THURSDAY, APRIL 13, 1905.

A DOCTOR'S VIEW OF THE EAST.

The Other Side of the Lantern. By Sir Frederick Treves, Bart. Pp. xvi+424. (London: Cassell and Co., Ltd., 1905.) Price 12*s.* net.

AN admirable book; a book written in terse and epigrammatic style, as full of cleverness as anything written by Kipling, and intensely interesting as illustrative of the first impressions conveyed to a highly trained and observant mind by the familiar and superficial details of eastern life. But there is nothing deeper in the book than first impressions, and it was perhaps inevitable that to the student of human nature under those aspects of sorrow and suffering which shadow the sick bed and the hospital, those first impressions should be tinged with the pathos and sadness rather than with the brightness and fulness of the east, and that the general tone of the book should be almost pessimistic. It is as if the lantern had proved to be no better than a common "bull's eye," with nothing on the far side but deep shadow and the policeman. Not that the book is wanting in humour by any means. On the contrary, some of the quaint outlines of men and things sketched in by the artist's hand are as full of humour as anything drawn by Phil May; but it is the grim humour of the man who complained in South Africa of the "plague of women and flies" rather than that of the ordinary holiday tourist infected with the light and sunshine of the eastern world.

The fascination of the book lies in the strength of it, and its appeal to ordinary experience. What Sir Frederick Treves describes with a few powerful and graphic touches of the pen is what we all know and have seen thousands of times for ourselves, and it is the reproduction of our own unwritten (and perhaps unrecognised) sensations that gives such pleasure to the understanding. The keen power of observation possessed by men who are trained by medical experience to judge character by the small superficial details of every-day action is sometimes almost uncanny to those who have eyes to see but see not, passing from country to country well wrapped up in a layer of self-satisfied insularity, regarding the changeful world of human existence as a sort of variety show with no reality at the back of it. Occasionally, no doubt, Sir Frederick permits an artistic fancy to introduce embellishments into the arena of actual observation; but where this occurs one cannot but recognise that he shares with Turner the great faculty of rendering his picture all the more truthful in realising the impression which he seeks to convey.

From the very start at Tilbury the author displays a powerful conception of all those minor features of the voyage eastward which are the framework and making of the voyager's daily experience. He begins with his fellow passengers:—"As an arena for the display of the resources of selfishness a departing ship has great advantages," and follows this up with a record of the mean little stratagems in which travellers will permit themselves to indulge on such occasions, and (it should be fairly admitted) on such occasions only. If there was anything of the usual good fellowship and interchange of little kindnesses which usually distinguishes the fellow voyagers of a P. and O. ship (many of whom are necessarily well acquainted with each other), Sir Frederick does not seem to have remarked them. He is impressed with the aspect of selfishness only. He is deeply interested in Gibraltar (the Rock of the past rather than of the present); charmed with the vision of Crete; inclined to relieve Port Said from the weight of universal anathema with which it is invested; and disappointed with India. At least, so one gathers from his book. He is profoundly impressed with the multitudes of India, and with the melancholy which tinges their whole existence. The truth is that the multitudes would not so much signify if they were equally distributed over the whole continent; and a comparison with France in the matter of population is ineffective for the reason that France much wants more people than she possesses. It is, however, the growing of the multitudes (checked even though it be by periodic famines over vast areas) that affords most serious consideration to Indian administrators.

The general prevalence of an atmosphere of melancholy pervading native life in India is real enough, and it is this which tends greatly to discount the chequered pleasures of European existence in that country. For it is an undoubted fact that in spite of isolation and exile in this "land of regrets" (the land of "grim extremes" Sir Frederick calls it), and the absence of so much that makes life worth living under European skies, life in India has more in it of pleasure than of pain. There are few who leave India quite of their own free will, and many who would gladly end their days there were it not for the disjointing of all ties of friendship by the departure to England of those whom they know best and love best in their own social circle.

Sir Frederick (perhaps naturally) appears to associate melancholy with misery. The association is by no means true of India whatever it may be in other lands; nor does he, with all his profound knowledge of human nature and the effect of environment and occupation thereon, quite appreciate the point of view from which the native looks at the conditions of his own existence. For instance, he finds in the Pahári (the hill men of the Himalayas) a class of people condemned to work as beasts of burden all their lives. Visiting Simla in the "off" season, he finds these men of the hills pervading the Tibet road, toiling painfully towards the Simla market loaded with planks of sawn wood. "They move slowly and they walk in single file, and when the path is narrow they must move sideways. In one day I met no less than fifty creeping wretches in this inhuman procession . . . if there were but a transverse beam to the plank, each one of these bent men might be carrying his own cross to a far-off place of crucifixion." If the author had waited until the "wretches" had stacked their planks for the evening, lit their fires for cooking, and gathered round for the day's ending, he would have

found no cheerier, happier hearted folk on the face of the earth than they. There is nothing melancholy about the Pahári. It is perhaps extraordinary that any people who are content (for there is no necessity in this case) to take the place of beasts of burden should be so absolutely unaware of the depth of their own miserable degradation. But so it is, and they would no more thank Sir Frederick for drawing them as central figures in a picture of a "circle in Purgatory" than would the bare-backed inhabitants of the bazaar thank the good missionary for calling them indecent. If he tried to turn a Pahári into a hospital orderly, and to wean him from his mountains and his planks, the contract would not last for a week!

But it is necessarily only with the outward aspect of things Indian that the casual traveller can possibly deal, and it is the freshness and vigour of Sir Frederick's descriptions of native life, his love of colour and nature, that make the charm of his book. Can anything be better than his description of the small shopkeeper of the bazaar? He "lives in the street *coram populo*, and his inner life is generously laid open to the public gaze. In the morning he may think well to wash himself in front of his shop, and to clean his teeth with a stick while he crouches amongst his goods and spits into the lane. He sits on the ground in the open to have his head shaved and watches the flight of the barber's razor by means of a hand glass. The barber squats in front of him and from time to time whets his blade upon his naked leg. The shopkeeper will change his clothes before the eyes of the world when so moved. He also eats in the open, and after the meal he washes his mouth with ostentatious publicity and empties his bowl into the road."

In moving amongst the historical cities of India and in describing them in detail there is, of course, a danger of treading on the skirts of the guide book. Sir Frederick only escapes the peril by the strength and beauty of his descriptions of these relics of the past and his keen appreciation of the stories that these stones can tell; his power of investing palaces and forts with all the movement and glitter, the coming and going, of past races of kings, making these old walls live once more under the light of an India which shall never be again. It is all delightful reading, and the stirring India of Sir Frederick's imaginings owns an enchantment which is wanting in the shadowed India of his latter day observation. There is not much said about Calcutta. The flavour of the place, that "essence of corruption which has rotted for a second time" (Kipling), seems to have been too much for the author; and yet we know that Calcutta is reckoned (statistically, at least) to be one of the wholesomest cities of the world, even when judged by the European standard.

Passing from India to Burma one is not surprised at the air of relief which pervades his book when dealing with that bright and laughter-loving land. Not even the stern critic of woman's mission in camp and hospital can resist the fascination of the Burmese coquette; and his description of Burma and Ceylon (where, *en passant*, the eminent surgeon was introduced to the devil of appendicitis and found him "unreasonably noisy") includes the best and brightest chapter in the book.

China falls again within the shadows cast by the far side of the lantern. The "nightmare city of Canton," where "such peace as is to be found in the city lies only on the green hill side without the walls, where the dead are sleeping," gives the key note of the almost morbid view of Chinese social existence which is taken by the author; and yet throughout his story of China and Japan (which country he also finds somewhat disappointing) there is the same brilliancy of description, the same fertile power of supplying precisely the right touch that is required to complete the sketch, that marks the work as original from beginning to end. It is almost Kiplingesque (to coin a word) in its epigrammatic summary of the usually complicated view of eastern humanity and its environment. It is the best book of travel that has been written for years; and yet when one lays it down regretfully (regretfully because it has come to an end), a feeling of thankfulness steals over one that the endless procession of human life and all the sweet variety of nature in the east is usually ranged for view before our eyes untinted by the medium of medical spectacles. T. H. H.

A BOOK ON MUSEUMS.

Museums, their History and their Use; with a Bibliography and List of Museums in the United Kingdom. By D. Murray. 3 Vols. Vol. i., pp. xv+339; vol. ii., pp. xiii+339; vol. iii., pp. 363. (Glasgow: MacLehose and Sons, 1904.) Price 32*s.* net.

WE have read the text of the first volume of this work (the second and third are devoted to bibliography, &c.) from title-page to index with the greatest pleasure and satisfaction, and can therefore recommend it to the best attention of those interested in the history and progress of museums. The book itself offers an illustration of an evolution somewhat similar to that of many of those institutions, for it is based on an address delivered by the author, in his capacity as president, to the Glasgow Archæological Society so long ago as the winter of 1897, and from this slender foundation it has gradually grown to its present dimensions. Much of the original address appears to remain in the final chapter of the text, where we find the author comparing the state of museums in 1897 to what it was half a century earlier, and what he presumes it will be in the future.

The work, which claims to be the first really full and approximately complete account of museum history in general, is confessedly written from the standpoint of an archæologist rather than of a naturalist; and it is none the worse for this, although, as we shall point out, there are a few instances where it would have been well had the author taken counsel with his zoological colleagues. Before proceeding to a brief notice of some of the leading features of the text, it may be well to mention that the list of museums in the British Islands is based on the one prepared by the Museums Association in 1887, and

that in the bibliographical and "museographical" lists forming the subject of the second and third volumes, reference is made only to museums of which there are printed catalogues or descriptions, or to which reference is made in other works. Consequently, many museums, including a few of some importance, are not referred to at all. In the case of large institutions like the British Museum, only such publications as refer directly to the building and its contents are quoted, so that the strictly scientific "catalogues" find no place in Dr. Murray's lists. That these lists, which must have involved an immense amount of labour in their preparation, will prove of great interest to "museographists" in the future can scarcely be doubted. We are unable, however, to find any reference to Dr. A. B. Meyer's well known survey of European and American museums.

In his first chapter the author discusses what we may call rudiments of museums, directing special attention to curiosities and rarities preserved in churches and cathedrals. Among these we miss a reference to the horn of the aurochs, or extinct wild ox, preserved in the cathedral at Strassburg up to the time of the French revolution. "Some Old Exhibits" forms the title of the sixth chapter, in which reference is made to our ancestors' extraordinary belief in the medicinal value of mummy, "unicorn's horn," and such like. In discussing the so-called giants' bones, the author makes a strange mistake (pp. 46 and 47) in regard to the bones which were assigned early in the seventeenth century to Teutobochus Rex, stating that they turned out to be those of a giant salamander, whereas they were really those of a mammoth. Dr. Murray has evidently confused these remains with Scheuchzer's *Homo diluvii testis*, based on the fossil salamander of the Œningen Pliocene.

Here we may take the opportunity of alluding to certain other errors in connection with zoological matters. On p. 58, for instance, we find the name of the red deer given as *Cervus elephas*, which might well be attributed to the "printer's devil" were it not that a few lines later the author deliberately states that this animal was the ἔλεφας of the Greeks! Again, in discussing the barnacle-goose myth, the author makes the following statement (p. 76):—

"Sir Robert Sibbald, about the same time, examined the whole subject personally, and showed that the Barnacle goose (*Bernicla leucopsis*) was a bird produced from an egg, and that the Barnacle shell (*Concha anatifera*) instead of being that egg was a *pholas*; the Scots piddocks."

If Sibbald made this misidentification, the mistake should have been pointed out—we scarcely dare think the author believes it to be true. As a minor error, it may be pointed out that the skeletons referred to on p. 187 as those of the mammoth are really referable to the mastodon. Finally, the statement on p. 136 that the Sloane herbarium "has recently been transferred from *Montague House* to the Natural History Museum" is scarcely exact or up to date.

Reverting to our survey of the contents of the first volume, we find in chapter vii. an account of some of the earliest museums, while in the eighth chapter those in existence at or about the date of the foundation of the Royal Society (1660) are discussed in considerable detail. A whole chapter is devoted to the history of the collections which formed the basis of the British Museum, and the gradual development of that institution. Museums for the exhibition of special subjects and the museums of Scotland next claim attention. From these the author passes on to museums which were "run" for profit, such as the well known museums of Lever and Bullock in London. Incidentally, it is mentioned how the former of these was disposed of *en bloc* by means of a guinea lottery; and from this there is an easy transition to the breaking-up of museums, with, in certain cases, the total loss of some of the most valuable of their contents.

In the fifteenth chapter Dr. Murray describes the arrangement—or rather want of arrangement—of the old style of museum, and takes occasion to express regret that a sample of one of these has not been preserved to our own day, as an illustration of museum evolution. Thence we pass on to modern museum arrangement, local museums, and the use of museums in general. In connection with museum buildings, it is interesting to note that Haltman, a pupil of Linnæus, advocated the importance of having a north light to the main galleries—advice which has been strangely neglected in the planning of many of our modern institutions. Of the importance of local museums, if run on right lines, and not made into mere curiosity shops, the author is fully convinced; but he is also equally convinced that they should not be left to the administration of local bodies, the members of which, as a rule, have but little conception of their true needs and purpose.

With regard to public museums in general, and especially those of the metropolis and our larger cities, Dr. Murray insists that modern methods of conservation and exhibition, and especially the labour of writing descriptive labels (which have to be from time to time renewed to keep pace with scientific progress), must entail constantly increasing expenditure, both in respect to the staff and to the upkeep of the whole establishment. In one passage (p. 280) he incidentally mentions that specimens shown in a museum do not grow out of date, apparently oblivious of the terrible effects of light in destroying so many zoological exhibits. His arguments for the increase of expenditure in the upkeep of museums are therefore, to a certain extent, understated rather than overestimated.

In regard to the general awakening of the country to the necessity of adequate training in every branch of culture and every department of industry, Dr. Murray writes as follows:—

"One of the most potent engines by which this is to be secured is the museum. Some of our museums are among the finest in the world; many are lending valuable assistance to the advancement and appreciation of art and science. A large number, however, are still content to be mere holiday resorts. All, even the best, must advance, and for this end enlightened and sympathetic administration and a liberal income are required. The museum of 1897 is

far in advance of the museum of 1847; but it in turn will be old-fashioned by the end of twenty years, and when the coming (= present) century is half-way through, its methods and arrangements will probably be wholly superseded by something better."

With these words we take leave of a very instructive and fascinating book, which it may be hoped will in some measure serve to awaken greater public interest in museums, and thereby enable them to receive adequate financial support from those responsible for their management. R. L.

ELEMENTARY PHYSIOLOGY.

(1) *A Primer of Physiology.* By Prof. E. H. Starling, F.R.S. Pp. viii+128. (London: John Murray, 1904.) Price 1*s*.

(2) *Elementary Practical Physiology.* By John Thornton, M.A. Pp. viii+324. (London: Longmans, Green and Co., 1904.) Price 3*s*. 6*d*.

(1) ASSUMING an elementary knowledge of the main facts of chemistry and physics on the part of the readers, Prof. Starling has endeavoured to present with as few technical terms as possible the leading ideas which make up present-day physiology.

It is clear that within the limited space of about 120 short pages the accomplishment of such a task is well-nigh impossible, and except in the accuracy of the stated facts due to the author's mastership of his subject, we do not think that the present attempt is more successful than those of others which have preceded it.

The great difficulty in writing such diminutive primers does not lie in the direction of finding matter to insert, but in a superabundance of material which must be left out if the reader is not to be stifled by a congested mass of facts crammed together into the shortest possible space, and as a consequence expressed in the tersest and baldest of language.

It is the difficulty of freeing the mind from the bondage of detail and dealing only with broad outlines which makes such primers dry and uninteresting reading, and causes one to sympathise with the children who are forced to read and to attempt to digest them mentally.

The primer at present under consideration is no worse, and perhaps somewhat better, in this respect than many similar productions; still, it would have served its purpose better if much of the detail had been left out, and room so provided for more ample treatment of the prominent and important aspects of the subject.

In the small amount of space at his disposal the author deals not only with the anatomy and physiology of the mammal, but finds room for some instruction regarding toxins and antitoxins, and a short chapter upon the defence of the body against micro-organisms. The introductory chapter takes up the consideration of the animal as a thermodynamic machine, includes the famous candle-burning experiment and the use of the calorimeter, and then passes rapidly to adaptive reactions, adaptation to poisons, and finally to antitoxins, thus showing that the whole of life is a series of adapted reactions.

In this chapter even the junior chemist who may read the primer will object to the illustration which shows him soda-lime as a fluid in bottles 1 and 4 of the illustration on p. 5, and it is to be feared that the junior physicist will be inclined to regard the calorimeter shown in section on p. 8 as a somewhat impossible piece of apparatus.

The remaining chapters furnish accounts of structure, food, digestion, circulation of the blood, breathing, exertion, the skin and its uses, the history of the food in the body, the chemical factories of the body, the defence of the body against micro-organisms, the physiology of movement and the muscles, the central nervous system, feelings—the whole contained in 112 brief pages, and forming a veritable *multum in parvo*.

(2) It is somewhat difficult on first glancing through Mr. Thornton's book to understand why the word *practical* appears on its title-page, for by far the greater part of the text is purely descriptive, although at intervals directions for simple dissections and experiments are interspersed in an unobtrusive manner.

On looking at the page opposite to the descriptive title page, however, one discovers that it is a member of the "Practical Elementary Science Series" issued by the publishers, and intended, as the author states in his preface, to meet all the requirements of stage 1 (the elementary stage) as set forth in the syllabus issued by the Board of Education, and in similar syllabuses of other examining bodies. Hence both the "elementary" and the "practical" of the title form, so to speak, the "class name" of the series, and are suggested by the syllabus and examination which have evidently given rise to their existence.

It is, in the opinion of the reviewer, a pity that even elementary text-books of science should have to be written to suit the requirements of syllabuses and examinations, but it appears to be inevitable in view of the artificial manner in which a love of science is propagated in this country that the majority of our text-books must be so written.

It accordingly becomes a problem whether such books can best be written by experts engaged upon the particular subject treated, or by the schoolmasters engaged in teaching that subject along with others.

