THURSDAY, JUNE 20, 1907.

PITT-RIVERS.

The Evolution of Culture and other Essays. By the late Lieut.-General A. Lane-Fox Pitt-Rivers. Edited by J. L. Myres, with an introduction by Henry Balfour. Pp. xx+232; twenty-one plates. (Oxford: The Clarendon Press, 1906.) Price 7*s.* 6*d.* net.

"IN language and in all ideas communicated by word of mouth there is a hiatus between the limits of our knowledge and the origin of culture which can never be bridged over, but we may hold in our hand the first tool ever created by the hand of man" (p. 31).

The great collection at Oxford needed this book, as a monument needs its inscription. These lectures, written during the actual collection and arrangement of the specimens, show the author's method of classification and explain the evolutionary principles which are concretely embodied in the objects themselves, from "the first tool ever created by the hand of man" to the highest effort of barbaric manufacture.

As every student of man knows, General Pitt-Rivers devoted a lifetime and a fortune to the application of the idea of evolution to the origin and development of the material arts. It was

"during his investigations, conducted with a view to ascertaining the best methods whereby the service firearms might be improved, at a time when the old Tower musket was being finally discarded, he was forcibly struck by the extremely gradual changes whereby improvements were effected. He observed that every noteworthy advancement in the efficiency, not only of the whole weapon, but also of every individual detail in its structure, was arrived at as a cumulative result of a succession of very slight modifications, each of which was but a trifling improvement upon the one immediately preceding it. Through noticing the unfailing regularity of this process of gradual *evolution* in the case of firearms, he was led to believe that the same principles must probably govern the development of the other arts, appliances, and ideas of mankind."

This extract, from Mr. Balfour's excellent introduction, puts on record a case of material inspiration very similar to that by which Darwin was led to his own great work. Colonel Lane-Fox began to put his ideas to a practical test in 1851. Evolution was in the air during the 'fifties, and it should not be forgotten that Pitt-Rivers, like E. B. Tylor in a parallel direction, worked out its principles independently of Darwin.

Taking what we may call *conscious* evolution at its first beginnings in the application of human hands and brains to the materials supplied by nature, he traces the development of utensils and weapons through savagery and barbarism into civilised culture. He takes as an axiom the principle that the earlier a weapon is the nearer it lies to some natural form. The consideration of these natural forms is extremely interesting, and the way in which, not only the form, but the material itself, flint, for instance, limited, or in some cases suggested, the use of a weapon or tool is an instructive psychological lesson. The author's analysis of variation, retardation, and other qualitative differences in the chain of continuity is full of interesting analogies with biological processes. Thus he can say that man "can no more be said to have *invented* the boomerang than he can be said to have *invented* the art of sustaining life by nourishment" (p. 124). Knowledge of the theory of projectiles renders the author's account of savage missiles scientific in the truest sense; there is nothing *a priori* about it. The evolution of the shield from the club will be strange news to the layman. A detail of development, which illustrates the interchange of use and ornament, is the following, from the lecture on "Early Modes of Navigation":—

"The *oculus*, which, on the sacred boats of the Egyptians, represented the eye of Osiris guiding the mummy of the departed across the sacred lake, is still seen eastward—in India and China—*converted* into an ornamental device, while westward it lived through the period of the Roman and Grecian *biremes* and *triremes* and has survived to this day on the Maltese rowing-boats and the *Xebecque* of Calabria, or has been *converted* into a hawser-hole in modern European craft."

The italics are not the author's, and serve to point out his tendency at times to make coincidence into causal connection. The bow of a boat is, of course, the obvious place for various gear to be put, failing which it is no less the obvious place for ornament, imaginative, as in the case of the "eye," or purely decorative. But the author did not mean that the hawser-hole of a modern ship is *sans phrase* a development from the Egyptian "eye."

The lectures deal generally with principles of classification (as applied to the Pitt-Rivers collection), the evolution of culture, primitive warfare and weapons (the largest section of the book), and early modes of navigation, and are filled with abundance of detail. Mr. Balfour in his introduction does full justice to his author's achievement and his inspiring of other workers on the same lines. A luminous example of the principles set forth in the book is given in a sketch of his own history of the origin of stringed instruments from the bow of the archer (*cf.* "The Natural History of the Musical Bow," by H. Balfour). He holds that some have taken exception to the use of the term "evolution" in connection with the development of implements and weapons, and adequately vindicates such use. So at least it seems to me; and a study of the earliest facts of "invention," so-called, would be most instructive to those who are inclined to draw too sharp a line between biological change and mental adjustments to environment. Psychologists and students of invention will find this a masterly book, and of unusual value in directing attention to many a fruitful series of facts and many examples of what Mr. Balfour well calls "hybridisation of ideas." There is no index. Many would prefer photographic process-work for the plates instead of woodcuts. Why should there not be some typical photographs of the Pitt-Rivers collection? A. E. CRAWLEY.

THE VOICE.

La Voix, sa Culture physiologique: Théorie nouvelle de la Phonation. Conférences faites au Conservatoire de Musique de Paris en 1906. By Pierre Bonnier. Pp. 299. (Paris: Félix Alcan, 1907.) Price 3.50 francs.

