bubo. In the two cases mentioned the number of *bacilli pestis* were still considerable, and in one at least of the cases there was a history of severe illness previous to arrival in English ports. And I would, in this connection, express a *primâ facie* strong scepticism as to the alleged high degree of infectivity of the bubonic type of plague in general. In the case of the pneumonic and septicæmic type, a high degree of infectivity is in complete accordance with the bacteriological facts and with the wide distribution of the plague bacilli in, and the copious discharge from, the body of the patient. In the pneumonic type, the exudation of the inflamed lung and the expectoration teem with the plague bacilli; in the septicæmic or hæmorrhagic form the blood contains an abundance of the bacilli, hæmorrhages occur in the membranes of the alimentary, respiratory and urinary organs; and therefore the voiding of plague bacilli is extremely great and their diffusion easy. But in the bubonic form, in the early phases of the disease, plague bacilli are rare in the blood; they are practically limited to the spleen and lymph glands, and as long as these latter do not open I do not see how they can be the agents of further infection. In the urine and in the alimentary canal they certainly cannot be demonstrated in a living state in this form of the disease. When the lymph glands, after the acute stage is passed, suppurate and open, then, no doubt, plague bacilli can and do become available.

[1] Abstract of a paper read before the Epidemiological Society on Friday, May 17, by Dr. E. Klein, F.R.S.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

OXFORD.—Dr. W. T. Brooks has been appointed Litchfield clinical lecturer in medicine.

Prof. H. A. Miers has been nominated to be a delegate of the University Press.

Mr. P. A. Barnett has been appointed an examiner in the theory, history and practice of education.

Profs. H. A. Miers and W. F. R. Weldon have been appointed examiners for the Burdett-Coutts Scholarship.

The Report of the Bodleian Library, just issued, shows that the accessions to the library during 1900 were the second largest on record.

The Junior Scientific Club held their 225th meeting on Friday, May 10. Prof. Odling read a paper upon the detection of arsenic.

Mr. E. L. Gill, of the Owens College, Manchester, has been appointed curator of the Hancock Museum by the committee of the Natural History Society of Northumberland, Durham and Newcastle-upon-Tyne.

The late Mrs. Morton Sumner has by her will bequeathed to Bedford College for Women 4000*l.* and a large number of books specially relating to geology, general literature and art; also a valuable collection of mineralogical specimens.

A FACULTY OF COMMERCE is to be established in connection with the University of Birmingham, and the council of the University are prepared to appoint a professor, at a salary of 750*l.* a year, to organise a course appropriate for students preparing to take a lead in commercial pursuits or to become consular representatives or holders of administrative posts abroad or in the colonies. The aims and scope of the work of the new Faculty are outlined in a document drawn up by the principal, Dr. Oliver Lodge, and containing suggestions which should meet with general approval. There can be no reasonable doubt as to the need for the cultivation of scientific sympathies among men engaged in manufacture, commerce and public affairs. "If our country is to keep pace with others," remarks Dr. Lodge, "we have to provide in every post a highly-educated man, skilled in many business relations, as Consul, whose duty it shall be to understand the conditions of each trade, to realise how it may be improved or increased, and to make annual or more frequent reports, either to the Board of Trade or to local Chambers of Commerce, or both." The more administrators, officials and men of business we have capable of realising this ideal the better it will be for our national welfare; but the best way to provide the educational basis has yet to be decided. Dr. Lodge suggests that commercial education must centre round a school of Economics—understood in its widest sense—but this may be doubted, and we believe that it would be better to keep this school out of the early stages of the scheme. Too much importance seems to be attached to preliminary knowledge of "Arts" and other subjects required of students in the Commercial Faculty. It is suggested that "The preparatory training in fact should be a wide and comprehensive one including a little science as well as a good deal of Arts." To our thinking, however, a little science is not enough, and what is essential in the preliminary education is not the accumulation of information so much as the training of the mind to acquire and assimilate knowledge. Geography is not to be considered as a separate science in the new Faculty, and its various aspects will be surveyed by the professors of history, economics and geology. Dr. Lodge makes a number of other suggestions which, if adopted, will give the new Faculty a character worthy of the new University.

The paper on "School Work in Relation to Business" read before the Society of Arts on May 8, by Sir Joshua Fitch, and printed in the Society's *Journal* for May 10, contained an expression of views with which many people will find themselves in agreement. The fundamental idea, illustrated by reference to several subjects, seems to be that too much attention is given in schools to the application of rules and too little to the development of common sense. For instance, in arithmetic the pupils are given a number of empirical rules and are drilled in working questions based upon them, but they are taught next to nothing of the theory of number or of arithmetical operations. The average pupil is happy if the teacher will tell him whether he has to multiply or divide to work a simple question, and he asks helplessly what rule he should use when he is given a problem. But the pupil who has learned arithmetic as a science rather than as a collection of artifices for the working out of problems is in a condition in which he can find his own rules. Instead of regarding such processes as multiplication of fractions and extraction of square roots as a kind of numerical conjuring and legerdemain, he feels that his operations have a reasonable basis. The advantage of such knowledge is that it enables the pupil to invent his own method of dealing with problems and to adapt himself readily to any arithmetical work he may have to do later in a business house. Arithmetic as usually taught does nothing but develop mechanical facility in working sums, whereas it ought to be used to bring out thought and inventiveness.