The schoolmaster can claim the advantage in that he is a teacher of children, and knows best how to put the subject so that they will understand it; also, being engaged year after year in preparing pupils for the examination, he knows the requirements of the situation so far as success in the examination is concerned; but his knowledge of the subject and his presentation of it must be chiefly second-hand, since the prosecution of the study is not his daily occupation. On the other hand, the specialist, while he can give a review of the subject from a living acquaintance with it, may fail signally in writing to suit the requirements of the syllabus and the examination, disappoint both teacher and scholars in this respect, and leave his publisher without a market.

The book before us will lead to no disaster in

examination results, as a comparison of the sets of examination papers included at the end of the volume with the text of the book amply demonstrates, and it must be added that if an observant student carries out the simple experiments so clearly described at various places in the volume, he will have acquired a very desirable knowledge of the more important features of physiology. But so much cannot be said of the remainder of the text, which aims at far too much statement of detail for the space available, a matter in which the syllabus may be much more to blame than the author.

For example, the student who has learnt no chemistry previously will not be able to digest much from the description of the chemical elements given in a single page, and the same is true of the description of the chief inorganic compounds and the organic compounds of the body, each dismissed in less than a page.

The valuable habit of coordinating knowledge in the form of tables is visible at places in the book, but summaries have a way of becoming either too sweeping or too inexact, and we fear that the pupil, especially after such a concise training in chemistry as we have just indicated, may be in danger of concluding from a perusal of the table on p. 13 that the body contains "mineral salts" formed from a very strange combination of elements, or, from the table on p. 162, that these same "mineral matters" share only "in forming bone and assist in digestion," and not that they are found in every cell and tissue in the body, and form as essential a constituent there as the all-important proteids, which are in the same table represented as the only tissue formers.

B. MOORE.

TERRESTRIAL MAGNETISM.

Terrestrial Magnetism and its Causes. By F. A. Black. Pp. xii+226. (London and Edinburgh: Gall and Inglis, 1905.) Price 6*s.* net.

WITH regard to the earth's magnetism, the general conclusions from observations made on its surface are that it is partly permanent, partly induced, and subject to the effects of electric currents in the earth's crust and the surrounding atmosphere. Moreover, that the direct action of the sun plays a comparatively subordinate part in producing the observed phenomena.

In this book, however, various reasons are submitted for the belief that the general magnetism of the earth, and the constant changes thereof as shown by the hourly variations of the needle, are due to causes external to the earth. In short, that the earth is to be considered as an electromagnet excited by electric currents proceeding from the sun and impelled towards the earth with inconceivable rapidity, the orbital and axial movements of the earth through these currents producing magnetic effects in a manner similar to the winding of an electromagnet through which a current passes.

In order that we may believe this to be the case, we must agree that the sun gives out electric waves continuously in every direction equal to the work of maintaining the earth as an electromagnet. For example, that during the forty-five years of the last century, when, according to computation from observed facts, the earth's magnetic moment hardly changed, these emanations were continuous. At present there does not appear to be any ground for such a belief.

In an endeavour to explain the hourly angular variations of the needle, it is submitted that the earth's magnetic poles probably occupy a considerable area round the centre of which certain centres of primary attraction in them make a daily circuit, due to the action of the sun as the earth rotates on its axis. In addition to the "primary" magnetic pole in North America, it is suggested that a "secondary" pole of a similar nature must exist in northern Siberia. The daily variations of the needle, both in declination and dip, in the northern hemisphere are then attributed to a battle for the mastery between the revolving centres of attraction in the two poles mentioned, modified as the magnetic equator is approached by the attraction of the south magnetic poles.

As one reads through several of the first chapters the fully expressed acceptance of the idea that the attraction of the needle by the magnetic poles is the immediate cause of its variations seems unaccountable, until a fundamental error is reached. This is when the author takes it as generally agreed that, in the same way as steel is attracted by the poles of an ordinary artificial magnet, the magnetic needle is attracted by the poles of that great natural magnet, the earth. Such a statement vitiates whole pages of the arguments adduced.

On the question of the position of the magnetic equator with regard to the terrestrial equator, the results of observation have also been too much ignored. There have not been four crossings of the two equators during the last sixty years, neither are the two known points of crossing regulated by the position of the magnetic poles as suggested. In the Atlantic region, the point of crossing seems to be chiefly regulated by local causes below the earth's surface.

It may be finally remarked that the chapter on magnetic storms is the most acceptable in the book.

OUR BOOK SHELF.

Mechanical Appliances, Mechanical Movements and Novelties of Construction. By Gardner D. Hiscox. Pp. 396. (London: Constable and Co., Ltd., 1905.) Price 12*s.* 6*d.* net.

THIS book is luxuriously printed, with clear figures, but it is difficult to say more in its praise. It consists of a series of short paragraphs, each with its illustration, describing some mechanical or constructional device. It is similar in plan to those "Centuries of Invention" of which the Marquis of Worcester's was the earliest (1746). The devices described are of the most heterogeneous character, old and new, important and unimportant, useful and useless. They are arranged in the roughest way in sections which have no relation to any natural order of classification. It is difficult to see to whom such a work appeals, but in fairness to the author it should be stated that a previous work

of which this is a continuation appears to have reached a tenth edition.

Section ii. is on the transmission of power. The first example is a screw-driver, and the second a sewer rod coupling. Another example is a cash conveyor, which, as money is power, is no doubt an example of transmission of power. On the next page is a viscosimeter, though what power is transmitted in this case is less obvious. Nor would one naturally expect four examples of acoustic telephones to be found under this heading.

Section vii., on hydraulic power and appliances, commences with some very sketchy ideas for wave motors, and then describes a fog-horn buoy. There is no reasonably good account of any one of the important class of water turbines, but there is a quite impossible design for a "multinozzle turbine," and next to this a duplex steam feed pump. There is a figure of a Venturi meter, but the description does not explain its action, and the curiously inaccurate statement is made that the differential velocity produces a differential pressure in two tubes with mouths turned in "opposite" directions, and ends with the very misleading statement that "the measurement is made by a meter." The reader would not realise that the Venturi tube is the meter, and that what the author probably mistakes for a meter is a recorder.

Section viii., on air power, motors and appliances, contains the "pneumatic ball puzzle," an "aërial top," "grain elevators," "a magic ball," a "megascope," a "sailing wagon," a "tail-less kite," and a "sail-rigged merry-go-round"; but nothing about the air-compressors, air-motors, and pneumatic tools which are now so important.

Enough has been said to indicate the general character of the work. Many useful and important devices are described amongst many others which are mere inventors' schemes. There may be readers who like an olla podrida of this kind.

Perhaps the most curious section, and we think the longest, is that on perpetual motions. About these the author does not seem to have quite made up his own mind. He does warn the reader in the preface that the problem is "unsolvable." But later, p. 363, he remarks that "attempts to solve this problem would seem, so far, only to have proved it to be thoroughly paradoxical," a statement which would hardly get many marks in a science examination. Further, we are told on the next page that, although admitting difficulties in the way of its discovery, "many eminent mathematicians have favoured the belief in the possibility of perpetual motion"; also that "it is evident, therefore, that even mathematicians are not agreed."

Modern Theory of Physical Phenomena, Radio-activity, Ions, Electrons. By Augusto Righi. Authorised translation by A. Trowbridge. Pp. xiii + 165. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd., 1904.) Price 5*s.* net.

IT is an interesting sign of the times that so many books have appeared during the last few months with the object of explaining in non-technical words the recent development of physical science. Part of the interest shown in these subjects by the general reading public is, no doubt, of the unintelligent and wonder-seeking order, which classes the more striking discoveries of natural science with the latest sensation of the law courts, or the cost of the flowers at a Transatlantic ball. But it is fair to hope that some, at all events, of those who read of the advance of knowledge do so with a desire to comprehend the method, as well as to admire the results, of scientific research. A more widely spread application of the open-minded and truth-seeking methods of science to the problems of individual and collective life is, for the sake of the community, greatly to be desired.

The little book before us deals in a light and interesting manner with the conceptions of the physical world which have been used of late in investigating the phenomena of light, electricity, and radio-activity. It states the results of recent inquiries in a clear and intelligible manner, and, if the account of the methods used in reaching the results sometimes seems inadequate, the difficulty of explaining those methods to non-scientific readers may be urged as an excuse.

After an introduction, the book contains chapters on electrolytic ions and electrons; electrons and the phenomena of light; the nature of the kathode rays; the ions in gases and solids; radio-activity; mass, velocity, and electric charge of the ions and of the electrons; and the electrons and the constitution of matter. The volume ends with a useful bibliography of the subjects considered.

The translation, on the whole, is well done, though a certain want of crispness in the literary style is felt in places.

In a future edition one or two corrections would be advisable. The period of vibration of light cannot be "expressed by a fraction whose numerator is unity and whose denominator is a number of fifteen places" unless it is understood that "a fraction" is a fraction of a second. The usual figure given to illustrate the opposite deflection by a magnetic field of the α and β rays from radium exaggerates greatly the deflection of the α rays compared with that of the β rays. This exaggeration is legitimate, in fact, necessary, in a diagrammatic representation; but it should be pointed out in the text, or misconception of the relative magnitudes of the two effects is sure to follow. In Thomson's method of determining the properties of the ions produced by the incidence of ultra-violet light on a metallic surface, the exactness is limited not only by the differing velocities of the ions, as stated in the book. Probably the ions are produced, not solely at the metallic surface, but also in a layer of the gas of finite thickness in its neighbourhood. Thus the distance from the surface reached against the influence of a magnetic field may be different for different ions even if their velocities be the same.

The Journal of the Royal Agricultural Society. Vol. lxv. Pp. clxvi + 392. (London: Murray, 1904.)

THE *Journal* of the Royal Agricultural Society makes its appearance this year in a rather slimmer form than usual, due, however, more to the use of a thinner paper than to a curtailment of the printed matter. The affairs of the society bulk largely as usual, taking up more than half the present volume, while the miscellaneous articles, to which the ordinary reader turns, only occupy about 150 pages. The volume is, in fact, burdened far too much with reports of council meetings and committees, which have lost all interest for the members by the time the annual volume reaches them, and which would be much more to the point if circulated as "proceedings" immediately after the meetings and not reprinted here.

The volume opens with a vivacious and readable account of Sir Humphry Davy by Mr. H. B. Wheatley, who well brings out the charm and fascination of Davy's personality. But we cannot help thinking Mr. Wheatley rates Davy's agricultural work altogether too highly; if any man is to be called "father of the science" it is De Saussure, and not Davy, who can be identified with no new discovery or novel point of view in agricultural science. In this respect Davy was somewhat like Liebig; both were great men who had the power of getting the world to listen to them, and when they turned their attention to agriculture the influence they wielded, each in their

generation, and the stimulus they gave to the progress of agriculture were out of all proportion to the value of the knowledge or even of the ideas they contributed to the subject. Davy gave dignity to the study of agricultural science; where Davy had laboured no man in future need be ashamed to work. Two articles follow on fruit farming, by Mr. Charles Whitehead, and on vegetable farming, by Mr. James Udale. Both are sound enough, but they are rather jejune performances for the *Journal* of the Royal Agricultural Society, since from the inevitable limitations of space they are too lacking in detail to be of service to anyone but the amateur. When it comes to reproducing pictures of the wireworm from the Society's text-book of agriculture, instructions for making Bordeaux mixture, and similar elementary matters, the farmer reader may well wonder where the editor's blue pencil has been lying. Mr. Dudley Clarke writes on a burning question of the day, the cost of labourers' cottages, and gives a number of sensible plans, bringing out the cost of a brick and tile cottage with three bedrooms at about 150*l.*, including the land and the cost of a well.

Mr. A. D. Hall writes on the agricultural experiments of Mr. James Mason, the well-known founder of the firm of Mason and Barry, who spent his later leisure in attempting to apply science to agriculture with some success, while the rest of the volume is occupied with the last Park Royal show, with reports of the experiments in progress at the Woburn Farm, and with other society matters.

Mediaeval Lore from Bartholomew Anglicus. By Robert Steele; with preface by William Morris. Pp. xv+195. (London: Alexander Moring, Ltd., 1905.) Price 1*s.* 6*d.* net.

THIS beautiful addition to the "King's Classics," of which Prof. Gollancz is the general editor, is likely to prove of interest to students of science. Written by an English Franciscan, probably before 1260, to explain the allusions to natural objects met with in the Scriptures and elsewhere, it is really an account of the properties of things in general so far as they were understood by an educated writer of the Middle Ages. After studying the quaint and pleasant accounts of mediæval science, medicine, geography, and natural history which the book contains, the student will begin to realise that during the Middle Ages science was not stagnant, but, by gradual development, was making possible the rapid growth of scientific knowledge characteristic of the nineteenth century. The reprint deserves to be read widely.

Ergebnisse und Probleme der Zeugungs- und Vererbungs-lehre. By Prof. Oscar Hertwig. Pp. 31. (Jena: G. Fischer, 1905.) Price 1 mark.

PROF. OSCAR HERTWIG is well known as a pioneer in the researches on fertilisation. In 1875 he made the important discovery that the essential fact in the process lay in the fusion of a single male with a female cell, and he also saw and recognised the fusion of the nuclei. It was fitting that at the congress held at St. Louis last year he should choose this subject as the text of his lecture. The reprint forms a clear statement of the chief details of fertilisation, and also indicates some of the theoretical conclusions towards which modern cytology is tending. The sketch of the so-called "reduction divisions" is specially good, and the author shows how clear a light they throw on the modern experimental results obtained from the study of heredity. The lecture will be welcomed by all who are interested in these and kindred questions, and those who know Prof. Hertwig's writings will not be surprised to find that if the treatment is of necessity brief, it is masterly of its kind.

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.*]

The Dynamical Theory of Gases.

IN Mr. Jean's valuable work upon this subject he attacks the celebrated difficulty of reconciling the "law of equipartition of energy" with what is known respecting the specific heats of gases. Considering a gas the molecules of which radiate into empty space, he shows that in an approximately steady state the energy of vibrational modes may bear a negligible ratio to that of translational and rotational modes.

I have myself speculated in this direction; but it seems that the difficulty revives when we consider a gas, not radiating into empty space, but bounded by a perfectly reflecting enclosure. There is then nothing of the nature of dissipation; and, indeed, the only effect of the appeal to the æther is to bring in an infinitude of new modes of vibration, each of which, according to the law, should have its full share of the total energy. I cannot give the reference, but I believe that this view of the matter was somewhere expressed, or hinted, by Maxwell.

We know that the energy of ætherial vibrations, corresponding to a given volume and temperature, is not infinite or even proportional to the temperature. For some reason the higher modes fail to assert themselves.[1] A full comprehension here would probably carry with it a solution of the specific heat difficulty. RAYLEIGH.

The Physical Cause of the Earth's Rigidity.

SINCE publishing the paper in the *Astronomische Nachrichten* (No. 3992), the investigations there outlined have been considerably extended, and lead to some remarkable results. My only purpose in this letter is to direct attention more particularly to the physical cause of the earth's rigidity. This seems to have remained rather obscure, and I am not aware that any definite theory has been adopted to account for the remarkable fact established by the researches of Lord Kelvin and Prof. G. H. Darwin.

It was pointed out in the *Astronomische Nachrichten* (3992) that the physical cause of the earth's high effective rigidity is to be found in the great pressure existing throughout the interior of our globe. This may be made somewhat more obvious by remembering that in any concentric spherical surface the resistance of the enclosed nucleus must be just equal to the pressure of the surrounding shells resting upon it, and thus the strain upon the matter of the globe increases towards the centre according to the same law as the curve of pressure given in the *Astronomische Nachrichten* (3992). This pressure is sustained by the increasing density and rising temperature of the matter in the earth's interior, which is thus under an inconceivable strain, far surpassing the strength of any known substance. As the matter is above the critical temperature of every element, it is essentially a gas reduced by pressure to a hardness greater than that of steel, and with an elasticity and rigidity infinitely near to perfection. The result is that the explosive strain upon the matter of our globe from within, which is everywhere just equal to the pressure sustained by the enclosed nucleus, renders the interior matter more rigid than any known substance; and even the outer layers, which are but slightly compressed, yield so little under the action of external forces that the globe as a whole is more rigid than steel, as Lord Kelvin and Prof. G. H. Darwin found from their profound researches on the long-period tides of the ocean.

It was these considerations which led to the conclusion that all the heavenly bodies of considerable mass when condensed to moderate bulk have nuclei of great effective rigidity, and experience no sensible circulation at great depths. T. J. J. SEE.

U.S. Naval Observatory, Mare Island, Cal., March 20.

[1] Compare "Remarks upon the Law of Complete Radiation" (*Phil Mag.*, xlix. p. 539, 1900).

The Lyrid Meteors.

THOUGH in the present year the light of the full moon will impede observations of these meteors, yet it is not improbable that the shower will be sufficiently strong to manifest its presence, provided that the atmospheric conditions prove favourable for the occasion. In 1905 the calculated maximum will fall on the night of April 19, as was the case last year, when Lyrids were found to be somewhat more numerous at Utrecht on the night of April 19 than on the succeeding night, both nights having been clear; observations at Dublin, made, however, under less favourable conditions, tended also to confirm this result.

On the present occasion the shower will extend throughout the night of April 19, and of its three constituent maxima two at least will be visible to Cisatlantic observers. The calculated time of the first of these maxima is April 19, 11h. 15m. G.M.T., while the second occurs at 15h.; the third may occur shortly after 14h., but owing to an uncertainty respecting some of the data requisite for its calculation, it is liable to arrive two or three hours later, and consequently elude the vigilance of observers of the first two maxima.

The conditions under which the anticipated display will take place indicate that it will be much above the average in brightness, and probably, notwithstanding the presence of the full moon, several brilliant meteors will be observed on April 19, owing to the meteoric concentration that characterises this night. JOHN R. HENRY.

ANTARCTICA.[1]

WE have entered upon a new era of South Polar literature, since each of the recent expeditions bears the promise and the potency of several books. Of these the recent publication of Dr. Otto Nordenskjöld's "Antarctica" is an addition to our knowledge of southern regions.