THIS is an excellent work on the physiology of the voice. Nowhere have we met with a clearer exposition of the anatomical structure of the larynx, the mode of voice production, and the mechanism of breathing. The diagrammatic figures showing the action of the muscles are specially to be commended. The author rightly discredits the old-fashioned view that a vocal tone is produced by the vibrations of the margins of the true vocal cords. In a sense this is true, but it is an incomplete statement of the truth, and M. Bonnier lays stress on the variations of pressure that occur in the laryngeal cavity. The vocal cords are brought close together, and then, by an expiratory effort, the pressure below the cords becomes much greater than in the ventricles of Morgagni above the cords and in the upper part of the larynx. This increased pressure opens the chink of the glottis, and the cords are slightly stretched upwards. The air escapes, the cords again approximate, and there is a fall of pressure below the cords whilst the pressure rises in the ventricles and in the upper part of the larynx. There is thus a puff of air. This is repeated again and again according to the period of the vocal tone produced.

M. Bonnier associates the old view with the name of Helmholtz, and he so far claims the newer view as his own. This is scarcely correct. Undoubtedly Helmholtz expounded the mechanism of tone production on the "puff" theory, and he likened the acoustic action of the larynx to that of a syren. The view so ably dealt with by M. Bonnier is now almost universally taught. M. Bonnier gives an admirable account of the action of the resonating cavities in modifying quality of tone. He illustrates this by an analysis of the bass, tenor, alto, and soprano voice, and he indicates the physiological mechanism which brings out the best quality in each of these voices, a mechanism which can be trained under a competent teacher. He shows that there is a constant interplay between the muscular mechanisms and the air pressures in the larynx, so that under favourable conditions the best qualities of the voice may be produced. Accent in singing, as the effort of the singer to give emotional expression, is brought about by the action of the nervous arrangements on the muscular mechanism.

There are many excellent remarks on articulation, on the trill, on the means for, as it were, "flinging out" the voice so as to make it effective, and on the vocal registers. There is a brief account of some of the mistakes by which the voice may be injured, and the volume closes with a description of the results obtained by a clinical examination (by laryngoscope and otherwise) of forty-four voices of persons who desired to become professional singers. Of the forty-four, eight were chosen, and thirty-six were rejected as having such qualities that no amount of training could efficiently fit them for following a *carrière lyrique*. This book places voice production on a scientific basis. Many teachers have taught empirically, and with remarkable success, but they may have made mistakes. M. Bonnier conveys the scientific knowledge that is always the surest guide.

J. G. M.

THREE BOOKS ON ELEMENTARY CHEMISTRY.

A Method of Teaching Chemistry in Schools. By A. M. Hughes and R. Stern. Pp. xii+120. (Cambridge: University Press, 1906.) Price 3*s.* net.

Elementary Science of Common Life (Chemistry). By W. T. Boone. Pp. 252. (London: W. B. Clive, University Tutorial Press, Ltd., 1906.) Price 2*s.*

An Elementary Study of Chemistry. By Dr. W. McPherson and Dr. W. E. Henderson. Revised edition. Pp. viii+434. (Boston and London: Ginn and Co., n.d.) Price 6*s.*

THE authors of the "Method of Teaching Chemistry in Schools" claim to have discovered a new method of teaching elementary chemistry, based on the principle of working from the known to the unknown. Although one may be inclined to question the novelty of the discovery, there is no doubt of the efficacy of the principle. The book is written in the form of suggestions to the teacher. The directions are clear and concise, the illustrations are excellent, and the book is embellished by photographs of the pioneers of chemistry. But it is not the method of treatment, which is scarcely new, or the arrangement of the subject, which might conceivably be improved, which commends the book. What impresses one favourably is its manner rather than its matter. It is written by thoughtful teachers, who have striven in an attractive way to get as much out of each simple problem as it can be made to yield. For the beginner in science, the imparting of many facts or the elucidation of general theories is not wanted; what is required is the cultivation of intelligent observation and of common-sense explanations of phenomena, and if this is the aim of the little book, as we take it to be, it undoubtedly fulfils its purpose.

The modest volume on "Elementary Science of Common Life," by Mr. Boone, is one of the "Organised Science Series," and is well up to the standard of the companion volumes. There is really very little that demands anything but favourable criticism. The subject is handled in a simple fashion, the examples are well chosen, and there is wealth of verbal and graphic illustration drawn from "common life." One is inclined to ask oneself in reading a book of this type whether anything is gained by formal definitions of well-known phenomena such as heat and light. Heat and light are first realised as sensations. Later, they are recognised by certain objective effects, such as expansion in one case and chemical change in the other, and this is, of course, pointed out. But does the definition

of temperature "as indicating a particular physical condition of that body while heat is the agency to which this condition is due," which is true enough, though it applies just as well to colour and light, convey information worthy of being recorded in formal language?

The "Elementary Study of Chemistry" is intended for much older students than either of the foregoing, and is an introduction to the serious study of chemistry as a separate science. The authors do not lay claim to any great originality in the treatment of their subject, and in this we must concur. At the same time, the fact that it resembles other elementary text-books does not detract from its merits. The authors have done their work thoughtfully and well. The matter is well arranged, the style is simple and concise, the paper and printing are good, and the illustrations are numerous and well executed.

As in the volume just referred to, we are soon confronted with definitions. "Physical changes," we are told, "are those which do not involve a change in the composition of the matter," but we are not told what "composition" means. "Chemical changes involve a change in the composition of matter." How would isomeric change be classified—say the conversion of ammonium cyanate into urea—according to this definition? Why attempt to define where there is no clear boundary, for it is not always easy to say where physical change ends and chemical change begins?

Apart from this we have nothing but praise for the book. The information is well up to date. There are suggestive chapters on "solutions," "chemical equilibrium," and the new learning; and if the teaching is a little didactic in places and leaves many obvious questions unanswered, it must be ascribed to the highly condensed treatment of the subject.

J. B. C.

MEDICAL SCIENCE.