Passing to measurements of length, volume and mass, Sir Joshua Fitch held with most of us that the metric system ought to take a more prominent place in the arithmetic course than is usually assigned to it, because of its increasing use both in science and manufactures. Then geography is a subject which is held in small favour in the public schools and in most secondary schools, yet when well taught it can be made, both from the educational and commercial point of view, one of the most fruitful of school exercises. Finally, no subject consciously designed to meet the needs of the shop or office should be taught in a primary school. The chief object should be education and the development of originality, rather than the acquisition of information and manipulation of rules. According to Sir Joshua Fitch the course of work in such a school should include "arithmetic in its principles, rapid calculation, the metric system, oral and written composition, industrial geography, and also some exercises in thinking about social economics and the way in which conduct and character tell upon the future honour and usefulness of the citizen." At the other end of the educational ladder are the universities, to which, it was held, we ought to look for more guidance than they have yet ever afforded in the solution of the great problem—the relation of scholastic culture to the duties of active life.

SCIENTIFIC SERIALS.

American Journal of Science, May.—Studies of Eocene mammalia in the Marsh collection, Peabody Museum, by J. L. Wortman.—On the velocity of chemical reactions, by W. Duane. A description of two physical methods for following the velocity of a chemical change occurring in solution. In one of these the solution to be studied is placed in a wedge-shaped hollow prism and compensated with a similar wedge, the chemical change being followed photographically. A diagram is given showing the inversion of sugar as followed by this method. In the second method the change of volume of the solution is followed in a large thermometer.—The transmission of sound through porous materials, by F. L. Tufts.—On a yoke with intercepted magnetic circuit for measuring hysteresis, by Z. Crook. A description of a new form of yoke possessing certain advantages over the ordinary types. It gives practically a perfect hysteresis cycle, and can be used for studying the demagnetising action of electric currents without interrupting the magnetic circuit or varying it by means of a solenoid.—Mineralogical notes, by C. H. Warren. Crystallographic measurements and chemical analyses of anorthite crystals from Franklin Furnace, felspar crystals from Raven Hill, Colorado, iron wolframite from Dakota, and pseudomorphs of wolframite after scheelite from Trumbull, Conn.—On the expansion of certain metals at high temperatures, by L. Holborn and A. L. Day. Bars of metal 500 millimeters long were used, and enclosed in a porcelain tube heated electrically. The temperatures were measured with the thermocouple and ranged from 250° C. up to 1000° C. in the case of platinum, and in other cases to as high a temperature as the properties of the metal under examination would permit. Results are given for platinum, palladium, silver, nickel, constantan, wrought iron and steel.

American Journal of Mathematics, xxiii. 2, April.—The cross-ratio group of 120 quadratic cremona transformations of the plane. Part 2: Complete form-system of invariants, by H. E. Slaught, is the continuation of a memoir by the author which appeared in vol. xxii. (pp. 343-388). The text is accompanied by a large number of tables.—Memoir on the algebra of symbolic logic, by A. N. Whitehead, is a purely mathematical investigation, taking its rise in Boole's laws of thought. The

credit of perfecting its laws of operation is assigned to C. S. Peirce and to Schröder. The keynote, according to the author, is the prominence given in his memoir to three ideas, viz. that of the "invariants" of a function of independent variables, that of "prime functions of independent variables," and that of the theory of "substitutions" of independent variables for independent variables. The last idea connects the algebra with the theory of groups and opens out a large field for investigation in that direction. The memoir, which occupies much space (27 pp.), is to be concluded in a subsequent number.—V. Snyder contributes a short note on a special form of annular surfaces.—On the transitive substitution groups whose order is a power of a prime number, by G. A. Miller, is a further contribution to a branch of mathematics for which the author has already done so much excellent work.—Geometry on the cubic scroll of the second kind, by F. C. Ferry, is a first instalment. Its object is to give a detailed treatment of several of the more interesting questions connected with the geometry of this scroll, and especially to consider the surfaces which can be passed through any curve on the scroll, so far as the order of those surfaces and the natures of the residual intersections are concerned. References are given to many memoirs bearing on the subject.

SOCIETIES AND ACADEMIES.

Royal Society, March 7.—"On the Heat dissipated by a Platinum Surface at High Temperatures. Part iv.—High-pressure Gases. By J. E. Petavel, A.M.I.C.E., A.M.I.E.E., John Harling Fellow of Owens College, Manchester. Communicated by Prof. Schuster, F.R.S.