[1] "Antarctica, or Two Years amongst the Ice of the South Pole." By Dr. N. Otto G. Nordenskjöld and Dr. Joh. Gunnar Andersson. Pp. xviii+608. (London: Hurst and Blackett, Ltd., 1905.) Price 18*s.* net.

Dr. Nordenskjöld sailed from Buenos Aires on Christmas Eve, 1901, with the Swedish expedition. The object of the expedition was not to make a dash for the Pole, but, in conjunction with the English, Scottish, and German expeditions, to pursue certain scientific studies in the unknown Antarctic, the special sphere of operations being that section known as the Weddell Quadrant. Dr. Nordenskjöld appears to have succeeded in carrying out much of his programme, although he was unable to push far south, indeed, not so far as the Antarctic Circle, and notwithstanding disasters and hardships without a parallel in the history of Antarctic exploration.

The narrative is divided into two parts. The first, by Dr. Nordenskjöld himself, deals with the cruise of the *Antarctic* in the summer of 1901–1902, and with the two consecutive winters spent on shore near Seymour Island. The second part is by Dr. Andersson and Capt. Larsen, and describes the attempt of the *Antarctic* to reach Nordenskjöld's winter quarters in the summer of 1902–1903, and the loss of the ship in the ice-pack off Louis Philipp Land near the entrance of Erebus and Terror Gulf.

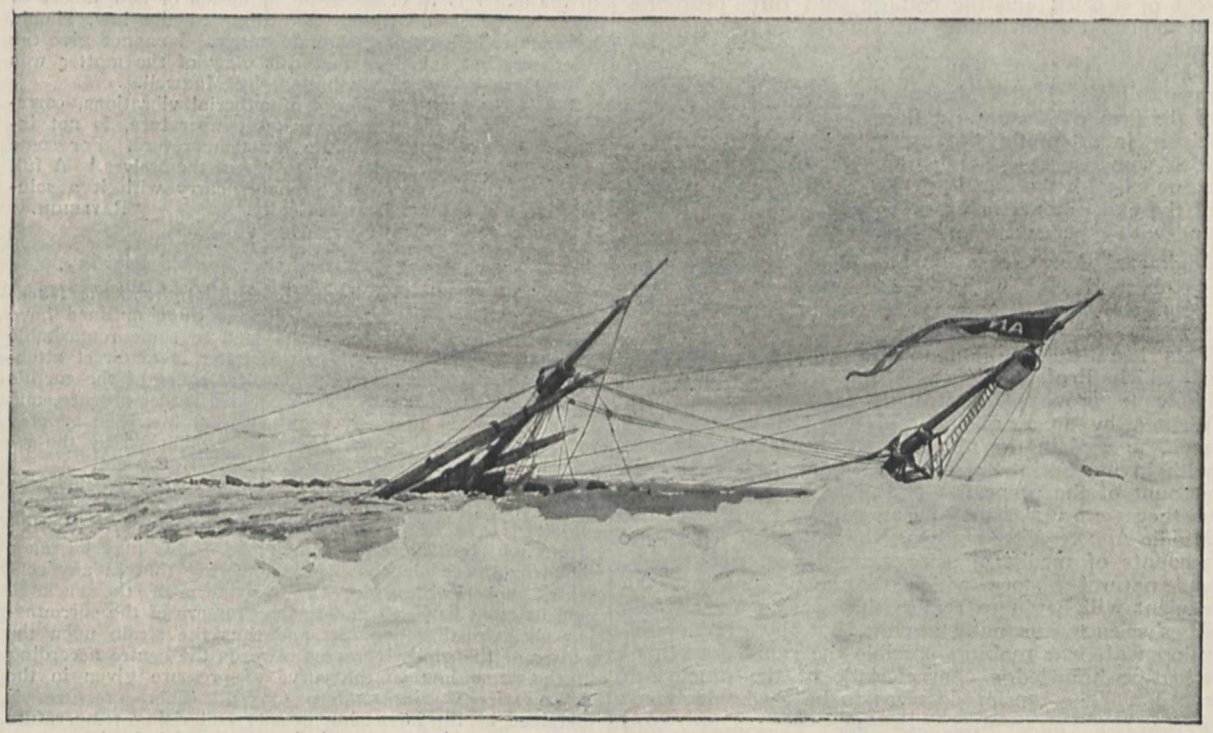

FIG. 1.—The loss of the *Antarctic*. From Nordenskjöld and Andersson's "Antarctica." The original illustration is slightly larger than the above.

Geographically, the summer of 1901–1902 was perhaps the most prolific in discoveries. Louis Philipp Land was found to be continuous with Danco Land, and Gerlache Channel nothing but a continuation of D'Urville's Orleans Channel. Indeed, D'Urville is the real discoverer of the whole island. It appears that the *Belgica* maps of this locality present many difficulties and differences. The illustrations of this land from about lat. 63° S. to 65° S. bear a strong resemblance to Victoria Land, and seem as desolate and as heavily glaciated as land in lat. 75° S. in the Ross Quadrant.

Continuing southwards down the east coast of King Oscar II. Land, the *Antarctic* was at last stopped by a perpendicular wall of ice about 130ft. high. This was in about the 66th degree of latitude south, and it grew clear to Dr. Nordenskjöld "that

the chief aim of the expedition to penetrate to unknown regions along the coast of King Oscar's Land was utterly annihilated by powers of nature against which it would be fruitless to combat."

Sailing eastwards along the barrier some trawl hawls were made in deep water, a fairly constant depth of 2000 fathoms found, and indications of a layer of warm water at about 300 fathoms. This layer of warm water at a certain depth is characteristic of a great part of the polar sea.

On February 1, 1902, in lat. 63½° S. and long. 45° 7′ W., it was decided to return westwards and seek a suitable place for winter quarters. The spot selected was Snow Hill, a little to the south of Seymour Island, where Capt. Larsen first discovered fossils in 1892. A party of six, including Nordenskjöld, was landed, with a strong, comfortable log hut, a few dogs, and provisions and equipment for two years. Before finally leaving the party an attempt was made by Capt. Larsen to establish a depôt farther south, but it was unsuccessful on account of the close conditions of the ice.

The two winters seem to have been passed cheerfully and harmoniously. The party was too far north to feel the terrors of a real polar night, for even at midwinter the sun remained four hours above the horizon, but the weather, common to all parts of Antarctica, was most boisterous; storm followed storm, and made outdoor work only too frequently impossible and the carrying out of scientific observations most arduous. Perhaps we do not thoroughly realise what physical hardships attend the taking of scientific observations in the Antarctic regions.

The magnetic work was undertaken by Dr. J. Bodman. There were no self-recording variometers like those of the *Discovery*, and there is therefore no continuous magnetic record, but the conditions of the International Term Days were fulfilled by means of the ordinary method of eye readings.

Bacteriological investigations were undertaken by Dr. Ekelöf, and chiefly concerned the bacterial flora of the surface soil. The result seems to show that "in these regions the surface soil must almost be considered as the place of origin of bacteria, and the results which were pursued during different seasons and with regard to different kinds of earth have given rise to wholly new ideas concerning the conditions of bacterial life within the polar regions."

The taking of the meteorological observations was shared by all alike. At first readings were taken only at 7 and 8 a.m. and 2 and 9 p.m., but towards the middle of April night observations were also taken.

August 6 was the coldest day, when the thermometer registered −42°.3 F. (−41°.3 C.). At Cape Adare (lat. 71° S.) the lowest temperature observed was −43°.5 F., also in August, and with the *Discovery* in lat. 78° S., −67°.8 F.

Dr. Nordenskjöld expresses the opinion that the summer of 1902–3 was exceptionally cold, and points out that the German ship *Gauss* alone succeeded in extricating itself from the ice, but no figures are given to prove the statement. Fewer heavy storms in the summer of 1902–3 were more likely the direct cause of the ice not breaking up.

On October 1, Dr. Nordenskjöld set out with Lieut. Sobral and a sailor on a sledge expedition southwards along the coast of King Oscar II. Land. The one sledge drawn by Nordenskjöld and Sobral weighed in all 200 lb., and the other, drawn by five dogs, 485 lb. The total length of route traversed in thirty-four days was 400 miles. As a result of this journey the chart of this coast has become completely changed.

During the summer of 1902–3, while waiting for the return of the *Antarctic*, important fossil finds were made on Seymour Island. The first were bones belonging to a species of penguin considerably larger than the largest now living—the Emperor penguin. This demonstrates that even at such a distant epoch—probably the beginning of the Tertiary period—the penguin was an inhabitant of the Antarctic regions. The other was that of numerous large and quite distinct leaves in a brown, coarse, hard, tuff-like rock, belonging to different forms of exogenous trees, firs, and ferns. The leaves are small and narrow, and call to mind similar fossils from the Tertiary formations of Central and Southern Europe, but also certain South American types of leaves.

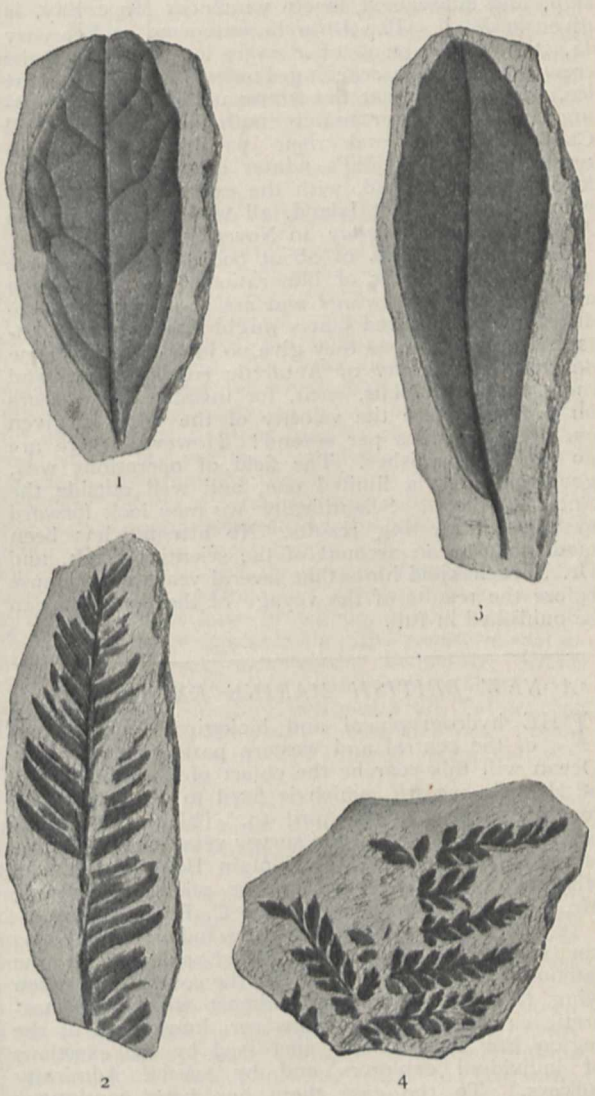

FIG. 2.—Tertiary plant fossils from Seymour Island (drawings by Prof. A. G. Nathorst). From Nordenskjöld and Andersson's "Antarctica."

Dr. Nordenskjöld writes: "If there was one hope whose fulfilment or non-fulfilment was, in my thoughts, almost synonymous with the success or failure of this expedition, it was just that of being able to discover in these regions determinable Tertiary vegetable fossils."

Dr. Andersson also discovered a fossil flora from the Jurassic system in Hope Bay, about a degree farther north, and some very fine illustrations of the

Cladophlebis, Pterophyllum, and Otozamites are given.

Some form of fossil plant was found by the geologist of the *Discovery* as far south as lat. 78°, but it has been found quite impossible to identify it on account of the imperfect nature of the specimen.

The second part of the book makes some thrilling reading, but adds very little to our knowledge. The attempt of Dr. Andersson, Lieut. Duse and seaman Grunden to reach Nordenskjöld across the ice from the *Antarctic* in the summer of 1902–3, their failure either to reach the winter quarters or to regain the ship, and subsequent lonely winter in Hope Bay, is given in detail. The *Antarctic* foundered on February 12, 1903, as the result of a severe ice "nip," and the crew succeeded in reaching Paulet Island across the ice, where they spent the winter under extremely trying conditions. Fortunately, both Dr. Andersson and Captain Larsen and their parties succeeded in reaching Nordenskjöld's winter quarters in the following summer, and, with the exception of a sailor who died on Paulet Island, all were rescued by the Argentine ship *Uruguay* in November, 1903.

The book consists of about 600 pages, and there are a large number of illustrations, some of which are from crude drawings and are indifferently reproduced. The coloured plates might have been advantageously omitted, as they give no idea of the extreme delicacy and beauty of Antarctic colour. Here and there are slight slips, such, for instance, as appears on p. 119, where the velocity of the wind is given as forty-five miles per second! However, there are no serious blemishes. The field of operations was, geographically, a limited one, and well outside the Antarctic Circle. Scientifically we may look forward to more interesting results. No attempt has been made to give an account of the scientific work, and Dr. Nordenskjöld hints that several years must elapse before the results of the voyage of the *Antarctic* can be published in full. L. C. B.

A NEW BRITISH MARINE EXPEDITION.

THE hydrographical and biological investigation of the central and western parts of the Indian Ocean will this year be the object of a special cruise of H.M.S. *Sealark*, which is fixed to leave Colombo for the purpose about April 20. This yacht, which is the latest addition to the survey vessels of the Navy, is under the command of Captain Boyle Somerville, who will be accompanied by two scientific civilians, Mr. J. Stanley Gardiner and Mr. C. Forster Cooper.

It will be remembered that the Indian Ocean was not visited by the *Challenger* Expedition in the famous cruise around the world, the course then taken lying further to the south, almost within the Antarctic circle. Meantime, however, knowledge of the region has been steadily increased by the exertions of individual explorers and by special Admiralty surveys. To the east there has been continuous progress, culminating in the Dutch *Siboga* Expedition of 1899–1900 through the East Indies, while other explorers have investigated Keeling Atoll, Christmas Island, and parts of Torres Straits and Western Australia. To the north, the Indian survey vessel *Investigator* has been active from the Persian Gulf almost to the Straits of Malacca, while individual explorers have borne their full share. Prof. Ortmann examined the reefs of Ceylon, and Prof. Herdman is now publishing a full account of the marine fauna and flora of that region. In addition, Mr. Stanley Gardiner, with Messrs. Borradaile and Forster Cooper, devoted sixteen months in 1899–1900 to the examination of the Laccadives and Maldives, being followed through the same region in 1901 by Prof. Alexander Agassiz, who devoted himself mainly to the coral reefs, with the surface and the deeper pelagic fauna.

The Red Sea and the coast of East Africa is largely a German zone, but to the south a regular systematic investigation of the hydrography and biology is being undertaken by Cape Colony in connection with its sea fisheries. The French have accumulated much knowledge of Madagascar (mainly of the land), while Rodriguez and Mauritius have become fairly well known, to a large extent owing to the Royal Society Expedition of 1874. Of greater importance, however, were the Admiralty surveys of the numerous islands and banks to the north of and around Madagascar, carried out for the most part by Captain (now Admiral Sir Wm.) Wharton. Lastly, the German *Valdivia* Expedition in 1898–9 ran a rapid traverse from St. Paul to Nicobar, Ceylon, Chagos, Seychelles, and up the East African coast. Its work showed the existence of a pelagic fauna at all depths, and of practically the same deep-sea fauna as exists in other oceans. A relatively shallow bank was found between Chagos and the Seychelles, an important discovery which ought to have been followed up by an extended investigation of the region.

The present expedition, organised by Mr. Stanley Gardiner, is an attempt to correlate in some degree the work of all these different expeditions and explorers by a thorough investigation of the oceanography and biology of the region between India and Madagascar, and is the direct outcome of the Maldive and Laccadive expedition of 1899–1900. As at present proposed, H.M.S. *Sealark*, after leaving Ceylon, will proceed to the Chagos Archipelago, situated to the south of the Maldives in lat. 7° S. This group, for the topography of which we are at present depending almost entirely on a survey made by Captain Moresby in 1837, consists of a series of atolls and submerged banks, of which Great Chagos, an irregular circle upwards of seventy miles in diameter, is the most conspicuous, being the largest existing circular coral reef with a basin in the centre. It is, however, perhaps better known through the atoll of Diego Garcia to the south-east, at one time used as a coaling station by the Orient Line between Aden and Australia. That there will be plenty of hydrographical work in the group is quite clear, for there are at present no bottom soundings between any of the banks, and considerable changes may reasonably be expected to have taken place in the last seventy years owing to the growth of the reefs. The expedition will endeavour to fill in these omissions, and while this work is proceeding a close biological and geological survey of the reefs will be undertaken.

From Chagos the *Sealark* will proceed to Mauritius, which should be reached about August 1. Here fresh stores will be taken in, and the collections so far obtained sent home. No extensive work around the island will be possible, but it is hoped to visit some of the reefs. The *Sealark* will then proceed to Cargados, a surface reef to the south of the submerged Nazareth Bank, and the line will be continued along to the Seychelles group over the likewise submerged Saya da Malha Bank. Both these banks may well lie on a crescent of relatively shallow water (less than 1500 fathoms) connecting the Seychelles with Mauritius, but the actual depths should be settled by the expedition. In any case, the examination of these two great submerged banks should throw much-needed light on the formation of

coral reefs. The Agalegas group may also be surveyed, and the nature of its land ascertained. From the Seychelles the *Sealark* will return to Colombo, while the civilian members of the expedition will spend some months in that group and its vicinity, returning home in January, 1906.

The scientific work of the expedition will be of a varied nature. In the first place, the soundings and temperature observations taken by H.M.S. *Sealark* should settle such questions as the existence or non-existence of any relatively shallow banks connecting India and South Africa, and also of any bank from Mauritius to the Seychelles. They should also give an accurate knowledge of the rise and relationships of the various Chagos atolls and banks to one another, and show whether they are really isolated by deep sea or arise on some shallow plateau as do the greater number of the Maldive atolls. Incidentally, also, the soundings may reasonably be expected to indicate what changes, if any, have taken place in the reefs and banks since the last surveys. At the same time it is hoped to examine the currents at various depths, so as to see as far as possible the actual influences at work. In the same connection an investigation has already been commenced on the waters of the Indian Ocean. By the kind assistance of the Meteorological Council, cases of bottles have been sent out to many captains of the British India, P. and O., Orient, Bibby, Clan, and other lines for daily samples of the surface waters, while the expedition itself will obtain samples both from the surface and from various depths during the whole of its sojourn in the Indian Ocean. Mr. D. Matthews, English hydrographer to the North Sea investigation, has undertaken the analyses of these samples, and it is hoped that by continuing the collection for twelve months a more accurate knowledge may be obtained of the movements of the waters of the Indian Ocean. In meteorology a careful log and graphic records will be kept, which, coming from such a little known region, should be useful for comparison with the more regular steamer routes.