(1) *The Control of a Scourge, or How Cancer is Curable.* By Charles P. Childe. Pp. ix+299. (London: Methuen and Co., n.d.) Price 7*s.* 6*d.* net.

(2) *The Essential Similarity of Innocent and Malignant Tumours. A Study of Tumour Growth.* By Charles W. Cathcart. Pp. xii+79; thirty-eight plates. (Bristol: John Wright and Co.; London: Simpkin Marshall, Hamilton, Kent and Co., Ltd., 1907.) Price 9*s.* 6*d.* net.

(3) *Guy's Hospital Reports.* Edited by F. J. Steward and Herbert French. Vol. lx., being vol. xlv. of the third series. Pp. 373. (London: J. and A. Churchill, 1906.)

(1) IN "The Control of a Scourge," Mr. Childe deals with the cancer problem particularly in relation to prevention and cure. Whether the subject could not have been dealt with in a quarter of the space with equally satisfactory results as regards the general public is a question, many of the details introduced being quite unnecessary for the average man or woman to know. What is really wanted is the broadest issue of a leaflet indicating the "danger signals" warning of the development of a cancerous growth. The medical profession has naturally shrunk from doing this, savouring, as it might seem, of unprofessional advertising; but the importance of the subject warrants this being done, and there is a good precedent in the case of tuberculosis. Mr. Childe's main theme is that cancer usually indicates itself at an early stage by certain signs—"danger signals"—a lump, a sore, an abnormal discharge, &c., and that the public should be educated to understand the importance of these, so that they may seek advice at the earliest possible moment; and, this being so, cure would be possible in a much larger proportion of cases than at present. For cancer is at first a *local* disease; in four-fifths of the cases, at least, it is situated in regions eminently accessible for surgical operation, and complete removal while in the local stage would mean cure.

To the layman who wants to know all about cancer, and to the general practitioner who desires to be in a position to discuss the cancer problem with laymen, the book can be thoroughly recommended.

(2) The second work is for the professional reader, and is illustrated with some beautiful plates. It is, of course, admitted that there is no sharp line of demarcation between innocent and malignant growths, but we should take exception to the unqualified statement (p. 71) that "the same tumour may be at one time innocent and at another time malignant." Even now the minuter characters of the structure of neoplasms are by no means completely worked out, and it is surely previous to assert that tumours having an identity of structure may at one time be innocent and at another malignant. In the case of some of the infectious warts, &c., they should be regarded as infective granulomata rather than as true neoplasms. If not, it would be quite as logical to classify the granulomatous new formations of tubercule, syphilis, &c., as neoplasms.

(3) This volume of the Guy's Hospital reports contains a number (sixteen) of interesting papers, many of which have, however, been published elsewhere. Among others, Dr. F. Taylor discusses the chronic relapsing pyrexia of Hodgkin's disease, Drs. Bainbridge and Beddard discuss the mechanism of secretion by the renal tubules in the frog, and Dr. Buzzard and Mr. Allen describe observations on the effects produced by choline upon animals. The volume contains much matter of scientific value, and to old Guy's men the "school" news which is included will add to its interest.

R. T. H.

OUR BOOK SHELF.

Ightham; the Story of a Kentish Village and its Surroundings. By F. J. Bennett. Pp. viii+158; illustrated. (London: The Homeland Association, Ltd., 1907.) Price 7*s.* 6*d.* net.

THE area described lucidly in this volume is one of the most interesting in the country to the archæologist, the geologist, and the general student of nature. It comprises some sixteen square miles north of Tonbridge, lying between Maidstone and Sevenoaks, and under the unremitting observation of Mr. Benjamin Harrison, the White of Ightham, has probably been surveyed in greater detail than any other similar rural

area. Much of Mr. Harrison's material is embodied in the present volume, having been personally communicated to the author and the associated contributors.

The earlier chapters deal with the physical and geological features of the area, and in them the student will find ample material for extended surveys, made easier by the careful descriptions and directions given. Debatable points are at times introduced, but where the author's conclusions run counter to those of other authorities, the actual field evidence in support thereof is submitted.

The development of flint implements, with illustrations drawn from those found by Mr. Harrison, and others, in this area, and the several epochs of the Stone age are next discussed, the seventh chapter being devoted to a description of the megalithic monuments which are to be found in the district. It is to be regretted that, in regard to the latter, more definite results have not been educed. Stone circles, dolmens, and the remains of *viae sacrae* are mentioned in a general way as being possible sites of prehistoric worship, but although the district teems with objects which may prove of the greatest value to the student of early Britain, and is situated in a home county, no one appears to have yet succeeded in discovering and elucidating alignments such as the labours of Sir Norman Lockyer have established for somewhat similar monuments in Cornwall, Devon, &c. Yet we read on p. 47 of recent vandalism which bids fair to obliterate for ever these unique traces of the early inhabitants of the district. Surely the time has now arrived when a Government which carefully preserves records of ancient Babylon and Egypt should take effective steps to protect the only records we have of prehistoric Britain.

The remainder of the book deals with the general history of the Ightham district, and is pregnant with interest both for the historian and the general reader. The illustrations are from excellent photographs taken especially for this work, and one puts the book down with a deep feeling of regret that similar records for the scores of other interesting areas in which rural England abounds are as yet unwritten.

W. E. R.

The Wit of the Wild. By E. Ingersoll. Pp. xi+288; illustrated. (London: Unwin, 1907.) Price 6*s.* 6*d.* net.