The rate of cooling of a hot body in gases at pressures up to one atmosphere has received considerable attention, but with regard to gases at high pressures practically no data were up to the present available.

The present experiments were carried out with a horizontal cylindrical radiator contained in a strong steel enclosure, the enclosure being maintained at about 18° C. by a water circulation.

It is shown that the rate at which heat is dissipated by the radiator may be expressed by the following formula—

$$E = ap^{\alpha} + bp^{\beta}\vartheta,$$

where E = emissivity in C.G.S. units = total amount of heat dissipated expressed in therms (water-gramme-degrees) per square centimetre of surface of radiator per second; p = pressure in atmospheres; ϑ = the temperature of the radiator minus the temperature of the enclosure, or in other words the temperature interval in degrees Centigrade.

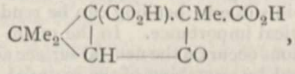
The gases studied are oxygen, hydrogen, air, nitrous oxide and carbon dioxide. In the case of the first three the formula holds good between 7 and 120 atmospheres and between 100 and 1100° C.

All the gases studied showed a rapid increase of the effective conductivity with the pressure.

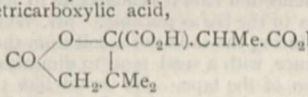
Physical Society, May 10.—Prof. S. P. Thompson, president, in the chair.—A paper on applications of elastic solids to metrology was read by Dr. Chree. The object of the present paper is to exemplify the bearing of elasticity on physical measurements. Many of the results depend ultimately on a previous paper by the author, in which expressions were obtained for the mean strains and for the change in total volume of any homogeneous elastic solid acted on by any given system of forces throughout its mass or over its surface. The effect of the pressure of a surrounding medium of constant density upon the shape and volume of an isotropic solid is considered, and the theory is extended to the case of an æolotropic solid in a medium of varying density. The change in volume of the material of the walls of a flask containing liquid is next investigated, and it is shown that the change is independent of the thickness of the walls, the mean expansion per unit of volume being inversely proportional to the whole volume. Whether the alteration consists of an increase or a decrease depends upon the dimensions of the vessel. We cannot, in general, determine the effect on the internal capacity of a vessel due to the pressure of contained liquid, but if the walls are coaxial right circular cylinders, the common axis being vertical, the solution is possible. As a numerical example a glass tube 12·7 cm. high, 10 cm. internal diameter and 1·5 mm. thick would hold 0·11 grammes more mercury than it would if inelastic. The solution is possible in the case of a spherical shell, and this problem is also investigated in the paper. The author next considers the application of the theory of elasticity to standards of length, and to give a more exact idea of the problems actually occurring in metrology he deals particularly with five forms—the standard yard, the international prototype metre of X section, a working standard belonging to the Bureau International, and two deflection bars used in magnetometers. Most modern standards are supported, not over the whole lower surface, but either on two symmetrical rollers or on three points. In using standards of length it is the horizontal projection of the graduated surface that usually concerns us, and it is proved that unless we deal with a very long bar the difference between the chord and the arc is very small. The curvatures and lengths of bars supported in various ways, both loaded and unloaded, are treated at length, and it is shown that by a proper arrangement of supports the alteration in length between two points due to bending can be rendered so small as to be of no practical importance. In the metre prototypes of X section the divisions occur on the neutral surface and their distance apart is unaffected by stretching of the material. In the case of magnetometer deflection bars it is advisable to have the magnet light and as near to the bar as possible. Mr. Watson said that it was usual in deducing the radius of a coil from the measurement of its circumference with a steel tape to diminish the result by half the thickness of the tape. He would like to know if this was the right correction to apply. In measuring the circumference of a cylinder it is necessary to wind the tape in a spiral so as to bring the divisions side by side. This gives a result which is too great, and not too small as might at first sight be imagined. Dr. Lehfeldt asked if the work of the author could be used to determine the pressure corrections of thermometers. He would like to ask why it was necessary to use supports instead of allowing a standard to rest on a flat surface. The chairman said that the paper was important because of its bearing on the question of the relation between the units of different nations. He drew attention to the alteration of the factor converting metres into inches, and asked if it was due to alterations in the properties of matter or to errors of observation. The two legal definitions of the gallon differ by an appreciable amount, and it would be interesting to know if this discrepancy could be due to changes in the volume of measures due to the liquids contained by them. Dr. Chree, in reply to Mr. Watson, said the correction would depend upon the diameter measured, because that determined the curvature of the tape and, therefore, the stretching produced. In reply to Mr. Campbell, the author stated that direct experiments had been made upon the bending of bars and they agreed well with theory. The correction formula obtained for a thermometer is similar to the ordinary one used. A bar is usually supported so as to remove the uncertainty of the distribution of surface pressure when it rests on a flat surface not a true plane. In reply to the president, Dr. Chree said that the alteration of the factor converting metres into inches was probably due to errors of observation on account of the width of the divisions of the standard yard, and on account of the difficulty of obtaining the bar at the standard temperature of 62° F.—A paper by J. Rose-Innes and Prof. S. Young, on the thermal properties of isopentane compared with those of normal pentane, was read by Mr. Rose-Innes. In previous papers the authors have investigated experimentally the thermal properties of isopentane and normal pentane and have stated certain conclusions from their observations. The present paper gives the conclusions reached after a more exhaustive examination of the experimental results of the former papers. The quantity $RT - pv$ at any volume and temperature is called the departure from Boyle's Law at that point, and it is found that there is a constant ratio between the departures from Boyle's Law of isopentane and normal pentane at the same volume and temperature. To test the law a probable value of the ratio was determined, and by means of it a large number of values of pv for isopentane were calculated from results for normal pentane. These calculated values fall upon the same curve as the observed values and agree with them to within about 1 per cent. The authors are confirmed in their previous conclusion that the difference of pressure between two isomeric substances at the same temperature and volume involves the same power of the density as the first deviation from Boyle's Law, *i.e.* the second power. Mr. J. M. Gray said the numbers obtained