In biology, the expedition will everywhere take samples of the bottom and of the pelagic fauna at various depths. The coral reefs will be examined, both surfaces and slopes, while the currents and other factors, possibly influencing the same, will be carefully investigated. The dredges and trawls will be let down as frequently as possible, both to ascertain the general characters of the bottom off the islands and banks, and also to sample the flora and fauna. The deep-sea fauna will not be collected, work being for the most part devoted to intermediate depths (50 to 500 fathoms), within which light tails off into absolute darkness. At the same time, the fauna at lesser depths, both in the Chagos and Seychelles, will be investigated as completely as possible. By these means some clear idea should be obtained of the vertical distributions of both animals and plants, and the comparisons of the marine fauna and flora of the Seychelles and Chagos, together and with those of the surrounding slopes of the Indian Ocean, should at least illuminate the question as to how far the horizontal distribution of such is of value in tracing the former connections of continents and lands. The land flora and fauna can scarcely be expected to be of great interest—it will not at present be attempted in the Seychelles—but it will nevertheless be collected in view of the gradual peopling of oceanic islands.

On the whole, this most recent British exploring expedition may be said to be conceived in the interests, not of one, but of many sciences, and all who sympathise with the advancement of knowledge may be grateful to the Admiralty for detailing a vessel for such work. The hydrographic results alone should more than justify the dispatch of H.M.S. *Sealark*, while any discovery which may be made of the laws which govern the formation and growth of coral and other reefs—and to which we seem to be tending—would make navigation in tropical waters appreciably safer. The scientific members of the expedition have been required to find all the extra gear and instruments necessary for their work. In this they have been materially assisted by grants from the British Association and from the Balfour memorial fund at Cambridge; but the bulk of the expense has been undertaken by the Trust recently founded by Mrs. Percy Sladen in memory of her late husband—to whom, it is felt, the objects of this expedition would have very closely appealed, and whose name will appropriately appear upon the publications issued as a result of the investigation.

THE INDIAN EARTHQUAKE OF APRIL 4.

A LARGE part of north-western India was severely shaken by an earthquake which occurred on April 4, shortly after six o'clock in the morning, causing the destruction of numerous buildings and the loss of many lives—the number being estimated at twenty thousand. The last great earthquake in India, in June, 1897, was one of the most violent of which there is any historical record, but the casualties and damage due to that disturbance were comparatively small, because the earthquake occurred at five o'clock in the afternoon, when many people were out of doors, and there were no large cities within the area of maximum violence. In the case of the earthquake on April 4, most people were indoors at the time of the shock, and the area of greatest disturbance included, unfortunately, several centres where fairly large towns have grown up, chiefly round the official settlements, cantonments, and sanatoria of the British Government. Dharmsala, Dalhousie, Simla with several neighbouring cantonments, Mussoorie, Dehra Dun, Almora, Ranikhet, and Naini Tal are the chief of these; and the many substantial stone buildings in them have naturally suffered much damage from the earthquake shocks.

The reports so far available show that the earthquake, like that of other great disturbances of the same kind, was of Himalayan origin, the centre being about Dharmsala. Its intensity decreased through the Punjab and the United Provinces, while from Rajputana to the north it decreased rapidly. There appears to have been no wide extension of the disturbance towards Assam or Afghanistan, but information from the west is very imperfect.

The whole area where serious damage is known to have been done is included within a line drawn from Shahpur through Kangra to Jawalamukhi, thence east to Sujanpur, and then to Baijnath; but what occurred eastwards of this area is not known.

It is clear from the Viceroy's telegrams that the towns of Dharmsala, Kangra, and Palampur are virtually destroyed, that the loss of life has been very great, and that the full measure of catastrophe, owing to difficulty of communication, cannot be ascertained for some time.

The King has sent to the Viceroy a telegram expressing his "profound concern at the news of the calamity which has befallen Lahore and surrounding district," and a message of sympathy with all who have suffered from the earthquake has been sent by the Prince and Princess of Wales.

No news about the earthquake has been received

from the regions north of Kashmir, but two days before the first shock was felt in India the Punjab stations reported the arrival of storms bearing large quantities of dust and ash. Natives arriving at Simla from the interior declare that a volcanic eruption has occurred in the hills in Bashahr State.

The earthquake was clearly registered by the seismograph in the observatory at Göttingen, and a record was also obtained at the Royal Observatory, Edinburgh. The record began with some very minute tremors about 1 a.m., while the larger waves began about eight minutes later. The *maximum* disturbance was recorded about 1.30, and was followed by one of almost equal severity a minute and a half later. From that point the tremors were gradually reduced until 4.43 a.m. The difference of time between Edinburgh and Dharmsala is about five hours. Seismograms recording the earthquake were also obtained by Prof. Milne at Shide, Isle of Wight, and at the hydrographic station at Pola.

A severe earthquake shock, lasting six seconds, was felt at Benevento, Italy, at 8.20 p.m. on April 9, and fresh shocks were experienced at Simla on April 10 and 11.

The following particulars of the effects produced by the earthquake in various parts of India have been extracted from the extensive reports which have appeared in the daily papers.

Dharmsala.—All houses and buildings throughout the entire station, including cantonment and bazaars, totally destroyed, with loss of many lives. About 80 per cent. of the population killed or injured, and from 20 per cent. to 30 per cent. in the neighbouring villages.

Kangra Valley.—Kangra and Jowala Mukhi and other villages in Kangra Valley reported totally destroyed, and many hundred lives lost. Every building, without exception, in Kangra and Bhawan in ruins. Of a total population of nearly 5000 in Kangra town it is believed that only about 500 remain alive. Similar state of affairs in most other villages in the neighbourhood. At Palampur, in the Kangra district, all the houses, including the Government buildings, reported totally destroyed, and many hundred lives lost.

Lahore.—A succession of violent shocks caused a panic. The inhabitants rushed from their houses to seek safety in the open. Almost every house suffered by the earthquake, and much serious damage was done to public and private property, and twenty-five people were killed. The shock created an extraordinary uproar at the zoological gardens. The shrieks of the pea-fowls were heard all over the station, while crows and other birds flew in alarm from the swaying trees.

Mussooree suffered severely. Two slight shocks were felt during the night of April 3. A succession of shocks began at 6.10 a.m. on April 4, the first, which lasted three minutes, being the severest. In all eleven shocks were felt. Every house in the city more or less injured. Several small landslips occurred, and many casualties reported. This is the fourth severe earthquake that has happened at Mussooree, and the second worst as regards its effects. Four or five slight shocks were felt during the night of April 4–5.

Simla.—Much damage done to buildings. The Viceregal Lodge is so badly damaged that the re-building will occupy several months. Other estate houses have been seriously damaged. *Delhi.*—The shock was severely felt, and damage was done to buildings, but no reports of injury to monuments. A further shock occurred at midnight on April 4–5. *Agra.*—A violent shock lasting several minutes, and travelling from west to east, was experienced at 6.10 a.m. No reports of injury to architectural monuments.

Jalandhar.—Much damage done. *Amritsar.*—Extensive damage, and several lives lost. *Ambala.*—A large number of houses thrown down. *Srinager.*—Much damage, and several lives lost. *Mudki.*—Serious damage. *Sialkot.*—Not a house escaped damage of some sort, but no lives lost. *Dalhousie.*—Property damaged, but no deaths. *Kashmir.*—Communication interrupted by landslips and accidents to telegraph lines.

Slight tremors appear to have been recorded at Calcutta and Bombay, but no decided disturbance was felt.

PROF. PIETRO TACCHINI.

THE death of Prof. P. Tacchini on March 24, at the age of sixty-seven years, has caused much regret among men of science interested in celestial and terrestrial physics. Italy has thus lost a representative man of science who especially devoted himself to the cause of astronomy with zeal and patience. For many years, as director of the Observatory of the Collegio Romano, he proved himself an indefatigable observer of planets and comets; but recently this position has been filled by Prof. Millosewich, and Prof. Tacchini had been known as the director of the Central Office of Meteorology and Geodynamics. But the especial work with which his name will ever be connected has been upon lines that have long commended themselves to Italian observers. Secchi made his reputation in the domain of spectroscopy and solar observation, and the example he set has been followed with no less eagerness and success by the distinguished astronomer whose death we have now to regret. All that related to sun-spots, faculæ, or protuberances had a fascination for Tacchini, and for years past our columns have borne witness to his continuous devotion to this subject. He was particularly interested in the heliographical distribution of solar phenomena, and every three months, in the pages of the *Mem. degli Spettroscopisti Italiani* or the *Comptes rendus*, he recorded the variations and gave comparative tables showing the growth or decline of solar activity as testified by these outbursts. Researches carried on so long and so industriously cannot but prove of eminent service, and we may well hope that the work he inaugurated will be carried on with equal zeal by his successors. Prof. Tacchini's work in this direction well deserved the Janssen prize which was awarded him by the Paris Academy of Sciences in 1892.

To a solar observer of such ardour, eclipses of the sun especially appealed, and he took part in several expeditions to observe these phenomena. He was present on the Caroline Island reef, where he associated himself with the French party organised by Janssen. Again in Egypt, and later on in 1886, he visited the American continent for the purpose of observing the great eclipse in that year. On this occasion he showed, by comparing the forms and appearances of the prominences seen during the eclipse with the images ordinarily seen in the spectroscope, that it is only the vaporous cores of these objects which are rendered visible by the usual methods of observation. In many other ways he showed not only his skill as a spectroscopist, but his anxiety to promote astronomical knowledge. He laboured long and diligently in the cause of science, and left a reputation that his countrymen will cherish; while his memory will be held in esteem by the astronomers of many nations. He was elected a foreign member of the Royal Society in 1891, and was awarded the Rumford medal of the society. He was also a foreign associate of the Royal Astronomical Society in 1883, and many other societies have been proud to enrol his name among those of their honoured fellows.

The progress of solar physics is largely due to Prof. Tacchini's unremitting labours; and the numerous papers published by him on solar phenomena stand as an enduring monument of work done by a pioneer in a fruitful field of scientific inquiry.

NOTES.

WE are glad to see the report that Lord Kelvin's condition continues to improve. It was stated on Monday that he now takes nourishment fairly well, and that his medical advisers are well satisfied with the progress he is making. It is expected that he will be able to leave his bed in about a fortnight's time.

THE Irish branch of the Geological Survey has been transferred from the Board of Education to the Department of Agriculture and Technical Instruction for Ireland. The work will be carried on under the immediate direction of Prof. G. A. J. Cole.

WE regret to learn that Mr. H. B. Medlicott, F.R.S., formerly director of the Geological Survey of India, 1876–1887, died on April 6, at seventy-six years of age.

AMONG the portraits recently added to the National Portrait Gallery are those of Sir Charles Lyell, painted by Lowes Dickinson, Charles Darwin, and Prof. W. Whewell.

REUTER'S Agency is informed that the Duc d'Orléans has organised a North Polar expedition, which will leave for the Arctic under the Duc's personal leadership next month. For the purposes of the expedition the *Belgica*, the vessel of the recent Belgian Antarctic Expedition, has been secured, together with the services of Lieut. Gerlache, who will again command the ship on the present occasion. The object of the expedition is not to reach the North Pole, and, according to present arrangements, the Duc will not winter in the Arctic, although the *Belgica* will be provisioned for the event of her being closed in by the ice. The expedition will leave Norway probably on May 1 and proceed direct to Franz Josef Land, where it is believed that an attempt will be made to push northwards by way of a new channel. The Duc's staff will include some French men of science and a number of Norwegian sailors.

AT the annual meeting of the Australasian Ornithologists' Union, held at the end of last year, Captain F. W. Hutton, F.R.S., submitted a presidential address dealing with some interesting problems in connection with New Zealand's avifauna. The evidence he has obtained during his years of research leads him to think that the ancestors of many New Zealand birds went south along a land ridge which connected New Zealand with New Caledonia and New Guinea, probably in the early Eocene period. New Zealand ornithologists, Captain Hutton pointed out, have special advantages for studying the effects of the absence of enemies on development, and New Zealand itself offers more examples of degeneration in the wings of birds than does any other country in the world.

PROF. J. MACMILLAN BROWN, of Christchurch, New Zealand, recently paid a visit to the Maoris who live in the fastnesses of the great King country and Urewera country, in the heart of the North Island of New Zealand. He went specially to visit the "Uru-kehu," or red-headed Maoris, who are often seen in those districts. He had previously come to the conclusion that the Maoris' ancestors, in their migrations, crossed with a white race, and he informed a representative of the *Lyttelton Times* that his visit has strengthened his opinion. He states that in one assembly at which he was present at least 25 per cent. of the children had brown, or even flaxen, hair, a complexion which resembled that of the Italians, and fine European features.

DR. W. J. HOLLAND, director of the Carnegie Museum, Pittsburg, has arrived in London for the purpose of superintending the setting-up of the plaster model of the skeleton of the gigantic herbivorous dinosaur *Diplodocus carnegii*, presented by Mr. Andrew Carnegie to the British (Natural History) Museum. The restoration, which is described by the late Mr. J. B. Hatcher in No. 1 of the *Memoirs* of the Carnegie Museum, is mainly based upon two incomplete skeletons discovered respectively in 1899 and 1900 in the Upper Jurassic beds of Sheep Creek, Albany County, Wyoming. As restored, the skeleton is nearly 80 feet in length. Whether this dinosaur is really specifically distinct from the typical *Diplodocus longus* may be a question.

DURING a violent thunderstorm on March 31 the second pyramid of Ghizeh was struck by lightning slightly below the apex of the monument. Several of the immense stones of which the pyramid is built were dislodged and rolled down the sides to the sands below. The storm was the most violent experienced in Egypt for the past fifteen years. This is the first recorded instance of any of the pyramids having been struck by lightning.

IT is announced in *Science* that the first John Fritz gold medal will be conferred upon Lord Kelvin. This medal is awarded by a joint committee of the American Institute of Electrical Engineers, the American Society of Mechanical Engineers, the American Society of Civil Engineers, and the American Institute of Mining Engineers to the man most representative of, and eminent in, scientific advance in the engineering field.

THE following are the lecture arrangements at the Royal Institution after Easter:—Prof. L. C. Miall, three lectures on the study of extinct animals; Sir James Dewar, three lectures on flame; Prof. J. A. Fleming, three lectures on electromagnetic waves (the Tyndall lectures); Prof. H. Marshall Ward, two lectures on moulds and mouldiness; Dr. J. G. Frazer, two lectures on the evolution of the kingship in early society; and Mr. A. H. Savage Landor, two lectures on exploration in the Philippines. The Friday evening meetings will be resumed on May 5, when a discourse will be delivered by Prof. H. E. Armstrong on problems underlying nutrition.

A BRANCH of L'Alliance Française, an association for the spread of the French language, is to be established in London and Paris under the title of "Alliance littéraire, scientifique et artistique Franco-Anglaise." Information as to membership of the new association can be obtained from 186 Boulevard Saint-Germain, Paris. The first *soirée* will take place in London in the course of the present month. The presidents of the association are M. Paul Delombre, previously Minister for Commerce, and M. Pierre Foucin, Inspecteur-Général de l'Instruction publique. Among those who have promised their support to the new society are Lord Avebury, Sir William Crookes, Sir Archibald Geikie, Sir Oliver Lodge, Prof. Meldola, Sir William Ramsay, Sir Henry Roscoe, and Sir William White.

THE *Times* correspondent at Athens reports that the proceedings in connection with the Archæological Congress began on April 7 with a reception at the university, at which the King and the Crown Prince were present. The opening ceremony took place at the Parthenon under the presidency of the Crown Prince, the King and Queen being also present. On April 8 Prof. Lambros delivered an address of welcome, recapitulating the achievements of foreign and Greek research in recent years. The ceremony of inauguration of the Penrose Memorial Library took place on April 8 in the British School. The King and Queen and all the members of the Royal family were

present. After Mr. George Macmillan had given an account of the past history of the school, a marble tablet to the memory of Penrose was unveiled by the Crown Prince, who delivered an address in English. Speeches were then delivered by Mr. Cecil Smith, a former director of the school, M. Homolle, secretary to the congress, who paid an eloquent tribute to the amiable and noble character of Penrose, as well as to his great scientific attainments, and by Profs. Conze, Wheeler, Waldstein, and Bosanquet (director of the school). The various sections of the congress met for the reception and discussion of papers on April 9 and 10.

A MEETING of the Association of Economic Entomologists will be held at Birmingham on April 19 and 20, in the large medical theatre of the university. The president of the association is Mr. F. V. Theobald, and the secretary Mr. W. E. Collinge, University of Birmingham.

THE London Geological Field Class, conducted by Prof. H. G. Seeley, F.R.S., will begin its twentieth year's season on Saturday, April 29, with a visit to the north downs at Betchworth. The field class, which is carried on continuously on the Saturday afternoons in May, June and July, affords practical teaching in geology by studying direct from nature the structure and modes of occurrence of the rocks in the basin of the Thames and adjacent country. Further particulars may be obtained from the secretary, Mr. J. W. Jarvis, St. Mark's College, Chelsea, S.W.