As Mr. Ingersoll is always interesting and generally accurate, his writings may be commended to the attention of the reader in a manner which would not be safe in the case of all works on popular natural history. To recapitulate the titles of the two dozen articles which go to form the present volume will be unnecessary—more especially as some of them are of a rather cryptic nature—and it must accordingly suffice to mention that they cover a wide field, ranging from an account of the jelly-fish picturesquely named the "Portuguese man-of-war" to an inquiry whether animals can rightly be charged with suicidal propensities. All have appeared in the form of periodical literature, but they are none the worse for this, especially as many were first published in America. The article in which we have been most interested is one on the death-feigning instinct in the opossum—an instinct which in this particular case the author suggests has been inherited from long dead ancestors to the animal's own disadvantage. That the "collapse" which occurs when an opossum is suddenly seized is not due to some form of hysteria the author is firmly convinced; and if it be a death-feigning instinct designed for protection it certainly fails in its object, as the unhappy creature is mauled and done to death by quite a number of animals when in this condition. The reader should, however, peruse the chapter for himself, in order to form his own judgment, and having done this he will scarcely "skip" the remainder of a very interesting volume.

(1) *Technical Electricity.* By H. T. Davidge and R. W. Hutchinson. Pp. x+502. (London: University Tutorial Press, Ltd.) Price 4*s.* 6*d.*

(2) *Elementary Electrical Engineering.* By John H. Shaxby. Pp. vii+192. (London: Blackie and Son, Ltd.) Price 3*s.* net.

(1) This book is intended chiefly for the use of students of electrical engineering, and covers the London City and Guilds preliminary examination in electric lighting and power, and also the necessary technical work for stage ii. of the Board of Education examination in magnetism and electricity.

The question of the various units and systems of units has been given very careful attention, and the absolute and practical units are taken side by side so as to enable the student thoroughly to understand the relationships between them, and should help to mitigate the difficulties which generally arise when dealing with these units. The same idea is applied in the description of the construction of laboratory and practical measuring instruments, all the most modern forms which are in present-day use being carefully described, both as to their construction and action.

Examples of calibration and testing are fully given, but perhaps chapter xxiv., on "indoor wiring and jointing," is one of the best. This subject is so fully dealt with and clearly explained by diagrams showing the various systems of wiring that it is one of the chief chapters in the book, although it need not be taken up for either of the examinations mentioned above.

(2) Mr. Shaxby has written a book which he hopes will assist the home reader and evening-class student. The latter mostly consist of men who during the day are employed on electrical machinery, the theory of which is little known to them. Consequently, Mr. Shaxby has written his book in the simplest and clearest manner, and mathematics are avoided as much as possible. The first part of the book deals chiefly with the theoretical side of electrical work, and the question of primary batteries is very fully gone into.

Alternating-current machinery is so very largely employed in works and mills at the present day that it does not surprise us to find the author devoting three chapters to the subject of alternating currents and alternating-current machinery. The author gives an adequate but simple explanation of their chief properties, and also supplies illustrations of modern generators and motors. J. L. M.

Neinia, Denkversuche. By O. K. Kremer. Pp. 420. (Vienna and Leipzig: E. Beyers, 1907.)

This book is not likely to appeal to many readers of Nature. "Neinia," or Nein-Ja, represents the wish of the author to recognise any and every point of view as equally legitimate, although he personally professes to be an enemy of mystic metaphysics and a friend of materialism. He belongs to no particular philosophical school, but desires to think merely for the sake of thinking, without intending to prove any more or less unconsciously preconceived notions. This thinking cannot lead to any positive conclusion, and the book ends, characteristically enough, first with the sentence, "I believe nothing and therefore I believe everything," and then with the colophon, "U.S.W. *ad infin.*" The author claims for his book the advantage that one may begin to read it

in the middle or from the end. This is no empty boast, for without wishing to depreciate a thinker who is evidently an earnest man, we cannot call his book anything but a collection of aphorisms.

Some Pages of Levantine History. By the Rev. H. T. F. Duckworth. Pp. iv+149. (London: Alexander Moring, Ltd., n.d.) Price 3*s.* 6*d.* net.

PROF. DUCKWORTH commends his book "to those of his countrymen who have either made, or intend to make, a pilgrimage to the holy places of Christian and Classical Antiquity," and it should certainly be of service to them. As he was formerly assistant chaplain representing the Eastern Church Association in Cyprus, he writes from first-hand knowledge in many of his chapters. The text is illustrated with several good plates.

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.*]

Root Action and Bacteria.

MR. SPENCER PICKERING'S letter on the effect of soil sterilisation on the growth of apple trees (June 6, p. 126) is of interest in connection with experiments which have been made by Dr. Francis V. Darbishire and myself, and described in a paper read last year before the chemical section of the British Association. We find that most plants grow much better in heated than in unheated soils.

That the productiveness of a soil can be increased by heating was shown in 1888 by Frank, and has since been confirmed by other investigators besides ourselves. We have not yet been able completely to account for it. There is, beyond question, an increase in the total activity of the soil microorganisms; this is shown by the increased absorption of oxygen. There is also evidence that some chemical change takes place. Mustard grown in heated soil takes up a larger amount of nitrogen and of phosphorus, indicating an increased "availability" of some of the compounds of these two elements. One of our experiments gave the following results:—

		Yield of mustard in grams		Percentage composition of dry matter		
		Fresh weight	Dry weight	N	P_2O_5	K_2O
Heated soil	(*a*)	229·59	26·14	4·26	2·39	4·34
	(*b*)	226·15	24·04	4·80	2·01	5·07
Unheated soil	(*a*)	84·60	15·70	2·53	1·07	4·11
	(*b*)	88·70	16·05	2·09	0·92	4·29

Further, it is easy to show that heating increases the solubility both of the organic and of the inorganic matter in the soil. The actual change that takes place can only be ascertained when something more is known of the proximate constituents of the soil, and especially of the ill-defined colloidal bodies collectively known as humus.