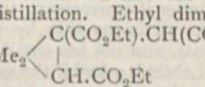
would be valuable to him and he would make use of them in his calculations. He was sorry, however, that the authors had dealt with empirical formulæ instead of rational formulæ deducible from the theory of gases. Dr. Chree asked how the temperatures were measured. Mr. Rose-Innes said that recourse had been had to empirical formulæ because they found theoretical formulæ useless. He gave examples of the failure of well-known equations to satisfy experimental results. The temperatures were measured with a constant volume air thermometer, a small correction less than the errors of experiment being employed to reduce the readings to the thermodynamic scale.—The Society then adjourned until May 31.

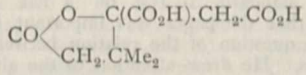
Chemical Society, May 2.—Prof. Emerson Reynolds, president, in the chair.—The following papers were read:—The synthetical formation of bridged-rings. Part 1. Some derivatives of bicyclopentane, by W. H. Perkin, jun., and J. F. Thorpe. Trimethylketobicyclopentanedicarboxylic acid,



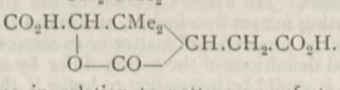
when digested with potash, yields the lactone of trimethylhydroxybutanetricarboxylic acid,



the anhydride of which is converted into the anhydride of a stereoisomeric acid by distillation. Ethyl dimethyldicarboxytrimethylenemalonate,  , is similarly hydrolysed by potash giving the lactones of the two isomeric dimethylhydroxybutanetricarboxylic acids,



and



—Lead silicates in relation to pottery manufacture, by T. E. Thorpe and C. Simmonds. Lead silicates or borosilicates, or complex silicates of lead and other metals, can be used instead of the oxides or carbonates as a means of introducing lead into pottery glazes. It is generally recognised that the employment of lead silicates for this purpose on the Continent has greatly tended to minimise the risk of lead-poisoning; this is due to the fact that the lead silicates used in the continental factories are of a high degree of insolubility so far as the lead is concerned. On examining a number of lead silicates used or proposed for use in England, many were found to be as easily attacked by dilute acids as the oxides or carbonates. The condition on which the insolubility of the lead depends was found to be, primarily, the existence of a certain ratio between the whole of the base-oxides, on the one hand, and the whole of the acid-oxides on the other. Provided that this ratio,

$$\frac{\text{number of acid molecules}}{\text{number of base molecules}},$$

falls within certain definite limits, the amount of lead extracted by dilute acids, such as the hydrochloric acid in the gastric juice, is always small.—The preparation and properties of 2 : 6-dibromo-4-nitrosophenol, by M. O. Forster and W. Robertson. This substance is prepared by the action of potassium hypobromite on paranitrosophenol in potassium hydroxide solution; a number of its derivatives are described.—The chlorination of toluene, by W. P. Wynne.