AT the annual meeting of the Iron and Steel Institute, to be held on May 11 and 12, the Bessemer gold medal for 1905 will be presented to Prof. J. O. Arnold. The awards of the Andrew Carnegie gold medal and research scholarships will be announced; and the president, Mr. R. A. Hadfield, will deliver his inaugural address. The following is a list of papers that are expected to be submitted:—experiments on the fusibility of blast furnace slags, Dr. O. Boudouard; recent developments of the Bertrand-Thiel process, Mr. J. H. Darby and Mr. G. Hatton; the application of dry-air blast to the manufacture of iron, Mr. James Gayley; the effect produced by liquid air temperature on the mechanical and other properties of iron, Mr. R. A. Hadfield; the cleaning of blast furnace gas, Mr. Axel Sahlin; the failure of an iron plate through fatigue, Mr. S. A. Houghton; the continuous steel-making process in fixed open-hearth furnaces, Mr. S. Surzycki; accidents due to the asphyxiation of blast furnace workmen, Mr. B. H. Thwaite; and the behaviour of the sulphur in coke in the blast furnace, Prof. F. Wüst and Mr. P. Wolff.

REUTER'S correspondent at Rome reports that the draft scheme for the organisation of the International Agricultural Institute, which will be considered by the conference to be held in May, is as follows:—(1) The constitution and organisation of the institute. (2) Functions of the institute:—(*a*) To report periodically information concerning agricultural production, the conditions of labour in rural districts, and the diseases of plants and live stock. (*b*) To facilitate the organisation and working of cooperation between the rural communities of different countries, and to provide insurance and banking facilities for the benefit of agriculture. (*c*) To propose on its own initiative or at the invitation of Governments interested, international measures and institutions for the protection of the common interests of the agriculturists of all countries, and at the same time to consider the resolutions passed by international congresses on agriculture. (*d*) To exercise other functions which are already exercised by the great agricultural associations, which the institute could discharge independently of the action of the different Governments. (3) The financial resources of the institute.

IN the House of Commons on April 5 Sir W. Palmer asked the President of the Board of Agriculture whether his attention has been directed to experiments which have been carried on in America with a view to the propagation and use upon the land of nitrogen-producing bacteria; whether he is aware that certain rights relating to the method of preparation of these bacteria are the property of the United States Government, and that that Government is distributing packets of these bacteria free of charge to any farmers who apply for them, and that the result of such distribution has been beneficial for farming; and, if so, could he say whether any rights relating to the preparation of these nitrogen-producing bacteria prevent His Majesty's Government from adopting a similar course; and, if not, whether he is prepared to recommend that a similar free distribution be adopted in this country. In reply, Mr. Fellowes remarked that some articles on the subject have appeared in the Board's monthly journal. Experiments as to the value of nitrogen-producing bacteria are now being carried out under the auspices of the Board by several of the agricultural colleges in this country, and so soon as the results are known the Board will consider what further action in the matter can be taken in the interest of British agriculturists. The process of producing and cultivating the bacteria has been patented by the United States Department of Agriculture, but it appears that the department does not propose indefinitely to continue its gratuitous distribution. There appears to be nothing to prevent the manufacture and sale of the material in this country.

ACCORDING to the report of the Australian Museum, Sydney, for 1903–4, remarkable fluctuations occur in the annual number of visitors. In 1900, for instance, the total was 85,474, in 1901 123,326, in 1902 106,704, and in 1903 118,372. The general condition and progress of the museum appear to be satisfactory.

NO. 3 of the Johns Hopkins University *Circular* for the current year contains an account of observations and experiments with regard to the abnormally elongated form assumed by a considerable percentage of American oysters during the early stages of growth. The author, Mr. O. C. Glaser, concludes that this is due to crowding, and that it is a premature assumption of the normal adult condition. The crowded condition of these prematurely old oysters makes it impossible for them to expand and grow to the normal width, but if removed to a more favourable situation they quickly assume the ordinary shape.

THE second portion of the article by Mr. F. Voss in part iii. of vol. lxxviii. of the *Zeitschrift für wissenschaftliche Zoologie*, on the thorax of the house-cricket, with especial reference to the articulation of the wings and their movements, and thus to the mechanics of insect flight in general, is devoted to the musculature, and is illustrated with several diagrams and text figures. The other article in the same issue, by Mr. F. Fuhrmann, of Gratz, is devoted to the history of the adrenal bodies of the guinea-pig. The internal tissue of these organs is subject to very rapid *post-mortem* degeneration, so that the investigation is one of considerable difficulty.

ACCORDING to its report for the past year, the Rugby School Natural History Society continues to do steady work, and its permanent collections are making satisfactory progress. During the year two important additions

have been made by gifts to the museum, namely, a collection of British butterflies and one of birds' eggs, the latter including many rare specimens. The conservatory, containing the greater part of the vivarium, has been rebuilt, and a new case is in course of construction for the geological collection. On the other hand, the secretary deplores the lack of interest in microscopy, and also the few competitors for prizes.

IN the report of the Northumberland Sea Fisheries on the scientific investigations conducted in 1904, it is stated that there has been a decided decrease in the number of flat fish, especially plaice, in Cambois Bay, although in this respect the other stations do not depart materially from the satisfactory results of the last few years. A number of flat fish, chiefly dabs, were marked and returned to the sea. Those re-captured apparently indicate that plaice do not usually leave the inshore waters until they are approaching maturity (four or five years old), but that dabs show a separation of the sexes, the females remaining near the shore while the males migrate to deeper water twenty or thirty miles to the south. Legislation for the protection of lobsters does not work well, as the fishermen are in the habit of stripping and selling the "berried" females instead of returning them to the sea.

IN the first part of vol. xxxiii. of Gegenbaur's *Morphologisches Jahrbuch* is continued Dr. A. Fleischmann's article on the skull of the Amniota, Dr. O. Hofmann contributing a section on the structure of the roof of the mouth-cavity in lizards. The second article, by Dr. H. Adolphe, is devoted to a discussion of the variation in the human sternum and vertebral column, more especially as regards the number of vertebræ which may bear ribs and which may enter into the composition of the sacrum. After referring to analogous variations in apes and monkeys, the author considers that there is no evidence that any of the earlier mammals had eight cervical vertebræ. In the third article Mr. W. M. Smallwood records some observations on the chromosome vesicles developed in the earlier stages of nudibranch molluscs.

THE two original articles in *Biologisches Centralblatt* of March 15 are devoted to the subject of ants, Mr. E. Wasmann continuing his account of the origin of slavery among these insects, while Prof. D. H. Forel figures and describes the nests and "fungus-gardens" of certain South American ants. The photographs and notes on which the latter account is based were communicated to the author by Dr. E. Goeldi, director of the museum at Pará. In the case of *Atta sexdens*, it appears that the female has a fungus-garden to herself, in which the eggs are laid; and while this and other large species of the same genus, together with certain kinds of Acromyrmex, make their fungus-gardens in holes in the ground, the smaller *Atta moelleri* constructs them in hollow trees, under leaves, and in such-like situations.

A FURTHER instalment of the account by Mr. B. Fedtschenko of his journey in Central Asia is given in vol. iv., parts vi. and vii., of the *Bulletin du Jardin Imperial Botanique*, St. Petersburg. These letters relate to his wanderings across the Pamir plateau, and he describes the vertical sequence of plant formations observed in the unexplored valley of the Mouskol River.

THE present time, when changes are pending in India in connection with the formation of a department of commerce and industry, is opportune for considering the possibility of changes in allied departments. A pertinent article advocating the establishment of a bureau of forestry as a complement to the Indian Forest Department appears in the *Indian Forester* (January). The duties of the staff would include the preparation of working plans, the institution and supervision of experimental investigations, and the responsibility of regulating the cultivation and supply of forest products.

A *Circular* (vol. ii., No. 24) of the Royal Botanic Gardens, Ceylon, by Mr. R. H. Lock, deals with the varieties of cacao trees existing in the gardens and the experiment station, Peradeniya, and incidentally supplies some interesting information on the colour of the seeds. As a primary division, Criollo varieties having seeds with a thin shell are distinguished from the Forastero varieties with a hard shell. Fruits of the old red type of Criollo were found to contain about 14 per cent. of purple and 80 per cent. of white seeds. Forastero varieties pass from forms of good quality, having well rounded beans of a light colour, to those of a poor quality, in which the beans are flat, purple, and bitter. The proportion of white to purple seeds in a number of pods of one of the best Forastero varieties was 35 per cent. to 63 per cent.

NOS. 1 and 2 of the *Zeitschrift* of the Berlin Gesellschaft für Erdkunde contain a valuable paper by Dr. S. Passarge on the Kalahari region and its significance as a factor in the ethnography of South Africa. The paper discusses the physical and biological conditions of the region, and the distribution of the races of mankind. It is illustrated by a number of excellent maps.

THE most recent addition to the *Abhandlungen* of the Vienna Geographical Society is a paper by Dr. Artur Gavazzi, forming the first or "morphological" part of a monograph on the lakes of the Karst region. The work includes measurements of permanent lakes, fresh-water, brackish, and salt, "periodic lakes," and periodically inundated "poljen." Observations of the micro-plankton and diatoms have been made by Drs. L. Car, A. Forti, and V. Lurgaiolli. Dr. Gavazzi's paper forms an important contribution to our knowledge of an extremely interesting region.

WE have received the report of the Danish Meteorological Institute on the state of the ice in the Arctic seas during 1904. The statistics go to show that the winter of 1903–4 was comparatively mild in that part of the Arctic regions which lies north of the Atlantic Ocean, that during 1904 the East Greenland current supplied the temperate seas with a smaller quantity of polar ice than in a normal year, and that the Labrador current carried more than the average number of icebergs past Newfoundland. It is expected that during 1905 there will be more ice along the coast of East Greenland and in Davis Strait than in 1904, and less off Labrador and Newfoundland.

THE Meteorological Institute of the Netherlands has issued a paper, by M. J. P. van der Stok, continuing and extending M. Phaff's discussion of tidal observations made on board the light-ships on the Netherland coasts. The periodic movements in horizontal and vertical planes, and the progressive movements of the waters, are dealt with separately, and the general result is to support the view set forth by Lord Kelvin in 1878, that the tides of the North Sea would not be materially affected if the Straits of Dover were closed. Further observations, especially off

the English coasts and in the centre of the North Sea, are necessary for the complete investigation of the complex conditions which occur.

AN interesting address was recently delivered to the Royal Meteorological Society (published in its *Journal* for January last) by Mr. C. W. R. Royds, first lieutenant of the National Antarctic vessel *Discovery*. As the observations are now under discussion, he was only able to give a general account of the meteorological conditions of the Antarctic, but entered fully into the arduous labours which were zealously carried out by the whole of the observing staff. The meteorological instruments were set up on the ice on April 17, 1902, in lat. 77° 50′ S., and eye observations were continued until February 15, 1904, at intervals of two hours; between 8h. a.m. and 10h. p.m. they were taken under the superintendence of Mr. Royds, and the night observations were divided between the eleven officers, each taking one night. In addition there were the self-recording instruments; these were managed under great difficulties, and their continuous registration was entirely due to the mechanical skill of Mr. Skelton, as they were frequently choked by blizzards. On these occasions the rain gauge would be buried under three or four feet of snow. The lowest screen temperature recorded in the winter quarters was −59°·5; on the same day at Cape Armitage (1½ miles distant) it was −64°·6; the coldest day at the latter station was −67°·7 (or nearly 100° of frost) on May 16, 1903. The highest black-bulb reading in the sun was 154°, on December 21, 1902. The heaviest gale recorded was 85 miles per hour, by the Robinson anemometer. Throughout the stay in the Antarctic Circle no *rain* was recorded, and fogs were not nearly so prevalent as is generally supposed; day after day clear skies and continuous 24 hours' sunshine were recorded. Speaking of the barometer as an instrument of warning of gales, Mr. Royds states that all faith was lost in it, as they came on without any appreciable sudden change in the motion of the mercury.

THE final report of the Royal Commission on Coal Supplies was recently reviewed at some length in NATURE (February 2, p. 324). The minutes of evidence, the reports on the various districts, and the appendices, on which the commissioners' conclusions were based have now been issued. The district reports contain much information of great value, and it is satisfactory to find that, in order to render them generally accessible, they are issued separately at moderate prices. The contents of the various parts are as follows:—part ii., report of Sir W. T. Lewis on the available coal resources of South Wales and the south of England; part iii., report of Prof. Lapworth and Mr. A. Sopwith on the coal resources of the midlands; part iv., report of Prof. E. Hull, Sir G. J. Armytage, and Mr. A. Strahan on the coal resources of North Wales, Lancashire, and Cheshire; part v., report of Mr. A. Currer Briggs on the coal resources of Yorkshire, Derbyshire, and Nottinghamshire; part vi., report of Sir Lindsay Wood on the coal resources of Northumberland, Durham, and Cumberland; part vii., report of Mr. J. S. Dixon on the coal resources of Scotland; part viii., report of Prof. E. Hull on the coal resources of Ireland; and part ix., report of the geological committee, consisting of Prof. E. Hull, Prof. C. Lapworth, Mr. J. J. H. Teall, and Mr. A. Strahan, on the resources of the concealed and unproved coalfields of the United Kingdom. Part x., which covers 400 pages, contains the minutes of evidence, and part xi. includes a series of appendices of great interest. Among these are an estimate of the future coal output of the United Kingdom, calculated at its average decreasing rate of increase during the last thirty years, by Mr. R. Price-Williams, a report on the colonial and foreign coal resources by Mr. Bennett H. Brough, and a report on deep borings through Secondary rocks by Mr. W. Whitaker. Lastly, part xii. is a supplement containing the plans and diagrams referred to in the evidence. The report on the coal available in concealed unproved areas at depths less than 4000 feet is certainly the most important of this valuable series of documents. Without being over-sanguine, the committee has added 40,000 million tons to the probable coal resources of the kingdom. The coloured geological map of the United Kingdom, on the scale of 25 miles to the inch, accompanying this report, is of particular interest.

THE well known firm of Bausch and Lomb (London agents, Messrs. A. E. Staley and Co.) has brought out an admirable instrument in their "B.B.P. portable microscope." The workmanship is excellent, and in spite of the fact that the stand and accessories are packed away into a case measuring 11·4×7·8×4·6 inches, the instrument is thoroughly serviceable and convenient for use. The base of the stand is made of two diverging bars, which move on the upright column so as to assume a parallel position when ready for packing; but they are well and heavily constructed, and are perfectly rigid when open. The stage is large, and is ingeniously contrived to turn into the plane of the stand when in the case, and when open it is firmly held in its place. The objectives are of the quality which would be expected from a firm with so high a reputation, and the cedar oil for the immersion lens is contained in a metal box, so that there is no danger of breakage or leakage. We think the instrument quite justifies the description given of it as a microscope "capable of being taken out and set up in a few seconds ready for use, giving all the desirable features of the highest grade bacteriological laboratory instrument."

IN the classical researches of Sainte-Claire Deville on dissociation much use was made of the "hot and cold tube" in proving the existence of chemical reactions at high temperatures, the idea being that by suddenly cooling a gaseous system there would not be time for the recombination of the gases, and hence that some clue could be obtained as to the actual composition of the gaseous mixture at the high temperature. The properties of fused quartz have led M. Berthelot to repeat these experiments under different conditions, and an account of the results is given in the *Comptes rendus* for April 3. The substances under examination were enclosed in hermetically sealed quartz tubes, heated for about an hour at 1300° C. to 1400° C., and then suddenly cooled by dropping the tubes into cold water. The cooling in this way was at least as sudden as in Sainte-Claire Deville's experiments, and the whole contents of the tubes could then be examined. The observations were too numerous to be given in detail here, but the whole trend of the results was to show that no dissociation could be detected in cases where from the earlier experiments a positive result would be expected. Oxygen furnished no trace of ozone, and no trace of hydrocarbon could be formed from carbon, in any of its states, with hydrogen. The dissociation of carbon monoxide was practically inappreciable, and in a case of special practical importance, the dissociation of carbon dioxide, and in which two experiments were made, one with slow and the other with instantaneous cooling, no trace of dissociation could be detected.

A BOOKLET on "Pattern Making," by Mr. J. E. Dangerfield, has been added by Messrs. Dawbarn and Ward, Ltd., to their "Home Workers' Series of Practical Handbooks."

A NEW edition of Mr. W. Woods Smyth's "Divine Dual Government" has been published by Messrs. Horace Marshall and Son. The present issue has been revised and illustrated with new matter, some of which has already appeared in earlier books, now out of print, by the same author.

MESSRS. LONGMANS, GREEN AND CO. have published a new edition of "Telegraphy," by Sir W. H. Preece, K.C.B., F.R.S., and Sir J. Sivewright, K.C.M.G. The book has been revised and enlarged, and now includes descriptions of recent devices used in telegraphy, in relation to fast-speed recorders, to automatic and translating apparatus for submarine circuits, to Murray's improvements in the Wheatstone automatic apparatus, and to the new telegraph switching system. A chapter on wireless telegraphy considered theoretically and in its most recent application has been added.

MR. HENRY FROWDE has sent us two pages of the "New English Dictionary on Historical Principles," edited by Dr. J. A. H. Murray, to show how the word refraction and its congeners are defined and traced. The number of references to uses of these words is astonishing; and a vast amount of research must have been necessary to bring so much material together. We extract a few early references of historical interest:—REFRACTING, causing refraction, refractive; 1704, Newton, "Optics" (1721), 4 def. iv., "the perpendicular to the reflecting or refracting surface at the point of incidence"; 1764, Hornsby, in *Phil. Trans.*, liv., 145, "an excellent refracting telescope of 12 feet focus." REFRACTION; 1603, Holland, "Plutarch's Mor.," 1295, "the rainbow is . . . distinguished by sundry colours, by the refraction of our eie-sight against a cloud"; 1646, Sir T. Browne, "Pseud. Ep.," 347, "the colours are made by refraction of light, and the shadows that limit that light"; *Astron.*: 1603, Heydon, "Jud. Astrol.," 137, "there lieth a deceipt or fallacie in the refraction of beams, which cheifly happeneth about the horizon, where the aire is alwaies thickest"; 1669, Sturmy, *Mariner's Mag.*, ii., 118, "the refraction of the sun, moon and stars, causeth them to appear higher above the horizon than they are." REFRACTIVE; 1673, Flamsteed, in Rigaud's "Corr. Sci. Men" (1841), ii., 168, "the refractive air reaches some height above our heads"; *a* 1691, Boyle, "Hist. Air" (1692), 190, "the air . . . was filled with vapours and exhalations, that made it much more refractive than formerly."