The case is somewhat more complicated if the plant depends for part of its food on the activity of organisms which have been killed during the heating process. The increased "availability" of the plant food in the soil may or may not counteract the loss of the special organism; leguminous plants, and trees dependent on mycorrhiza, may therefore be expected to give irregular results.

A further complication may arise if the amount of calcium carbonate in the soil is insufficient. In certain circumstances humus is known to decompose and form bodies which, in absence of calcium carbonate, are injurious to plants. There is no evidence that a similar change does not take place on heating; on the contrary, one of Schulze's experiments (*Landw. Versuchs. Stat.*, 1906, lxv., 137) seems to show that it does. He found that heated pasture soil deficient in calcium carbonate gave a poorer crop of mustard than did the unheated soil, but on adding calcium carbonate the difference in crop disappeared. So far we have always worked with soils containing 3 per cent. or more of this substance, and no depressing effect has been observed, but it would be interesting to know how much was present in Mr. Pickering's soil. Unless there happened to be sufficient, the retardation in growth which he observed may well be due to some injurious body formed by heating the soil rather than to the absence of particular organisms.

EDWARD J. RUSSELL.

South-Eastern Agricultural College, Wye.

Unscientific Administration.

MAY I be allowed to offer a few words of comment on one point raised by Prof. Ronald Ross in his article appearing in this week's NATURE? No one can read his indictment of the Indian official attitude towards science without feeling that another voice crying in the wilderness is warning our administrators and governing classes of the dangers that await an unscientific nation that persists in the error of its ways. In explaining the cause of the present state of affairs, Prof. Ronald Ross says:—"... Lastly, it is due to our defective public education." May I amend the phrase by interpolating the words "school and university" between the last two words quoted? For surely it is not the mass of the people who are to blame, but rather those who are directing the affairs of the country. Our governing classes have up till now been mostly educated at public schools and the universities of Oxford and Cambridge. To the latter institutions I will not refer. The Editor of NATURE, Prof. Turner, and Prof. Perry, not to mention the council of the Royal Society and others, have done sterling service to the cause of scientific education in their attempts to stir up public opinion; but, notwithstanding a special memorial from the Royal Society, neither university has as yet, by altering its entrance examination, acknowledged that science forms an integral part in a liberal education.

But with regard to science teaching in public schools, of which I may claim several years' experience, it is not too much to say that the outlook is far from promising. Notwithstanding the fact that governing bodies have voted money, built laboratories, and insisted on a minimum at least of science teaching, not one single public school, using the term in its usual application, has for its headmaster a man scientifically trained. The Naval College at Dartmouth and one or two grammar schools are the exceptions which prove the rule.

As a result of this, no science master can ever hope to get a headmastership, and the best men, therefore, do not enter the teaching profession. I should be far from wishing to assert that headmasters are not, as a rule, anxious to do the best they can for science, although their sympathies are with literary subjects, but they cannot do more than allow facilities for boys to learn science. The great clog to progress lies at the door of the assistant masters, who are as a body decidedly anti-scientific. What science master has not heard the opinion confidently asserted that science is only suited to the minds of a small minority of boys? They cannot and will not admit that it can be made an educational instrument of any moment. Who could not mention cases of clever boys being warned not to "waste their time" over science? Was not Darwin himself publicly rebuked for the same offence when a youth at Shrewsbury School? But if chemistry and physics are useless, biology is positively harmful. I have been told that biology should never be taught to boys, since it must turn their minds towards questions of sex about which they should be kept in perfect ignorance! Finally, it is said that the introduction of "modern" subjects such as science has only brought about mental confusion and stagnation, and the sooner we go back to the old exclusively classical curricula the better.

It is not hard to imagine what will be the attitude of mind towards science if the present generation of officials, against whom Prof. Ronald Ross brings his complaints, are succeeded by those who are now at our public schools and

ancient universities. Surely it is not asking too much of some of our most distinguished men of science that they will follow in Huxley's footsteps, and once more bring home to our schools and universities the responsibility they are incurring by their attitude towards science in the education of the well-to-do classes.

Eton, June 13. M. D. HILL.

The Rainbow.

IN "Poems by Two Brothers," written by the Tennysons, and published in 1827, is a poem called "Phrenology." The following lines occur:—

"Shall we, with Glasgow's learned Watt, maintain
That yon bright bow is not produced by rain?
Or deem the theory but ill surmised,
And call it light (as Brewster) polarised?"

Can any of your readers kindly tell me (1) what view was held by James Watt about the rainbow? (2) If Brewster was the first to point out that its light is polarised? Brewster states that he observed the fact in 1812. (3) Having regard to the date (1827), what were the most probable sources of information to which the writer of the poem was indebted?

Lord Tennyson kindly informs me that the poem was probably written by Charles Tennyson.

CHAS. T. WHITMELL.

Invermay, Hyde Park, Leeds, June 5.

The Mass of the α Particle.

JUST too late to prevent the publication of my letter of last week, I perceived that the arguments contained in it are valueless. Rutherford's estimation of the number of α particles is based on the assumption that the charge on each of them is ϵ, and cannot be used to prove that proposition. The numbers given only show that the heat energy radiated by radium is approximately equal to the kinetic energy of the α rays, as has been pointed out by Rutherford. I regret that this foolish mistake should have led me to trespass needlessly upon your valuable space.

NORMAN R. CAMPBELL.

Trinity College, Cambridge, June 14.

Animal Messmates.