Geological Society, April 24.—Mr. J. J. H. Teall, V.P.R.S., president, in the chair.—Notes on two well-sections, by the Rev. R. Ashington Bullen. The well-section at Southwark passes through sand and gravel, &c., 34 feet, London clay 75 feet, Woolwich and Reading beds 56 feet 9 inches, and Thanet sand 36 feet 6 inches, into chalk which was bored to a depth of 148 feet. The well-section at Dallinghoo post-office, near Wickham Market (Suffolk), penetrated 53 feet of blue chalky boulder-clay, into 20 feet of sand and gravel, water being found at a depth of 79 feet.—On the geological and physical development of Antigua, by Prof. J. W. Spencer. Antigua and Barbuda rise from the bank which occupies the north-eastern portion of the chain of the Lesser Antilles. The part of the bank on which these two islands are founded is submerged to the very uniform depth of about 100 feet, but from other island-groups it is separated by depressions of 1800 to 2500 feet. It is concluded from the erosion-features of the region that the region was an extensive land-surface, probably at least 2000 feet higher than now, during the Mio-Pliocene period, and was reduced by denudation to a comparatively low elevation before the close of that time. This was followed by a submergence (the Friar's Hill) to a depth of 200 feet below the present altitude. At the close of the Pliocene period there was another elevation to an extent probably exceeding 3000 feet, as shown by the channels on the submarine plateau between Antigua and Guadeloupe. This did not continue sufficiently long to complete the dissection of the tablelands, and consequently the Antigua-Barbuda mass remains intact. Then followed a subsidence culminating in a 75-foot submergence, a re-elevation to 100 feet above the present level, when the shallow channels in the submarine bank were formed, and possibly one or two other small movements.—On the geological and physical development of Guadeloupe, by Prof. J. W. Spencer. The Guadeloupe group is separated from the Antigua and Dominica groups by depressions 2000 feet deep. Much of Guadeloupe itself consists of eruptive rocks, evidently as old as the igneous base of Antigua. The land-surface during the Mio-Pliocene period appears to have been 2000 feet above the present level, but it was submerged 200 feet at the close of the Pliocene period during the accumulation of the Lafonde and Lower Petit Bourg gravels and loams. There was a re-elevation of about 3000 feet in the early Pleistocene period, and during this epoch *Elephas* could have crossed from the continent. This was followed by a depression to 100 feet or more below the present level, a re-elevation to 150 feet, submergence below the present level with growth of corals, and the elevation of these to six or eight feet above the sea.—On the geological and physical development of Anguilla, St. Martin, St. Bartholomew and Sombrero, by Prof. J. W. Spencer. Deep channels, not less than 1800 feet deep, separate the bank on which this group is founded from the banks to the north and south. The St. Martin plateau was a land-surface throughout the Mio-Pliocene period, during the earlier part of which it appears to have stood 2500 feet above its present level, and was probably connected with the now neighbouring insular masses, from which it was disconnected by denudation during a very long period of atmospheric activity, followed by a subsidence, so as to bring the present surface of the submarine banks to a level so low that the undulating features of a base-level of erosion could be formed on them; for, during the period when the deep and broad depressions on the Antillean chain were being fashioned, the now isolated island-groups stood out as table-mountains, which were slowly being eaten away by atmospheric agents. There was next a subsidence to about 200 feet below the present level, about the close of the Pliocene period, followed by a re-elevation to 3000 feet, as shown within the area, but in reality much more. It was during this early epoch of the Pleistocene that the great rodents described by Prof. Cope reached here from South America, but the race continued to live here sufficiently long to give rise to distinct species.—On the geological and physical development of the St. Christopher Chain and Saba Banks, by Prof. J. W. Spencer. The St. Christopher (St. Kitts) ridge rises from 2000 to 2800 feet above the submarine Antillean plateau, and is for the most part covered with shallow water, except between St. Kitts and Montserrat, where a depression reaches 2592 feet, and between Statia (St. Eustacius) and Saba, where it reaches 1200 feet. Relics of old igneous formations are found on the islands, but in most places they are covered by more recent volcanic formations. The group appears to have had the same physical history as the neighbouring groups of islands.

May 8.—Mr. J. J. H. Teall, V.P.R.S., president, in the chair.—The influence of the winds upon climate during the Pleistocene epoch; a palæo-meteorological explanation of some geological problems, by F. W. Harmer. The views taken in this paper afford a simpler explanation of geological facts than those usually adopted. Instead of supposing that the climatic changes of the Great Ice Age, several times recurrent at intervals of a few thousand years, were due to astronomical or physical causes, it is suggested that the climate of the northern hemisphere being, from some unexplained cause, colder than that of our era, conditions of comparative warmth or cold may have been more or less local, affecting the great continental areas at different periods.