OUR ASTRONOMICAL COLUMN.

COMET 1905 *a* (GIACOBINI).—A further extract from Dr. Strömgren's daily ephemeris for comet 1905 *a*, as published in No. 4009 of the *Astronomische Nachrichten*, is given below. A set of elements and an ephemeris similar to those obtained by Dr. Strömgren have been computed at the U.S. Naval Observatory, from observations made on March 26, 27, and 28, and are published in the same journal.

Ephemeris 12h. (Berlin M.T.).

1905	α	δ	log *r*	log Δ	Brightness
	h. m. s.	° ′			
April 15 ...	7 8 22 ...	+33 47·9 ...	0·0590 ...	9·8855 ...	0·87
17 ...	7 18 24 ...	+35 38·6			
19 ...	7 28 42 ...	+37 22·7 ...	0·0638 ...	9·8988 ...	0·80
21 ...	7 39 16 ...	+35 59·8			
23 ...	7 50 6 ...	+40 29·8 ...	0·0699 ...	9·9139 ...	0·73

Brightness at time of discovery (March 26) = 1·0.

The following magnitudes have been estimated by various observers at the times named:—

	h. m.		mag.
March 28 ...	7 59·6	(Geneva M.T.) ...	11·5
29 ...	8 28·2	(Vienna ,,) ...	13·0
April 1 ...	9 6·3	(Bamberg ,,) ...	11·0

On the last mentioned date Prof. Hartwig found that the comet was circular, about 3′ in diameter, and had a scattered nucleus.

VARIABILITY OF A MINOR PLANET.—A telegram from Prof. Pickering, published in No. 4009 of the *Astronomische Nachrichten*, announces that Prof. Wendell has discovered a variation of 0·5 magnitude in the brightness of the minor planet (15) Eunomia.

This is one of the asteroids situated at an intermediate distance from the sun, and having a revolution period of 1570 days.

VISUAL OBSERVATION OF JUPITER'S SIXTH SATELLITE.—A further visual observation of Jupiter's sixth satellite has been made at the U.S. Naval Observatory with the 26-inch refractor.

Observing on January 8, Mr. Hammond made a search for the recently discovered satellite in the position computed from the Lick photographs, and there found a very faint object, which, from its movement in relation to a neighbouring star, proved to be the object sought.

REAL PATH OF A BRIGHT METEOR.—From a large number of observations made in south-west Germany, Herr H. Rosenberg has calculated the real path of an exceptionally bright meteor which was seen at 8h. 22m. (central European time) on March 21, 1904, and emitted about one-quarter of the light given by the moon at full.

After giving the details of the times and places of the various observations, he deduces the following values for the actual path of the object. Length of path 385 km., duration of flight about 9 seconds, mean velocity 42·8 km. per second, mean velocity relative to the earth 41·4 km. per second. The average absolute height of the path above the earth's surface was about 30 km. Other deductions are made concerning the actual size, brightness, parabolic velocity in space and actual path, and the following value is obtained for the radiant point:—long. = 23° 8′, lat. = +9° 10′ (*Astronomische Nachrichten*, No. 4008).

A NEW 24-INCH REFLECTOR AT HARVARD.—In No. 93 of the Harvard College Observatory *Circulars* Prof. E. C. Pickering announces that the construction of the new 24-inch reflector—one of the chief acquisitions with the Anonymous Fund of 1902—is now so far advanced that the instrument may be used for visual observations. The mirror was made by Messrs. Alvan Clark and Sons, and the mounting has been designed and constructed in the observatory workshop.

Magnitude observations of three of the variable stars discovered by Miss Leavitt near the Orion nebula have been made with this instrument, and their variability confirmed, by Mr. L. Campbell, and the results are set out in detail in the *Circular*.

STARS WITH VARIABLE RADIAL VELOCITIES.—A list of nine spectroscopic binaries discovered with the Mills spectrograph, in addition to the forty-eight previously announced, is given in No. 70 of the Lick Observatory *Bulletins*. Amongst them we find α Andromedæ, which was announced as a binary by Mr. Slipher in 1904, and which the Lick spectrograms show to have a negative radial velocity varying from 2 km. (October 5, 1903) to 36 km. (November 30, 1903). ζ Ceti has a small but undoubtedly real variation, whilst γ Geminorum shows a variation from −17 km. (on October 24, 1899) to −4·7 km. (on January 27, 1904). Twenty-five spectrograms of the brighter component of Castor, α^2 Geminorum, indicate a variation of about 26 km. in the radial velocity. Applying the values determined to Prof. Doberck's orbit of Castor, a preliminary value of 0″·05 is found for the parallax of this star; but this has not very great weight, owing to the uncertainty in the elements of the visual system. η Böotis with a period of several years, ξ Serpentis with a probably short period, ζ Lyræ, τ Sagittarii, and 71 Aquilæ are the other stars for which variable radial velocities have been discovered.

NORTH AFRICAN PETROGLYPHS.

M. E. F. GAUTIER has published in *l'Anthropologie* (xv., 1904, p. 497) an illustrated account of a recent find of rock carvings in the ravine of Zenaga, between Figuig and Beni-Ounif, in Sahara. The drawings are in deep outline and of large size, sometimes life-size, and their antiquity is established by the patina in the cuts being as pronounced as that on the surface, and by the fact that some of the animals represented, such as the elephant, no longer exist there, while others, like the buffalo, are now extinct. In Fig. 1 we have two recognisable portraits of *Bubalus antiquus* and one of an elephant. Several South Oranais petroglyphs represent a ram or goat with a spheroid on its head, provided with projecting appendages (Fig. 2). It is suggested that the spheroid is a solar disc flanked on each side by a snake (*uraeus*), and this would be a representation of the great god Ammon, of Thebes. If this be so, the question arises, did the inspiration of the South Oranais engraving come from Egypt, or had the god Ammon a Libyan origin? The goat (*Ovis longipes*) of Zenaga differs in some details from those of Bou-Alem, and the "solar disc" is provided with rays. The other drawings of this problematic design were exhibited at the International Congress of Anthropology of 1900, and gave rise to a long discussion.

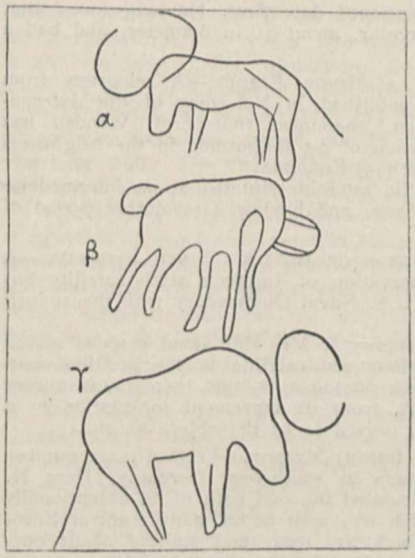

FIG. 1.—Rock carvings from Zenaga. Dimensions from the furthest point of the horns to the end of the body. α, 43 cm.; β, 39 cm.; γ, 53 cm.

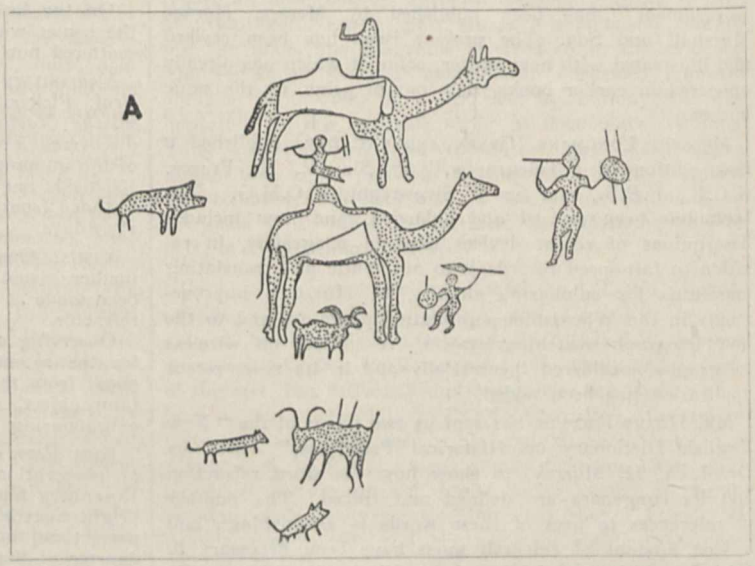

FIG. 3.—Touareg rock carving. Total height of the space occupied by the people.

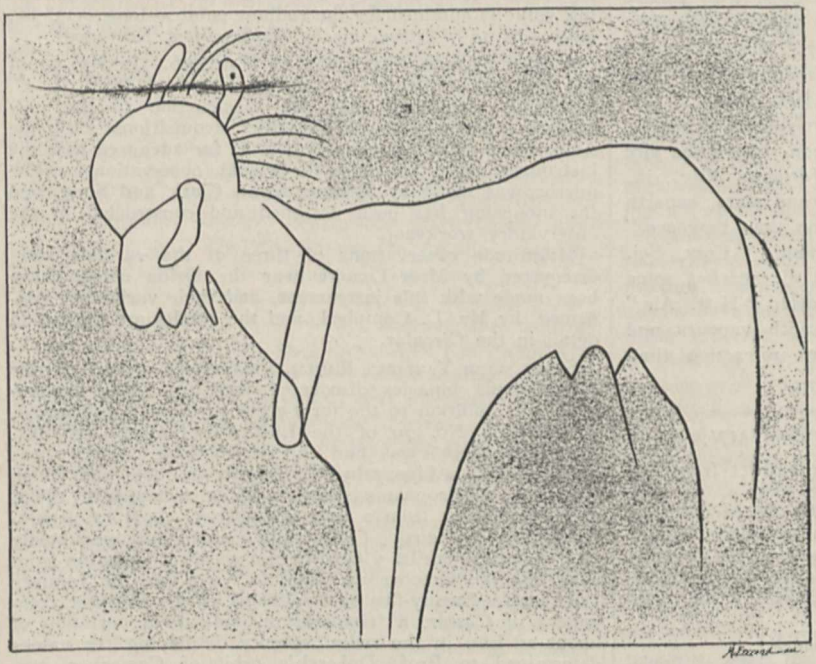

FIG. 2.—Rock carving from Zenaga. Dimension, 1 metre from the head to the tail. All the part of the design left white is carefully polished in the original.

Rock carvings of a very different character were discovered by the author in the Touareg (Tawarek) country on the first slopes of the Hoggar (Ahaggar) massif, 200–300 kilometres south of In Salah. Some are scribblings in which animals and men are represented diagrammatically, and with these inscriptions are associated. M. Flamand some time ago described entirely similar graffiti in South Oranais which he identified as "Libyco-berbères." The greater part of the figures in this paper illustrate engravings of a very different character, and are far less ancient than those just referred to, for the animals represented are forms that still exist there. The presence of the camel is very significant, since it is generally admitted that it was only introduced, or re-introduced, into north-west Africa in the first centuries of our era, and appears to have been abundant there about the period of Justinian. Other animals represented are the horse, ass, cattle, goat, moufflon, gazelle, dog, ostrich, &c. The engraved portions differ in their colour markedly from the rest of the rock, and lack patina. From their appearance, these petroglyphs may be recent, but it has been denied that they have any relation with the Touaregs. Direct evidence is afforded by the representations of men instead

of the square shield, very long spear, and sword of the present inhabitants. These men are provided (Fig. 3) with a small round shield and three javelins, thus proving that they are "Libyco-berber" productions.

A. C. H.

THE MINERAL RESOURCES OF CANADA.

THE publications of the Geological Survey of Canada have long been characterised by the want of promptness of publication. This defect is, however, to a large extent removed by the new departure made by the section of mines under the direction of Mr. E. D. Ingall. It consists in issuing a series of bulletins, giving in condensed and popular form information regarding the mineral resources of the Dominion, together with particulars of similar occurrences in other countries, which may be of use to mining engineers in Canada. We have received thirteen of these bulletins, and from the information given it is evident that the mineral resources of the Dominion are of a most varied character, and that the mineral industry is in a healthy condition. The subjects dealt with are platinum, coal, asbestos, infusorial earth, manganese, salt, zinc, mica, molybdenum and tungsten, graphite, peat, apatite, and copper.

So far the production of platinum has been obtained from placer workings on the Similkameen river in British Columbia. At Sudbury, Ontario, it is found *in situ* in combination with arsenic and associated with the nickeliferous pyrrhotite deposits. The yield of platinum in Canada has been falling off for some years past and is now insignificant.

The bulletin on coal covers sixty-four pages, and contains a collection of analyses of typical coals and a valuable bibliography of the subject. In 1902 the output of coal in Canada exceeded seven million tons. The principal areas at present worked are the Nova Scotia coalfields with rocks of Carboniferous age, and the Cretaceous coalfields of Vancouver island, and of the Crow's Nest Pass, British Columbia. Anthracite is mined in Alberta, and lignite is mined in the Souris river district, Assiniboia, and in the Yukon district.

The asbestos industry of Canada is of considerable importance, the production having increased from 380 tons in 1880 to 40,000 tons in 1902. Canada now furnishes about 88 per cent. of the world's supply. The deposits are found in serpentine. In 1896 the manufacture of asbestic was begun. This is a finely-ground serpentine in which there is a small amount of very fine fibre disseminated, and the resulting product is specially adapted for fine plaster for walls and interior decoration. Its value per ton is low, but as its preparation involves little extra expense, it is claimed that a profit results from its manufacture.

Infusorial earth was produced in Canada in 1902 to the amount of 1000 tons, valued at 3300*l*. It is mined at Bass river lake, and St. Ann's, Nova Scotia, and is sold chiefly in the United States. The uses to which it is put are varied. Formerly it was largely used in the manufacture of dynamite, but it has now been replaced by cheaper absorbents, such as wood pulp. It is now chiefly used as a polishing material and as a boiler covering. It can also be used in the manufacture of bricks when great lightness is required.

Although Canada has not yet taken a prominent place among the manganese-producing countries of the world, this is not due to lack of deposits of the ore. The extent of the production depends on the development of steel manufacture, and, as Canada is now making great strides in this direction, its deposits will probably soon assume greater importance. The ores represented comprise pyrolusite, manganite, psilomelane, and wad, and as some of the Canadian deposits contain a large proportion of the first-named mineral, the ore is specially adapted for chemical manufacture.

At present Ontario is the only province producing salt, the output in 1902 having been 64,000 tons. The country's chief resources consist of the rock salt beds underlying some 2500 square miles on the eastern shores of Lake Huron. The amount of salt imported into Canada is at present double the amount produced in the country, owing to the fact that salt is produced more cheaply in England, whence the bulk of the imports come.

In eastern Canada mica occurs in large and important deposits, the mining industry being chiefly confined to the provinces of Ontario and Quebec. The merchantable mica is always associated with intrusive masses and dykes of pegmatite-granite and pyroxene, which cut the gneiss and crystalline limestone. The mica produced is chiefly used for electrical purposes.

Apatite is widely distributed in Canada in deposits in the crystalline rocks, and in fossiliferous strata of Cambrian age. In 1889 the province of Ontario produced as much as 3547 tons, but since then, owing to the competition of the cheaply mined phosphates of Carolina, the output has rapidly decreased. Graphite is widely distributed in the gneiss and crystalline limestones of Canada, the output in 1901 having been 2210 tons. Zinc ore is produced at one mine in Olden township, Ontario. The ores of molybdenum and tungsten are of frequent occurrence in Canada. Copper ores have been known in eastern Canada for nearly a century, and large amounts of capital have been expended in developing what appeared to be promising localities, but little economic success has as yet resulted.

The Canadian peat resources are dealt with by Dr. R. Chalmers in a bulletin of forty pages. The peat bogs in the eastern provinces are attracting attention in view of the depletion of the forests and the increasing prices of coal, and attempts are being made, in many cases with poor success, to utilise them in the production of fuel, coke, and moss-litter.

In connection with this valuable series of bulletins of the Geological Survey, reference may be made to a memoir in the *Ottawa Naturalist* on the marl deposits in Ontario, Quebec, New Brunswick, and Nova Scotia, by Dr. R. W. Ells, the author of most of the bulletins mentioned. The chief value attributed to this shell-marl was supposed to be confined to its use as a fertiliser for soils deficient in calcareous matter. Recently it has been found to be specially adapted for the manufacture of the best grades of Portland cement, when mixed with a proper proportion of clay; and large manufacturing establishments have been established at several points, more especially in the province of Ontario.

The latest publication of the Geological Survey of Canada is an exhaustive report by Dr. A. E. Barlow on the origin, geological relations, and composition of the immense nickel and copper ore deposits of Sudbury, Ontario. Details of the mining, smelting, and refining methods are given, and reference is made to the character and extent of all the more important nickel ore deposits in other countries. With a production of 6253 tons of metallic nickel in 1903, valued at 5,002,204 dollars, Sudbury is the largest producer of nickel in the world; and this monograph of 236 pages, with numerous plates and maps, summarises all the previous original investigations and supplies the most detailed and accurate information regarding these important deposits yet available.

THE ROYAL HORTICULTURAL SOCIETY.[1]

THE history of the Royal Horticultural Society has been chequered to an extent probably exceeding that of any other society. At one time fashionable, it enjoyed a fictitious prosperity. We say fictitious, for horticulture, especially scientific horticulture, was neglected, and, as a consequence, the wave or waves—for there were several—of prosperity broke on the shores of adversity, with the result that the gardens were curtailed, the expenditure was reduced in all directions, the valuable collections were sold or destroyed, the herbarium and the library were dispersed.

It is, however, not our purpose now to dwell on ancient history, but rather to point out the satisfactory progress in recent years of which the journal before us affords evidence. Some foreshadowings of that progress date back to the year 1866, when an international horticultural exhibition on a very large scale was held on the ground where the Natural History Museum now stands. The exhibition itself differed from others mainly in its extent and in the larger participation of foreign exhibitors. It was organised and managed, not by the society, the financial position of which at that time precluded it from embarking on such an enterprise, but by a special committee presided over by the late Sir Wentworth Dilke, to whose organising faculty and strenuous labour the success obtained was largely due.