WHILE searching for marine animals on January 14, I came across some large specimens of *Ciona intestinalis*, which I kept for some time in a large bottle. After a while I noticed a small worm emerging from the larger or exhalent siphon, which, on examination by a competent authority, proved to be a small example of the nemertine worm *Drepanophorus rubrostriatus=Amphiporus spectabilis*, Qtrf. Other worms of the same species afterwards emerged, about ten being observed altogether. The Ciona betrayed no apparent annoyance at the egress or return of the creatures, though it withdrew its siphons at the slightest touch of any foreign objects. This observation seems to be a new instance of "animal messmates," or at any rate of the use of an ascidian's test for purposes of shelter by an active creature.

This has been confirmed on several subsequent occasions by myself and others; in one instance, a small Ciona, from which not fewer, but possibly more, than fifteen worms issued, the creature was so transparent that the worms could be observed moving about in its interior.

FRANK S. WRIGHT.

Guernsey, June 10.

Decomposition of Radium Bromide.

WITH reference to Prof. Porter's note in NATURE of June 13 (p. 151) on the odour of bromine detected on opening a sealed tube of radium bromide, it appears that the minimum quantity of bromine that is detectable by smell is between the orders 10^{-8} to 10^{-10} grams per cubic centimetre of air. This result has been obtained by the progressive dilution of a definite volume of bromine vapour. It may be mentioned that the vapour of bromine is just detectable by its odour at the temperature of liquid air.

ALFRED C. G. EGERTON.

University College, London, June 17.

THE DESTINY OF MAN.[1]

THE present volume contains three essays reprinted from two recent addresses and one article by the author. They have been slightly modified and freely illustrated for the present purpose. The first essay, "Nature's Insurgent Son," was delivered as the Romanes lecture at Oxford in 1905. It traces the history of man and his rebellion against nature, shows that his inevitable destiny is to transform rebellion into conquest, points to the causes of delay and the special responsibility for their removal which belongs to our universities.

The second essay, "The Advance of Science," served as the presidential address to the British Association at York in 1906. It gives an account of man's campaign against nature during the last twenty-five years. It is triumphantly successful in the difficult feat of rendering supremely interesting a brief general account of advance in all the great departments of science.

The third essay, "The Sleeping Sickness," reprinted from the *Quarterly Review*, gives an account of this recent terrible scourge of tropical Africa, and the attempts which have been made to deal with it. This essay is the other side of the picture presented in the second. The latter told of splendid successes in the warfare with nature; the present essay gives a startling example of those haphazard, unintelligent methods which bring terrible disaster upon man.

In attempting to give some account of this arresting and important work in the brief limits of the allotted space, I have thought it best to confine my attention to the central argument founded on man's history, rebellion and destiny. This argument, developed in the first essay, appeals strongly to the imagination, and supplies a powerful motive force which has been wanting in the case of earlier appeals for reform.

"Man is held to be a part of Nature, a product of the definite and orderly evolution which is universal; a being resulting from and driven by the one great nexus which we call Nature. He stands alone, face to face with that relentless mechanism. It is his destiny to understand and to control it."

This statement of man's origin is rightly held to contain no implied degradation—rather the reverse. It is only a superficial and ignorant view which sees in evolution the dominion of "chance." "The conclusion that Man is a part of Nature . . . is in fact a specific assertion that he is the predestined outcome of an orderly—and to a large extent 'perceptible'—mechanism." It was of importance to urge this conclusion again, a conclusion set forth, as the author states, by Tyndall in his presidential address to the British Association at Belfast in 1874, and again stated and admirably illustrated by Huxley in 1887.[2] But the error refuted in 1874 and 1887 was still alive and vigorous in 1905, and there is reason to fear that even now it is not wholly extinct.

The emergence of man—perhaps in Lower Miocene times—is shown to be the grand example of an evolution also witnessed in other animals. In many of the early Tertiary Mammalia, as well as in the ancestors of man, it is probable that mechanical form and function had reached a climax. From this point the struggle was conducted and evolution proceeded on a higher plane, and led to progressive increase in the size and powers of the brain. The author suggests the convincing hypothesis[3] that this sudden growth

1 "The Kingdom of Man." By E. Ray Lankester, F.R.S. Pp. xii+191. (London: Archibald Constable and Co., Ltd., 1907.) Price 3s. 6d. net.

2 "The Life and Letters of Charles Darwin." Edited by Francis Darwin. Vol. ii., Chapter v., Prof. Huxley on the reception of the "Origin of Species," pp. 105–201.

3 First published in "Cinquantenaire de la Société de Biologie." Pp. 48–51. (Paris, 1877.)

in the bulk of brain-substance—in animals as well as in ancestral man—signifies the substitution in large part of "educability" for a life controlled by inborn hereditary nervous mechanisms. An increased power of storing up and profiting by individual experience takes the place of all but the most fundamental and essential instinctive actions which are the inevitable outcome of inherited brain-structure. "The result is that the creature called Man emerged with an educable brain of some five or six times the bulk (in proportion to his size and weight) of that of any other surviving Simian." One of the most astonishing facts in this history is that so much of it was accomplished by early Palæolithic times, so that from this period to the present day "the bulk of his brain does not appear to have continued to increase in any very marked degree." We must, however, remember, as indeed the author reminds us, that Palæolithic man was probably not much more monkey-like than some of the existing savage races. The best implements of that age "are manufactured with great skill and artistic feeling"; they certainly go beyond the bare necessities of use as weapons or tools, and imply a life of immense complexity as compared with that of the highest animal. Although the subsequent increase in cranial capacity is surprisingly small, it is admirably shown, by two pairs of figures, to be very significant. By the courtesy of the publishers these illustrations are here reproduced. The first pair of figures, together forming the frontispiece of the work, represent above the cranial dome of Pithecanthropus, below the skull of a Greek, both seen from the left side. The former differs from the latter in the same features, but even more remarkably than do the Spey and the Neanderthal skulls.