Entomological Society, May 1.—The Rev. Canon W. W. Fowler, president, in the chair.—Mr. C. G. Barrett exhibited for Mr. H. W. Vivian a specimen of *Xylophasia lateritia*, Hufn., a species not hitherto recorded in the British Islands, taken in South Wales by Mr. W. E. R. Allen; also *Deiopeia pulchella*, from the same district; *Dianthecia luteago*, var. *barrettii*, from one of the islands off the Glamorganshire coast, and varieties of *Eupithecia virgaureata*, much blackened, *E. lariciata*, *E. satyrata* and *E. exiguata*, taken by Mr. Vivian.—Mr. M. Jacoby exhibited specimens of *Heliocopris gigas*, L., from Mashonaland, and *Silpha biguttata*, Fairm., from Patagonia.—Sir George Hampson exhibited two females of an apterous *Lasiocampid* from the Transvaal, with cocoon and ova bred by Colonel J. M. Fawcett, 5th Lancers. The larva is very much like that of the British *Lasiocampa rubi*. The female does not emerge from the cocoon, its antennæ being aborted and all the joints coalesced with a flabellate organ with slight striæ indicating the joints; the fore tibiæ short with traces of tibial claws. The male is unknown.—Mr. H. St. J. Donisthorpe exhibited specimens of *Ripersia tomlini*, Newst., a coccid new to Britain, taken among *Lasius niger* at Portland in April 1900.—Mr. C. P. Pickett exhibited aberrations and varieties of *Lycaena bellargus*, *L. corydon* and *L. astrarche*, taken by him in August 1900 at Folkestone and Dover.—Mr. H. Goss exhibited a gynandromorphous specimen of *Lycaena bellargus* which he had taken at Reigate in June 1900. It had the characters of a male in the right wings, and the characters of a female in the left wings, which were, however, not entirely free from the blue scales of the male.—Dr. Chapman exhibited a cocoon of *Antheraea mylitta* and a flint from Redhill—two objects with practically nothing in common. Whilst dissenting *in toto* from those who see nothing in many cases of mimicry but accidental resemblance, he presented them with this as a case undoubtedly in accordance with their views, the cocoon and the flint being remarkably alike.—Prof. Poulton exhibited an apparatus invented by him to determine the strength of the formic acid discharged by the ant in defence of its nest. A discussion followed, in which Prof. Hudson Beare said he had found his skin affected by *Formica rufa*, and Mr. Donisthorpe that the skin had been removed from his hand and his gloves burnt in patches after being placed in the nest of the same species.—Mr. F. Enock exhibited numerous specimens illustrative of the metamorphoses of dragon-flies.—Mr. Enock read a paper entitled "The Metamorphoses of *Æschna cyanea*, illustrated by the electric lantern with photographs taken from life."—Sir George Hampson, Bart., communicated a paper on the classification of a new family of the Lepidoptera; Mr. Martin Jacoby a paper entitled "A further contribution to the knowledge of African Phytophagous Coleoptera"; and Mr. Gilbert Arrow a paper entitled "The Carabid genus Pheropsophus; notes and descriptions of new species."

Mathematical Society, May 9.—Dr. Hobson, F.R.S., president, in the Chair.—Major MacMahon, R.A., F.R.S., communicated two notes, on the series whose terms are the cubes and higher powers of the binomial coefficients and a case of algebraic partitionment.—Mr. J. B. Dale read a paper on the product of two spherical surface harmonics and Mr. H. M. Macdonald communicated a note on the zeros of the spherical harmonic $P_n^{-m}(\mu)$.—A note on a property of recurring series by Mr. G. B. Mathews, F.R.S., was communicated from the chair.

Royal Meteorological Society, May 15.—Mr. W. H. Dines, president, in the chair.—Mr. Rupert T. Smith read a paper on the periodicity of cyclonic winds, which was the result of a discussion of his own observations made in the neighbourhood of Birmingham during the twenty-six years 1874-1899. The equinoxes do not appear to be very stormy periods, but from the author's tables it is shown that the greatest frequency and force of cyclonic wind occurs some two weeks before the spring equinox and some three weeks after the autumn equinox.—Mr. W. Marriott gave an account of the bequest by the late Mr. G. J. Symons, F.R.S., to the Royal Meteorological Society. By his will Mr. Symons bequeathed to the Society his Cross of the Legion of Honour, the gold Albert Medal awarded to him by the Society of Arts, the testimonial album presented to him in 1879 by the fellows of the Royal Meteorological Society, and the sum of 200*l.*, as well as such of his books, pamphlets, maps and photographs of which there were no copies in the Society's library. Mr. Marriott stated that from Mr. Symons's valuable collection he had selected for the Society over 5000 books and pamphlets and about 900 photographs. A large number of the books were old and rare works, 750 bearing dates previous to 1800, while 8 were as early as the fifteenth century. By this bequest the Royal Meteorological Society now possesses the most complete and extensive meteorological library in existence.

CAMBRIDGE.

Philosophical Society, May 6.—Prof. A. Macalister in the chair.—The oscillations of a fluid in an annular trough, by Mr. B. Cookson.—Some experiments upon beams under endlong compression, by Mr. H. E. Wimperis.—Liveingite, a new mineral from the binnenthal, by Messrs. R. H. Solly and H. Jackson. This new mineral, to which the name "Liveingite" has been given in honour of Prof. G. D. Liveing, F.R.S., is a new member of the group of sulpharsenites of lead which comprise Sartorite $PbS + As_2S_3$, Rathite $3PbS + 2As_2S_3$, Dufrenoysite $2PbS + AS_2S_3$ and Jordanite $4PbS + As_2S_3$.—Note on the magnetic deflection of kathode rays, by Mr. H. A. Wilson. In this note the results of measurements of the magnetic deflection of kathode rays proceeding from kathodes of different metals are recorded. The results show that e/m is independent of the nature of the metal forming the kathode.—On the diminution of the potential difference between the electrodes of a vacuum tube produced by a magnetic force at the kathode, by Mr. J. E. Almy.—An attempt to discover radiation from the surface of metals carrying alternating currents of high frequency, by Mr. O. W. Richardson. The experiments were suggested by the corpuscular theory of the conduction of electricity in metals. The radiation expected was of the nature of secondary Röntgen rays. It was sought to detect this by its photographic effect and by the conductivity it would produce in the surrounding air. The maximum current density at the surface of the wires used was 130,000 amperes per sq. cm. and was produced by the discharge of two Leyden jars connected to an induction coil. A sensitive method was used to detect the leak, which was shown to be not greater than that generally present in air.