[1] The *Journal* of the Royal Horticultural Society, vol. xxix., parts i., ii., and iii.

If this exhibition had been merely a flower-show on a gigantic scale there would have been little or no need to advert to it in these columns. But associated with it was a botanical congress attended by many of the chief European notabilities, and presided over by the late Alphonse de Candolle. The results of their discussions were recorded in a report of proceedings which still forms a most valuable document. Copies are now rarely met with, although they were distributed widely among foreign and British botanical libraries.

We have a special reason for alluding to this nearly forgotten congress, because it may be looked on as the progenitor of two important events in the modern history of the Royal Horticultural Society. A large surplus was eventually derived from the exhibition, and this surplus was devoted to the publication of the proceedings before mentioned, to charitable purposes, and to the purchase of the valuable library of the late Dr. Lindley. This library was placed in the hands of trustees for the benefit, primarily, of the fellows of the Royal Horticultural Society, and, under certain regulations, of the general public also. In this way the society once more became possessed of an extensive library, which cannot be alienated if evil days should again arise. It is now, after various vicissitudes, fittingly installed, at the expense of Baron Sir Henry Schröder, in the new building erected for the society in Vincent Square, Westminster.

Thus has been accomplished one result of the congress of 1866. Another consequence of that meeting was the formation of a scientific committee under the presidency of Sir Joseph Hooker, which has endeavoured so far as circumstances permitted to carry out the objects formulated in M. de Candolle's presidential address. The early days of the committee, when such men as Sir Joseph Hooker, Mr. Berkeley, Prof. Westwood, Mr. Wilson Saunders, Colonel Clarke, Mr. Andrew Murray, Sir William, then Mr., Thiselton-Dyer, and other naturalists took part in the discussions, remain as a pleasant memory. The Rev. Prof. Henslow, who acted as secretary for the last quarter of a century, has only lately relinquished his office. The committee still includes a body of experts in many departments of horticulture and natural history generally.

We have alluded to the new building, to the erection of which Baron Schröder has magnificently contributed, whilst others have not been backward. Much, however, remains to be done, and until the existing debt is cancelled not much in the way of scientific experiment or research can be effected. The society has been exceptionally fortunate in its centenary year. Not only has it secured a fine hall for exhibition purposes, together with commodious offices and accommodation for the library, but through the generosity of Sir Thomas Hanbury it has come into possession of the late Mr. G. F. Wilson's interesting garden at Wisley, near Weybridge.

The old garden at Chiswick, the value of the services of which in the past is beyond compute, has been abandoned, soil and climate no longer being propitious for gardening operations. The cultural trials hitherto carried out at Chiswick will henceforth be conducted at Wisley, and there is every reason to hope that in a short time a research station under a competent director may be established, and thus a great and pressing need may be supplied.

This is rather a long preface to the notice of the *Journal*, but we hope it will not be thought irrelevant. The necessity for a journal to link together all the otherwise separate departments of the society has always been recognised, but in the evil days aforementioned the publication was often spasmodic and irregular. Since the appointment of the Rev. W. Wilks as secretary, and under the steady impulse of the president, Sir Trevor Lawrence, a great improvement all round has been manifested, and in no way more remarkably then in the contents and regularity of issue of the journal. So marked is the improvement that it has become too much for the digestion of some people, and some of the fellows are crying out, not for more, but for a more limited supply.

Our notice has extended to such a length that we can only indicate some of the contents other than those relating merely to practical cultivation; such are Dr. Cooke's article on the fungous pests of the shrubbery, with coloured illustrations; on the heredity of acquired characters, by Prof. Henslow; gooseberry mildew, by Mr. Salmon; diseases of Calanthes, by Mr. Bidgood; note on electric heating, by Mr. Rogers; diseases of the potato, by Mr. Massee; Indian primulas, by Sir George Watt; and a large number of other communications which tend to show that the scientific side of horticulture is not neglected. The abstracts from botanical and horticultural literature which have of late formed so important a feature of the *Journal* are omitted from the present part, possibly because so much space has, not unnaturally, been devoted to the proceedings in connection with the centenary celebration and the formal opening of the new hall by H.M. the King.

The interests of the commercial side of horticulture, however great their importance, can very well be left to take care of themselves. Nevertheless, the cultivators may well look to the society for light and guidance in such matters as cucumber spot, and the many diseases which so very seriously affect their business prosperity. Progressive horticulture looks to the society to investigate outstanding problems, open out new paths, and generally to acquire and diffuse useful knowledge. Even if not immediately useful, such knowledge is sure eventually to be of advantage even to the "practical man." With a research station at Wisley, a competent director, a sympathetic scientific committee to direct and advise, and an energetic secretary, the society may on entering its second centenary look forward to being able to advance scientific horticulture in a more thorough manner than it has ever done before.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

THE *Pioneer Mail* states that a gentleman of Nagpur has bequeathed a sum of fifty thousand rupees to the Central Hindu College, Benares.

AT the spring graduation ceremony of the University of Edinburgh on April 7 the honorary degree of LL.D. was conferred upon Prof. W. W. Cheyne, C.B., F.R.S., Dr. J. H. Jackson, F.R.S., Dr. A. D. Waller, F.R.S., Sir Frank E. Younghusband, and Prof. G. A. Gibson.

THE Catholic University of America will receive, says *Science*, a bequest of 20,000*l.* from Miss Helen Tyler Gardiner. We learn from the same source that Mr. Andrew Carnegie has agreed to give a 10,000*l.* library to the Washington and Lee University on condition that the university raises an endowment of 10,000*l.* for maintaining it.

THE *Glasgow Herald* announces that by the will of the late Mr. Donald the sum of 20,000*l.* is bequeathed to the Glasgow and West of Scotland Technical College, to be paid on the death of Mrs. Donald. After various other bequests have been made, the residue of the estate is to go to the governors of the Glasgow and West of Scotland Technical College for purposes specified in the trust disposition and settlement.

THE committee of the Privy Council has decided to recommend the King to grant a Charter incorporating a university in Sheffield. A large sum of money has already been given or promised for the endowment of the university, and, in addition, the city council has pledged the city to the gift annually of a sum equal to the proceeds of a rate of 1*d.* in the pound (the capitalised value of which gift is 200,000*l.*). The draft Charter of the proposed university provides for the establishment of a teaching university with powers to grant degrees in the faculties of arts, science, technology, and medicine.

THE articles of agreement under which it is proposed to combine the Massachusetts Institute of Technology and Harvard University have been made public. Provision is made for a joint school of industrial science, to be known under the present name of the Institute of Technology, to be governed by an executive board of nine members, of which three shall represent Harvard, and to be maintained by present institute funds, augmented by the income of all funds of the Lawrence Scientific School, by three-fifths of the net income which may accrue from the Gordon McKay bequest, amounting to several millions, and by the income of all property which Harvard may hereafter acquire for the promotion of instruction in industrial science.

THE new regulations recently issued by the War Office, under which commissions in the Army may be obtained by university candidates, provide that commissions shall be allotted each half-year to the University of London. To satisfy the requirements of the regulations, the Senate has appointed a nomination board for military commissions which will nominate qualified students for commissions, and arrangements have been made for the instruction of candidates in military subjects. To be eligible for a commission, a candidate must have graduated as an internal student, and this involves three years' study at one or more of the schools of the university. Before a student can be nominated for a commission he must, as a rule, have attended the various courses of instruction in military subjects in the university, and he must have been attached for two periods of six weeks, or for one period of twelve weeks, to a regular unit. Courses of lectures in military subjects are being given at the University of London by Colonel H. A. Sawyer, P.S.C., and Lieut.-Colonel F. N. Maude, P.S.C., late R.E.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, February 23.—"Two Cases of Trichromic Vision." By Dr. F. W. **Edridge-Green.** Communicated by Dr. F. W. Mott, F.R.S.

One case (Prof. J. J. Thomson) sees only three colours in the bright spectrum—red, green, and violet. He can distinguish nothing of the nature of pure yellow, like the sensation given him by the sodium flame, in the spectrum. There is no definite colour to him at the portion of the spectrum where the normal sighted see pure blue. Reddish-green would describe the orange and yellow regions and greenish-violet the blue. λ 5950 (orange-yellow) is the point which differs most from red and green. There was no shortening of either end of the spectrum.

Difference of Hue Perception.—The author then tested him with his apparatus for ascertaining the size of different parts of the spectrum which appear monochromatic, and found him defective in distinguishing differences of hue.

Colour Mixtures.—Tested with Rayleigh's apparatus for matching spectral yellow by a mixture of red and green, the mixed colour of his match always appeared green to the author.

Classification Test.—Only a few colours were selected in each case. On being asked to pick out all the yellows he chose those with orange in them. He had considerable difficulty in matching the colours. In common with the cases previously observed, the effects of simultaneous contrast were much more marked than in the normal sighted. Two wools changed colour to him on being contrasted, when no change was evident to the author.

Lantern Test.—He correctly named the red, green, and violet with and without the neutral glasses, and saw them at the normal distance. He had difficulty with yellow and blue. He called pure yellow "greenish yellow."

The other case is that of Mr. P. S. Barlow, a research student in the Cavendish Laboratory, and was similar in most respects to the above.

The author uses the term trichromic as a statement of the fact that persons having this vision see only three colours in the bright spectrum, whilst the normal sighted see six, and may, therefore, be designated hexachromic. It is probable that the appearance of the bright spectrum to the trichromic is very similar to that of a spectrum of feeble luminosity to the normal sighted, in which only three colours—red, green, and violet—are seen. The defective difference perception which is found in these cases accounts for most of the facts. Both these cases are bordering on the tetrachromic, as the sodium flame appears to give rise to a distinct sensation.

March 2.—"Atmospheric Electricity in High Latitudes." By George C. **Simpson,** B.Sc. Communicated by Arthur Schuster, F.R.S.

This paper is an account of a year's work on atmospheric electricity undertaken at Karasjok, Norway, from October, 1903, to October, 1904, with the results of a month's observations on atmospheric radio-activity made at Hammerfest.

Karasjok is situated well within the Arctic Circle (69° 17′ N.), and during the winter has a severe Arctic climate, so that it is well situated for finding the influence of meteorological elements and the presence or absence of direct sunlight on the electrical conditions of the atmosphere.

The observations were limited to determinations of the potential gradient, electrical dissipation, atmospheric ionisation, and atmospheric radio-activity. A continuous record of the potential gradient was obtained by means of a Benndorf self-registering electrometer, and measurements of the dissipation and ionisation were made three times each day unless the weather made it impossible to use the instruments. Measurements of the radio-activity were made between the hours of 10 to 12 a.m., 3 to 5 p.m., and 8.30 to 10.30 p.m. on 253 days, and in addition 42 measurements were made between 3 and 5 a.m. The results of the work are shortly as follows:—

YEARLY VARIATION.—*Potential Gradient.*—The yearly course was found to be in accordance with the general rule for the northern hemisphere—rising rapidly from October to February, when it reaches a maximum, then falling more rapidly until the end of May, after which it remains constant until the winter sets in again during October. *Dissipation.*—The yearly course is exactly opposite to that of the potential gradient, the curves representing the two being almost mirror images of one another. *Ionisation.*—The course of the ionisation consists of a nearly linear six months' fall from the beginning of September to the end of February, followed by a similar six months' rise from March to the end of August.

DAILY VARIATION.—*Potential Gradient.*—The daily course for the whole year consists of a single period having a minimum about 5 a.m. and a maximum about 9 p.m. *Dissipation.*—For the whole year the dissipation is slightly higher at midday than earlier in the morning, while the evening observations show the lowest dissipation of the three. *Ionisation.*—The daily period of the ionisation is not so pronounced as that of the dissipation, but the ionisation is slightly lower in the evening than in the morning or at midday during the whole year.

RELATION BETWEEN THE METEOROLOGICAL AND ELECTRICAL CONDITIONS OF THE ATMOSPHERE.—*Wind.*—As is to be expected, the dissipation increases greatly with the wind strength. *Temperature.*—Both the ionisation and dissipation become much less as the temperature goes down. With temperatures between 10° C. and 15° C. the dissipation is 4·95 per cent. and the ionisation 0·44 per cent., while with temperatures below −20° C. these become 0·83 per cent. and 0·17 per cent. respectively. The potential gradient increases as the temperature falls. *Relative Humidity.*—With rising relative humidity the dissipation falls rapidly, and the ratio of negative to positive dissipation increases. When the whole year is taken into account, the same result is found for the ionisation; but for the winter and summer six months, taken separately, the effect of the humidity of the air on the ionisation is not apparent.

INTERRELATION OF ELECTRICAL FACTORS.—Both the dissipation and ionisation greatly influence the potential gradient. Low values of ionisation and dissipation are accompanied by high values of the potential gradient, and *vice versâ*. The dissipation increases with the ionisation.

THE AURORA AND THE ELECTRICAL CONDITION OF THE ATMOSPHERE.—No relation whatever could be detected between the aurora and the electrical conditions of the atmosphere. The most careful watching of the electrometer needle revealed no variation of the potential gradient with variations of the aurora.

RADIO-ACTIVITY.—Measurements of the radio-activity were made by Elster and Geitel's method, and their arbitrary unit was used in expressing the results. A most distinct yearly course of the radio-activity was found, the maximum, 129 (mean for month), falling in December, and the minimum, 47, in June. The radio-activity has also a very pronounced daily course, the maximum, 162 (mean for year), falling in the early hours of the morning, and the minimum, 58, about midday.

There is a distinct connection between the radio-activity and the meteorological conditions of the atmosphere; the radio-activity increases as the temperature falls, rises as

the relative humidity rises, decreases with increasing wind strength, and is greater with a falling than with a rising barometer. All these facts support Elster and Geitel's theory that the source of the emanation in the atmosphere is the soil of the ground. Those meteorological conditions which prevent the air immediately above the ground from ascending tend to increase the radio-activity; on the contrary, all those conditions which cause a rapid circulation of the air greatly reduce the radio-activity when measured in the lower atmosphere.

OBSERVATIONS AT HAMMERFEST.—The mean values of the radio-activity were found to be lower at Hammerfest on the coast than at Karasjok inland. The most important result of the Hammerfest measurements was the great difference between the radio-activity of the air from the sea and that from the land. The mean radio-activity with a wind from the sea was only 6, while with a land breeze the mean was 72.

March 16.—"A New Radio-active Element, which Evolves Thorium Emanation." Preliminary Communication. By Dr. O. **Hahn**. Communicated by Sir William Ramsay, K.C.B., F.R.S.

The radio-active preparation was gained from barium radium bromide, obtained from thorianite from Ceylon, while fractionating it in order to separate the radium. It collected along with small traces of iron and other impurities in the more soluble portions, and was precipitated by ammonia. From this preparation a quantity of about 10 mg. of a strongly radio-active oxalate was obtained, giving off a strong emanation and imparting bright luminosity to sensitive screens. The emanation was found to be identical with that of thorium; different samples gave for the half-period of decay from 52 to 55 seconds. For the half-period of the induced activity somewhat more than 11½ hours was found. The emanation given off by the 10 mg. of the oxalate, dissolved in hydrochloric acid, corresponds in intensity to more than that of a kilogram of thorium in solution; consequently it was more than 100,000 times stronger than the common thorium emanation when compared weight for weight. Further work led to the separation of about 20 mg. of a substance giving nearly 250,000 times more emanation than thorium.

Whether this active substance is the constant radio-active constituent of thorium preparations, or whether it is another new radio-active element, remains still undecided. It is hoped that an even more strongly radio-active product may be obtained, and that it may be possible to describe more in detail the properties of the substance.

Recent researches would appear to show that the amount of this substance in soil is comparable with, but still considerably smaller than, radium.

March 30.—"The *Rôle* of Diffusion in the Catalysis of Hydrogen Peroxide by Colloidal Platinum." By Dr. George **Senter**. Communicated by Sir William Ramsay, K.C.B., F.R.S.

The deviations from the simple logarithmic formula in the catalytic decomposition of hydrogen peroxide by colloidal platinum are probably due to disturbances caused by convection currents. When the velocity-constant calculated on Nernst's diffusion hypothesis is great compared with the chemical velocity-constant, increased convection can produce no appreciable effect on the observed reaction-velocity.

In the case under consideration, therefore, since increased convection modifies the observed reaction-velocity, there must be some error in the assumptions which lead to the conclusion that the diffusion velocity-constant is great in comparison with the chemical velocity-constant. This error is probably to be found in the assumption that the whole surface of the platinum is, under ordinary conditions, active towards hydrogen peroxide.

It cannot be claimed, from the above considerations, that Nernst's hypothesis is true for the platinum catalysis, but only that the diffusion-velocity is not great in comparison with the chemical velocity. Other considerations, however, such as the small value of the temperature coefficient, make it probable that the above hypothesis does apply to this particular action. Further support for this view may, perhaps, be found in the fact that the deviations from the simple logarithmic law in catalysis by platinum have their exact analogy in the hæmase catalysis. On the "chemical" velocity hypothesis it would seem rather remarkable that two catalysers of so different origin should show exactly similar behaviour, but this becomes at once intelligible on Nernst's hypothesis, according to which the chemical action plays quite a secondary part in the reaction-velocities in question.