"The three great features of difference are: (1) the great size of the eyebrow ridges (the part below and in front of A in the figures) in the Java skull; (2) the much greater relative height of the middle and back part of the cranial dome (lines *e* and *f*) in the Greek skull; (3) the much greater prominence in the Greek skull of the front part of the cranial dome—the prefrontal area or frontal 'boss' (the part in front of the line AC, the depth of which is shown by the line *d*)."

"The parts of the cranial cavity thus obviously more capacious in the Greek skull are precisely those which are small in the Apes and overlie those convolutions of the brain which have been specially developed in Man as compared with the highest Apes."

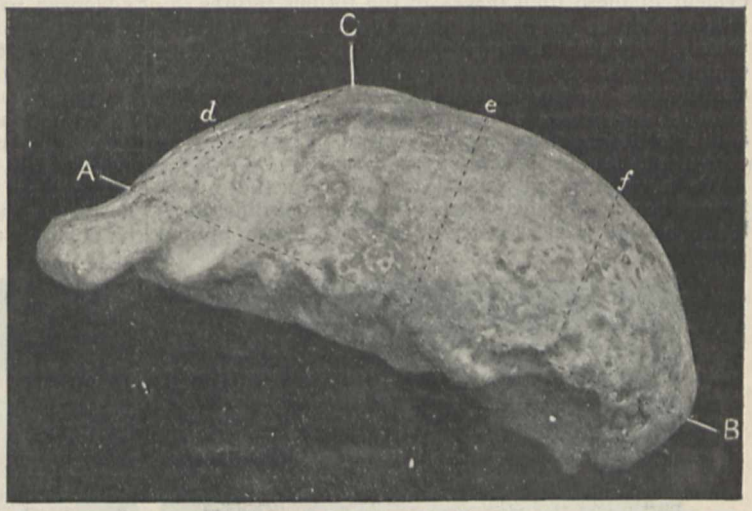


FIG. 1.—Cranial Dome of *Pithecanthropus erectus* from river gravel in Java. From "The Kingdom of Man."

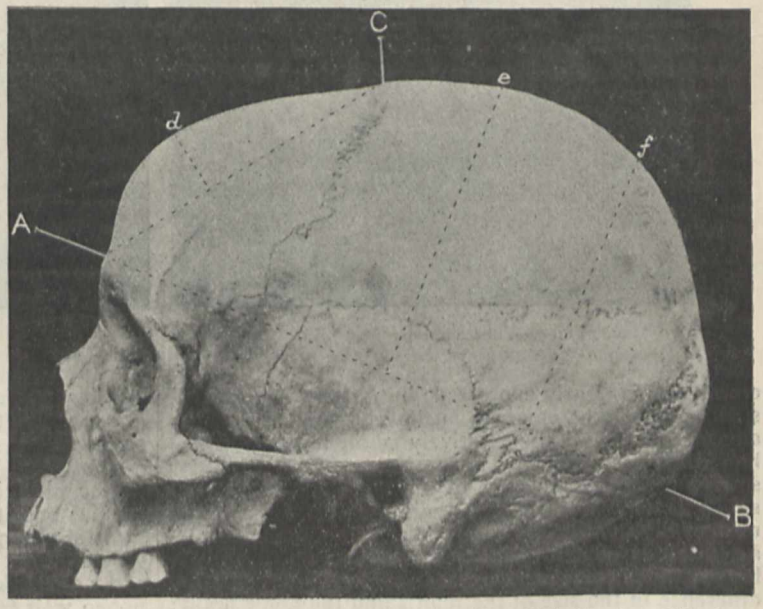


FIG. 2.—Skull of a Greek from an Ancient Cemetery. From "The Kingdom of Man."

It is necessary to add a few sentences in explanation of the simple but extremely efficient set of lines by which the important differences between the skulls are indicated and can be assigned a quantitative value. The line A–B, in both skulls, is drawn from ophryon (the median point of a line drawn across the narrowest part of the frontal bone) to the extra-tentorial point between the occipital ridges. A–B thus practically represents the base-line of the cerebrum. Lines *e* and *f* are perpendiculars drawn respectively from the median point of A–B and the junction of the third with the posterior fourth of the same line.

The development of the frontal boss is clearly shown by the line A–C drawn from ophryon to bregma—the point of contact of frontal with both parietal bones. Line *d* is a perpendicular drawn from A–C to the most prominent point of the frontal boss.

The line A–B may be divided into units, and the lines *d*, *e*, *f*, indicating the depth of the brain-cavity at these three important points, expressed numerically as percentages of the ophryo-tentorial length.

The full significance of this method of comparison is only realised when the figures already described are considered in relation to those reproduced on the next page, Fig. 3, of course, corresponding to the upper, Fig. 4 to the lower of the preceding pair. It is here shown that line A–C—appearing as a straight line when the skulls were looked at from a little

distance and placed so as to give an accurate side view—becomes when seen in front view the ovoid outline of the base of the frontal boss—the line where the frontal bone is cut by a plane at right angles to the sagittal plane, and passing through both ophryon and bregma. Similarly the line *d*, straight in the previous figures, becomes in front view the (white) line across the greatest breadth of the frontal boss. The astonishing difference between the size of this boss or prefrontal area in Pithecanthropus and that of the Greek skull is perhaps even more evident in these than it was in the former figures.