DUBLIN.

Royal Dublin Society, February 20.—Mr. J. Holms Pollok in the chair.—In the absence of Prof. W. F. Barrett, F.R.S., Mr. R. J. Moss read a paper by the Rev. H. V. Gill, S.J., on the stratified discharge in Geissler tubes, which was communicated to the Society by Prof. Barrett.—Prof. J. Joly, F.R.S., read a note on the pseudo-opacity of anatase.

March 20.—Sir Howard Grubb, F.R.S., in the chair.—Sir Howard Grubb read a paper on a new collimating telescope sight for large and small ordnance.—A paper entitled "Variation—Germinal and Environmental," by Prof. J. C. Ewart, F.R.S., was communicated by Prof. D. J. Cunningham, F.R.S.—Mr. J. Holms Pollok read a paper on a new thermo-chemical notation.—Prof. W. N. Hartley, F.R.S., presented a paper on the conditions of equilibrium of hygroscopic and deliquescent salts of copper, cobalt and nickel.—Dr. W. E. Adeney read a paper on ultra-violet spark spectra from the Rowland's spectrometer in the Royal University of Ireland.—Prof. W. F. Barrett, F.R.S., exhibited a series of recent radiographs.

April 17.—The Earl of Rosse in the chair.—Prof. J. Joly, F.R.S., read a paper describing a new form of electric furnace. The furnace consists of a fire-clay crucible in the walls of which a platinum wire, wound in the form of a spiral, is imbedded and through which a current is passed. Very high temperatures, up to the softening of the clay, are obtainable. A pattern in which the charged crucible is placed within an outer fire-clay vessel or muffle, heated as described, is recommended. Here the crucible may be of platinum or any refractory material. A reflector surrounds the muffle. A minute pattern was also shown in operation designed to give an intense local temperature in certain experiments on the viscosity of silicates. These furnaces are sufficiently durable to be of value in many experiments where a prolonged high temperature is required, controlable with considerable accuracy and free from flame contamination.—Prof. Joly also read a paper on a new method of identifying minerals in rock-sections by their birefringence. The degree of thinness which it is necessary to confer upon rock-sections is attended with the evil that the value of birefringence as a means of diagnosis is largely restricted to substances of high birefringence, the polarisation colours of many of the most important rock-

forming minerals thus being but little differentiated. To overcome this difficulty, while preserving to the section the desirable transparency, the author, by a simple addition to the petrological microscope, sends the polarised ray twice through the section. This is accomplished by means of an opaque illuminator, an arrangement furnished by many makers, consisting of an attachment above the objective, containing a totally reflecting prism illuminated by light received through a frontal aperture, and transmitting the ray downwards through the objective on the object being examined, from the surface of which it is reflected again into the microscope. In the present application of the illuminator to the petrological microscope a nicol is attached over the aperture, and the ray totally reflected and transmitted downwards within the objective is (sensibly) plane polarised. Beneath the rock-section a small mirror of speculum metal or silver is placed. The ray after its first passage through the crystal under examination is reflected by this mirror, and the incidence being nearly normal is again returned through the crystal, thus traversing it twice before reaching the eye. It can be demonstrated, with a double image prism and by colour observations on a plate of selenite overlapped upon itself, that the loss of phase does not interfere with the accuracy of the method. This mode of examination at once introduces discriminative differences into the tints of many important substances, as the monoclinic and triclinic felspars, quartz, &c., all former differences of retardation being, in fact, doubled in amount.—Prof. Hugh Ryan read a paper on the synthesis of glucosides, and, in conjunction with Mr. W. Sloan Mills, one on the synthesis of galactosides.—Mr. R. J. Moss made some interesting experiments with liquid air by means of the Hampson gas liquefying apparatus.

PARIS.