Mineralogical Society, March 15.—Prof. H. A. Miers, F.R.S., president, in the chair.—Description of the big diamond recently found at the Premier Mine, Transvaal: Dr. F. H. **Hatch** and Dr. G. S. **Corstorphine**. The stone weighed more than 1¼ lb., and its greatest linear dimension was 4 inches. It was part (probably less than half) of a distorted octahedral crystal.—On some new mineral localities in Cornwall and Devon: A. E. I. M. **Russell**. An account was given of various new finds of the minerals anatase, scheelite, wolframite, childrenite, apatite, and connellite.—On a crystal of phenakite from Africa: L. J. **Spencer**. This crystal, which was transparent and rich in faces, was brought back together with crystals of tourmaline, corundum, and amethyst, by the Rev. A. North Wood from the Usagara country in German East Africa.—Notes on various minerals from the Binnenthal, Switzerland: G. T. **Prior** and G. F. Herbert **Smith**. Further crystallographic and chemical details were given of the three new red minerals from the Binnenthal originally described by R. H. Solly, and named by him Smithite (after G. F. Herbert Smith), Hutchinsonite (after A. Hutchinson), and Trechmannite (after C. O. Trechmann). Smithite is a sulpharsenite of silver having the composition represented by the formula $AgAsS_2$; it is monoclinic with $a:b:c=2{\cdot}2205:1:1{\cdot}9570$, β 78° 40′. A perfect cleavage parallel to 100 distinguishes it from the other two red minerals. Hutchinsonite is rhombic with $a:b:c=1{\cdot}6356:1:0{\cdot}7540$. A prominent form is 140. Trechmannite is rhombohedral with $c=0{\cdot}7265$. The symmetry is the same as that of quartz.—On a new oxychloride of copper from Sierra Gorda, Chili: G. T. **Prior** and G. F. Herbert **Smith**. This new mineral, to which the name paratacamite was given, has the same chemical composition as atacamite, but begins to lose its water at a higher temperature than that mineral. It is pseudorhombohedral with $rr'=83°$ nearly. Twins about r are common. It displays optical anomalies, for minute fragments under the microscope are found to be biaxial.—On Dundasite from North Wales: G. T. **Prior**. The mineral was found by Mr. H. F. Collins in the Welsh Foxsdale Mine, Trefriw, Caernarvonshire; it occurs in white silky radiating tufts on cerussite with allophane; analysis showed it to be identical with Dundasite, hitherto known only from Dundas, Tasmania. A probable formula is $PbO.Al_2O_3.2CO_2.4H_2O$ or $PbH_2(CO_3)_2.Al_2.OH_6$.

Zoological Society, March 21.—Mr G. A. Boulenger, F.R.S., vice-president, in the chair.—*Exhibits*.—Photograph of a wounded Oryx (*Oryx beisa*) hiding in undergrowth of wood in its native haunts, in order to show the protective nature of the coloration of the animal: F. **Gillett**.—A series of pencil sketches of fishes of the Rio Negro and its tributaries made by Dr. A. R. Wallace about fifty years ago: C. Tate **Regan**.—Radiograph of a living snake showing the skeletons of two frogs it had swallowed some hours previously: M. **Yearsley**.—Skulls of the fallow deer (*Dama vulgaris*) and the red deer (*Cervus elaphus*) showing arrest of the growth of the antlers due to complete or partial castration: R. E. **Holding**.—*Papers*.—Effects of castration upon the horns of the prongbuck (*Antilocapra americana*): R. I. **Pocock**. The effects of the operation were curvature in growth, prevention of exuviation, and practical suppression of the anterior tyne.—The mammals and birds of Liberia: Sir Harry **Johnston**, G.C.M.G., K.C.B. Although Liberia was not marked off clearly by any natural features from either Sierra Leone on the one hand or the Ivory Coast on the other, it possessed a certain distinctness and a slight degree of peculiarity as regards its flora and fauna. As regards mammals and birds, Liberia was, to a great extent, a meeting-place for the forms of northern Guinea (Sierra Leone to the Gambia) and those of the Gold Coast, the Niger Delta, and the Cameroons. The species of

mammals peculiar to it included the dwarf hippopotamus, the zebra antelope, Jentink's duiker, and Büttikofer's monkey. The author enumerated eighteen species of mammals and twenty of birds, specimens of which had been obtained by various collectors in Liberia.—Abnormal remains of the red deer (*Cervus elaphus*): M. A. C. **Hinton.** The remains consisted of three antlers which were obtained from different post-Pliocene deposits in the south of England. They agreed in having all the tynes suppressed and in being supported upon very long pedicles, thus resembling in form, though much exceeding in size, those of the pricket. Rudimentary offsets were seen on the most perfect example, which proved the antler to be the third in the series. These antlers belonged to individuals who had suffered testicular injury at an early period of life, by which the characters of youth were retained for a longer period than was usual.—On the affinities of Procolophon: Dr. R. **Broom.** The author believed that reptiles in Permian times became specialised along two distinct lines, the one represented by the pareiasaurians, anomodonts, therocephalians, and theriodonts, and terminating in the mammals, the second giving rise to all the other reptilian orders. The common ancestor was believed to have been a true reptile probably belonging to the order Cotylosauria. Procolophon was held to be an early member of the branch which led to the rhynchocephalians, and possibly fairly closely allied to the land ancestor of Mesosaurus.—Skulls of the fossil reptile Procolophon from Donnybrook and Fernrocks: Prof. H. G. **Seeley.** The author concluded that the main affinities were with the Anomodontia, chiefly with the Pareiasauria, and in the teeth with the Theriodontia; but that in a less degree there were indications of affinity with reptiles classed as labyrinthodonts. All parts of the skeleton supported the separation of the Procolophonia as an order of extinct Reptilia.

Geological Society, March 22.—Dr. J. E. Marr, F.R.S., president, in the chair.—An experiment in mountain-building, part ii.: Lord **Avebury**, P.C., F.R.S. In this paper some experiments are described, which were conducted by an apparatus by means of which pressures could be applied in two directions at right angles to one another, a space of 2 feet square being reduced to one 22 inches square. In the first series, plastic materials, such as cloth and thin oilcloth, were used, with layers of sand between them. Two main folds crossing at right angles were formed, the upper one shifted over the lower. The use of two layers of linoleum produced a different type of folding, and the lower layers of the linoleum were broken along the principal ridges. In the second series, a layer of plaster was introduced; this was found to be fractured, tilted up into a "writing-desk" form, and forced irregularly into the sandy layers. Overthrusts were thus produced, so that in some cases a boring would have passed through two or even four layers of the rigid substance. In other cases, the edges of the primary fracture broke off more or less regularly, and the detached pieces were pushed up, assuming gradually a very steep angle. The remainder of the edges of the plate of plaster, having now room, were able to approach each other. Pliable material above the plaster was thrown into one or a few extensive folds, while that beneath assumed a greater number of small folds.—The Rhætic rocks of Monmouthshire: L. **Richardson.** The Rhætic rocks occur only in the neighbourhood of Newport, and the present paper describes three new sections and four new exposures.

MANCHESTER.

Literary and Philosophical Society, February 21.—Prof. H. B. Dixon, F.R.S., vice-president, in the chair.—Electrically-heated carbon tube furnaces: R. S. **Hutton** and W. H. **Patterson.** These furnaces are intended for experimental work, and not only enable extremely high temperatures to be attained, but with them the temperature, being under perfect control, can be kept steady at any value up to the maximum.

February 28.—Prof. W. Boyd Dawkins, F.R.S., president, in the chair.—The early history of seed-bearing plants, as recorded in the Carboniferous flora (Wilde lecture): Dr. D. H. **Scott**, F.R.S. (see p. 426).

March 7.—Prof. W. Boyd Dawkins, F.R.S., president, in the chair.—Two new aldehyde reactions: W. B. **Ramsden.**

March 21.—Prof. W. Boyd Dawkins, F.R.S., president, in the chair.—A new genus Nevillina, of the subfamily Miliolininæ, of the Foraminifera: H. **Sidebottom.**—On the temperature coefficient of electrical resistivity of carbon at low temperatures: H. **Morris-Airey** and E. D. **Spencer.** The method of taking observations at temperatures between the normal temperature and that of boiling oxygen was described, and the results plotted in the form of curves. The shape of the curves was discussed in connection with the theory that carbon conductors behave like loose powders.

PARIS.

Academy of Sciences, April 3.—M. Troost in the chair.—On the use of the hot and cold tube in the study of chemical reactions: M. **Berthelot** (see p. 568).—Observations on the new Giacobini comet made at the Observatory of Paris: G. **Bigourdan.** The observations were made on March 28 and 31; the positions of the comparison stars and apparent positions of the comet are given. On March 28 the comet appeared as a nebulosity of about the thirteenth magnitude, with a nucleus sensibly brighter than the rest. On March 31 the size had diminished, and the apparent brightness increased.—On the relation between the integrals of the total differentials of the first and second species of an algebraic surface: Émile **Picard.**—The variation of the band spectra of carbon with the pressure and some new band spectra of carbon: H. **Deslandres** and M. **d'Azambuja.** The kathode spectrum in air having shown peculiar variations with the pressure, it was thought desirable to study the effect of pressure upon the carbon spectrum. The negative spectrum of carbon is a band spectrum which appears at the kathode in the oxygen and hydrogen compounds of carbon, and is especially intense in the case of carbon monoxide and dioxide. Two spectra were photographed simultaneously on the same plate, one from a Geissler tube containing the gas at a pressure of about 0·2 mm., and the other from the kathode of a tube in which the pressure was capable of being varied up to nearly atmospheric. The variations noted strongly resemble those already studied for the negative spectrum of air. Details of a new spectrum of carbon dioxide, given by the kathode at a pressure of 30 cm. of mercury, are given.—On the grains found attached to *Pectopteris Pluckeneti*: M. **Grand'Eury.** In the search for fronds giving rise to fossil seeds, the author has found fronds of the above species to which are fixed, not one or two, but many hundreds of grains, proving that the fossil ferns of the Coal-measures, other than the Neuropterideæ, are gymnosperms, and must be placed among the Cycadeæ. Two reproductions of photographs of the fossils are given.—On the new Giacobini comet: M. **Giacobini.** The elements of the comet are given, calculated from observations made at Nice on March 26, 28, and 30.—The provisional elements of the Giacobini comet (1905, March 26): E. **Maubant.** The elements are calculated from observations made at Nice on March 26, and by M. Bigourdan at Paris on March 28 and 31.—Abel's theorem on algebraic surfaces: Francesco **Severi.**—On linear differential equations of the second order with a periodic solution: Maxime **Bôcher.**—On a hyperelliptic surface: E. **Traynard.**—On the dynamics of the point and the invariable body in an energy system: Eugène and François **Cosserat.**—On the properties of tungstic anhydride as a colouring material for porcelain: Albert **Granger.** The yellow enamel was obtained by heating with tungstic anhydride at 800° C., using lead monosilicate as a flux. With the addition of bismuth oxide this colour withstood firing well. The conditions under which these colours tend to become opaque have not been fully worked out, and work is being continued by the author in this direction.—On the production of the hyposulphites: M. **Billy.** The production of sodium hyposulphites by the action of sulphur dioxide on sodium in presence of a neutral solvent has been claimed by a German patent, but the author's experiments have led invariably to a negative result. In presence of alcohol the reaction would appear to take place. By the introduction of sulphur dioxide into magnesium powder in suspension in

absolute alcohol, the metal dissolves, possibly as an acid hyposulphite. This solution, left in a vacuum, deposits magnesium hyposulphite.—On acetyl-lactic acid: V. **Auger.** Previous accounts of this substance being contradictory, the author has attempted to procure it in a pure state. It can be obtained either by the action of acetyl chloride on calcium lactate or on lactic acid, or by using acetic anhydride in the place of the acetyl chloride. The substance was obtained in a crystalline form in all three preparations, and its physical and chemical properties are given.—On the compounds of aluminium chloride with hydrocarbons and hydrogen chloride: G. **Gustavson.** By the interaction of benzene, isopropyl chloride, and aluminium chloride, the author has isolated a definite compound, the action of which, in the Friedel and Crafts reaction, may be compared to that of a ferment. This substance can unite both with hydrocarbons and hydrogen chloride.—On the hydrides of phenanthrene: Pierre **Breteau.** Previous work on the hydrogen addition compounds of phenanthrene has been carried out with the aid of hydriodic acid. The author has applied the Sabatier and Senderens reaction with reduced nickel, and in the present communication gives the results obtained with the hexahydride and octahydride of phenanthrene.—On the retrogradation of artificial starch: E. **Roux.**—The influence of the ethylene function in an active molecule: J. **Minguin.** With the view of throwing further light on the effect of the ethylene linkage on the rotation, the author has prepared amyl succinate, maleate, and fumarate, as well as the corresponding esters of bornyl alcohol, and has measured the rotatory power.—The constitution of the ligamentary ridge and the evolution of the ligament in existing Acephalæ analogous to the Rudistæ: R. **Anthony.**—Diagrams showing the ligament in section are given for *Unio Pictorum* and *Aetheria Caillaudi* at two ages.—Heterotypical mitosis in the Ascomycetes: René **Maire.**—On the possible *rôle* of slipping in metallogeny: L. **De Launay.** An application of the idea of *charriage* to a study of the continuity of metallic lodes.—On the existence of schists with graptoliths at Haci-El-Khenig, Central Sahara: G. B. M. **Flamand.** Specimens of schists bearing fossils, collected by Captain Cottenest, prove to be characteristically Silurian, and form the first definite proof of this system in the Central Sahara.—On the presence of the Middle and Upper Carboniferous in the Sahara: Émile **Haug.**—On an extraordinary halo observed at Paris: Louis **Besson.** This halo, which was observed at the Montsouris Observatory on March 26, besides the ordinary circle and parhelia of 22°, presented two abnormal coloured arcs, the angular measurements of which are given.

DIARY OF SOCIETIES.

THURSDAY, APRIL 13.

ROYAL SOCIETY, at 4.30.—On a New Type of Electric Furnace; with a Redetermination of the Melting Point of Platinum: Dr. J. A. Harker.—On Colour Vision by Very Weak Light: Dr. G. J. Burch, F.R.S.—(1) The Improved Electric Micrometer; (2) The Amplitude of the Minimum Audible Impulsive Sound: Dr. P. E. Shaw.—The Refractive Indices of Sulphuric Acid: Dr. V. H. Veley, F.R.S., and J. J. Manley.—On the Intensity and Direction of the Force of Gravity in India: Lieut.-Colonel S. G. Burrard, F.R.S.—A Quantitative Study of Carbon Dioxide Assimilation and Leaf-Temperature in Natural Illumination: F. F. Blackman and Miss G. Matthaei.

ROYAL INSTITUTION, at 5.—Synthetic Chemistry: Prof. R. Meldola, F.R.S.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—The Alternating Current Series Motor: F. Creedy.—Discussion of Mr. Bion J. Arnold's address to the joint meeting at St. Louis.

INSTITUTION OF MINING AND METALLURGY, at 8.—The Kedabeg Copper Mines: Gustav Köller.—Refining Gold Bullion and Cyanide Precipitates with Oxygen Gas: T. Kirke Rose.—Wood Gas for Power Purposes and Gas Generator: G. M. Douglas.—Notes on the Prestea District, Gold Coast Colony: P. Poore.—Notes on the New Dharwar Gold Field of India: R. O. Ahlers.—The Cause of Border Segregation in some Igneous Magmas: J. Park.

MATHEMATICAL SOCIETY, at 5.30.—On Irreducible Jacobians of Degree Six: P. W. Wood.—On Fermat's Numbers and the Converse of Fermat's Theorem: A. E. Western.—On the Strains that accompany Bending: Prof. A. E. H. Love.—Ordinary Inner Limiting Sets in the Plane or Higher Space: Dr. W. H. Young.

FRIDAY, APRIL 14.

ROYAL INSTITUTION, at 9.—The Law of Pressure of Gases below Atmosphere: Lord Rayleigh.

PHYSICAL SOCIETY, at 8.—On Ellipsoidal Lenses: R. J. Sowter.—(1) The Determination of the Moment of Inertia of the Magnets used in the Measurement of the Horizontal Component of the Earth's Field: (2) Exhibition of a Series of Lecture Experiments illustrating the Properties of the Gaseous Ions produced by Radium and other Sources: Dr. W. Watson, F.R.S.

ROYAL ASTRONOMICAL SOCIETY, at 5.—Value of Meteoric Radiants Based on Three Paths: W. F. Denning.—Determination of Longitude on the Planet Jupiter: G. W. Hough.—(1) Revised Elements of UY Cygni; (2) Revised Elements of Y Lyræ: A. Stanley Williams.—Further Note on Instrumental Errors affecting Observations of the Moon; in reply to Mr. Cowell's paper of June, 1904: H. H. Turner.—Reply to Prof. Turner's paper: P. H. Cowell.—Note on the Point Distributions on a Sphere; with Remarks on the Determination of the Apex of the Sun's Motion: H. C. Plummer.

MALACOLOGICAL SOCIETY, at 8.—Anatomical and Systematic Notes on Dorcasia, Trigonephrus, Corilla, Thersites, and Chloritis: Henry A. Pilsbry.—Some Account of the Anatomy of *Cassidaria rugosa*, L.: Alexander Reynell.—Notes on a small Collection of Shells from the Victoria Falls, Zambesi River: H. B. Preston.—Descriptions of Six New Species of Land Shells from South Africa: H. Burnup.

INSTITUTION OF MECHANICAL ENGINEERS, at 8.—President's Address. Conclusion of discussion on Steam-engine Research Report and Prof. Capper's reply.

SATURDAY, APRIL 15.

ROYAL INSTITUTION, at 3.—Some Controverted Questions of Optics: Lord Rayleigh.

MONDAY, APRIL 17.

INSTITUTE OF ACTUARIES, at 5.—On the Importance and Practicability of a Standard Classification of Impaired Lives: Dr. S. W. Carruthers.—Social Conditions as affecting Widows' and Orphans' Pension Funds: S. J. H. W. Allin.

TUESDAY, APRIL 18.

ROYAL STATISTICAL SOCIETY, at 5.

ZOOLOGICAL SOCIETY, at 8.30.

INSTITUTION OF CIVIL ENGINEERS, at 8.—Annual General Meeting.

WEDNESDAY, APRIL 19.

GEOLOGICAL SOCIETY, at 8.—The Blea Wyke Rocks and the Dogger in North-East Yorkshire: R. H. Rastall.—Notes on the Geological Aspect of Some of the North-Eastern Territories of the Congo Independent State: G. F. J. Preumont; with Petrographical Notes: J. A. Howe.

ROYAL MICROSCOPICAL SOCIETY, at 8.—On the Application of the Undulatory Theory to Optical Problems: A. E. Conrady.

ROYAL METEOROLOGICAL SOCIETY, at 7.30.—An Account of the Observations at Crinan in 1904, and Description of a new Meteorograph for use with Kites: W. H. Dines.—Rate of Fall of Rain at Seathwaite: Dr H. R. Mill.

CHEMICAL SOCIETY, at 5.30.—Complex Nitrites of Bismuth: W. C. Ball.

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