Academy of Sciences, May 13.—M. Fouqué in the chair.—On a perfectly astatic galvanometer, by M. Lippmann. The needle of the galvanometer described is mounted in such a way that it can be placed in the plane of the magnetic meridian and under the action of the current tends to move parallel to itself. Under these conditions the earth's field exerts no opposing force to the action of the current, and the apparatus is perfectly astatic.—On the theorems of Hugoniot, the lemmas of M. Hadamard, and the propagation of waves in viscous fluids, by M. P. Duhem.—On the real integrals of differential equations of the first order in the neighbourhood of a singular point, by M. Henri Dulac.—On certain involutive relations, by M. Maurice Lelieuvre.—On a problem of d'Alembert, by M. F. Siacci.—On an experiment in electrical oscillations, by M. H. Pellat.—The permeability of nickel-steels in intense fields, by M. René Paillot. Three classes were examined—irreversible steels, reversible steels, and steels containing small quantities of chromium and manganese besides nickel. In the first of these the magnetic permeability sensibly increased in the intense fields; in the second case, the reversible steel, the permeability attained a value of 1·19 for a field of 4000 C.G.S. units, and remained practically constant up to 30,000 units.—On the laws of outflow of air in musical instruments, by M. Firmin Larroque.—On the aromatic organomagnesium compounds, by MM. Tissier and Guignard. It is shown that the halogen benzene derivatives react with magnesium in a manner exactly analogous with the halogen compound of the fatty series. As examples of the generality of this method, the preparation of triphenyl-carbinol, dimethylphenyl-carbinol and diphenyl-ethylene are described. In all cases the yields are nearly theoretical.—The decomposition of albuminoids into protoplasmides, by M. A. Etard. Decalcified bone, submitted to a simple hydrolysis, gives three groups of substances: glycocoll, leucine and a little tyrosine; a syrupy material very soluble in methyl alcohol; and a substance quite insoluble in methyl alcohol. The last compound has been analysed and is named bos-osteoplasmide.—Differences in the constitution of the bile according to the age and fatty state of the animal, by M. R. L. Craciunu.—On the phosphoric acid of the soil, by M. Th. Schloesing, jun. An examination of the amount of phosphates removable from certain soils by repeated extraction with water.—On the composition of amblygonite, by M. Henri Lasne.—Histological researches on the sporulation of yeasts, by M. A. Guilliermond. At the moment of sporulation there appears to be a sort of solution of the red grains contained in the vacuoles, these bodies appearing to behave in some respects as a reserve material.

DIARY OF SOCIETIES.

THURSDAY, MAY 23.

ROYAL SOCIETY, at 4.30.—On the Presence of a Glycolytic Enzyme in Muscle: Sir Lauder Brunton, F.R.S., and Herbert Rhodes.—On Negative After-Images and their Relation to certain other Visual Phenomena: S. Bidwell, F.R.S.—The Solar Activity, 1833–1900: Dr. W. J. S. Lockyer.—A Comparative Crystallographical Study of the Double Selenates of the Series $R_2M(SeO_4)_2$, $6H_2O$.—Salts in which M is Magnesium: A. E. Tutton, F.R.S.—On the Intimate Structure of Crystals. Part V. Cubic Crystals with Octahedral Cleavage: Prof. W. J. Sollas, F.R.S.

ROYAL INSTITUTION, at 3.—The Chemistry of Carbon: Prof. J. Dewar, F.R.S.

FRIDAY, MAY 24.

ROYAL INSTITUTION, at 9.—The Aims of the National Physical Laboratory: Dr. R. T. Glazebrook, F.R.S.

SATURDAY, MAY 25.

ROYAL INSTITUTION, at 3.—The Rise of Civilisation in Egypt: Prof. W. M. Flinders Petrie.

TUESDAY, MAY 28.

ROYAL PHOTOGRAPHIC SOCIETY, at 8.—(1) Practical Tricolour Photography; (2) The Optics of Tricolour Photography: E. Howard Farmer.

ANTHROPOLOGICAL INSTITUTE, at 8.30.—Measurements of Crania from the Fly River: J. Gray.—Anthropometrical and Craniological Notes on the Eastern Papuans: C. G. Seligmann.—Remarks on the Present State of our Knowledge of the Ethnology of British New Guinea: Prof. A. C. Haddon, F.R.S.

THURSDAY, MAY 30.

ROYAL INSTITUTION, at 3.—The Chemistry of Carbon: Prof. J. Dewar, F.R.S.

INSTITUTION OF ELECTRICAL ENGINEERS (Society of Arts), at 8.—Annual General Meeting.

FRIDAY, MAY 31.

ROYAL INSTITUTION, at 9.—With the Allies in China: A. H. Savage Landor.

PHYSICAL SOCIETY, at 5.—On a Model which imitates the Behaviour of Dielectrics: Prof. Fleming, F.R.S., and A. W. Ashton.—(1) On the Resistance of Dielectrics and the Effect of an Alternating Electromotive Force on the Insulating Properties of India-rubber; (2) Note on the Electrification of Dielectrics by Mechanical Means: A. W. Ashton.

SATURDAY, JUNE 1.

ROYAL INSTITUTION, at 3.—The Biological Characters of Epiphytic Plants: Prof. J. B. Farmer, F.R.S.

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