It should be mentioned that the Greek skull was selected because it happened to be a favourable example suitable for photographic reproduction, and not because of any special superiority in the crania from south-eastern Europe. Were it otherwise the author's illustrations might perhaps be called as evidence in favour of compulsory Greek!

We have directed special attention to these four figures because by their means the essential differences between the earliest known and the latest human crania are so clearly expressed; but, after all, the most striking fact that emerges is the immense size of the ancient brain and the relatively small increase which has since occurred. "The cranial capacity of many savage races and of some of the most ancient human skulls is only a little less than that of the average man of highly-civilised race. The value of the mental activities in which primitive man differs from the highest apes may be measured in some degree by the difference in the size of the man's and the ape's brain; but the difference in the size of the brain of Isaac Newton and an Australian black-fellow is not in the remotest degree proportionate to the difference in their mental qualities. Man, it would seem, at a very remote period attained the extraordinary development of brain which marked him off from the rest of the animal world, but has ever since been developing the powers and qualities of this organ without increasing its size, or materially altering in other bodily features."

It must, however, be again pointed out that, as the author states, these earliest human crania are probably Palæolithic, and thus belong to an advanced stage of human evolution with conditions not very different from those of certain savage races both existing and extinct within recent years.

The rise of the mind of man has finally led to a new "power in Nature, an *imperium in imperio*, which has profoundly modified not only man's own history but that of the whole living world and the face of the planet on which he exists." He has become "Nature's rebel," and "where Nature says 'Die!' Man says 'I will live.'" Finally, "he has advanced so far and become so unfitted to the earlier rule, that to suppose Man can 'return to Nature' is as unreasonable as to suppose that an adult animal can return to its mother's womb." But if man cannot go back he can go forward, and the author urges "the conscious and deliberate assumption of his kingdom by Man—not as a matter of markets and of increased opportunity for the cosmopolitan dealers in finance—but as an absolute duty, the fulfilment of Man's destiny, a necessity the incidence of which can only be deferred and not avoided."

FIG. 3.—Pithecanthropus from Java.

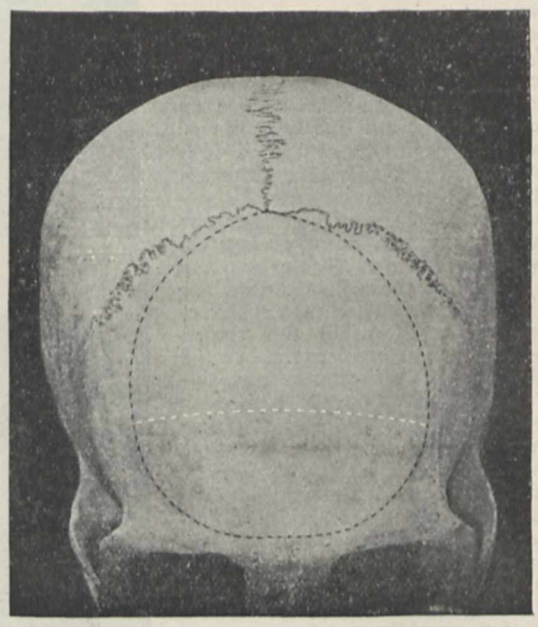


FIG. 4.—Greek Skull.

From "The Kingdom of Man."

After tracing some of the chief lines in the past and urging the necessity for determined and active progress, the author proceeds to consider the causes of man's delay. These are found to spring from ignorance of the situation on the part of the masses of the people; and it is rightly argued that when the inevitable light shall have dawned the democracy will insist on very different qualifications in its public servants. The essay concludes by calling on the University of Oxford not to wait for the pressure that will surely come, but to take a foremost part in equipping mankind for further victories and a speedy entrance into the kingdom; and in order to play this splendid part, our ancient university is reminded that no new attitude towards learning is required, but a return to the old academic spirit which laid in Oxford the foundation of the Royal Society—this, together with some relaxation of the grip of the "present curriculum, . . . a mere mushroom growth of the last century."

It is astonishingly difficult to induce mankind to adopt fundamental changes in the methods of education. The results of education, although of bound-

less practical importance, are not immediately recognisable by those whose imagination has been stunted by the methods employed in their own youth. An inadequate cramping education tends to prolong itself; for youth, with all its hidden powers calling for development, must submit to the methods imposed by age. It is probable that no branch of the human race is more difficult to move than our own. The thought sometimes arises that salvation can only be found, if at all, by national disaster; and then, under modern conditions, the remedy may be too late and recovery impossible. About forty years ago Huxley delivered the powerful and eloquent addresses on education reprinted in "Lay Sermons, Addresses, and Reviews," and yet the same subject is felt to be still the paramount question of the hour when one of our foremost scientific men is invited to deliver the Romanes lecture in 1905. It is disheartening to read Huxley's admirable and convincing essays and to realise how small has been the effect. But a reformer who would achieve anything must not give way to despondency: it is only by hope and confidence in the future that mankind can be moved. And this latest appeal has one great advantage over the old. The history of man could not have been spoken of forty years ago as it can to-day; his interference with nature is also far more evident. In this latest appeal, the imagination of the author aroused by these considerations has originated the splendid argument founded on the deeds, the delay, and yet, in spite of delay, the inevitable triumphant destiny of man. It is not too much to hope that the power and the onward sweep of this great argument will carry away many an old but not time-honoured barrier, and many an obstacle built up, alas, in modern times, intervening between man and the race that is set before him. E. B. P.

INTERNATIONAL ASSOCIATION OF ACADEMIES.

A BRIEF note on the third triennial general assembly appeared in NATURE for May 30. The following academies were represented:—Amsterdam, Berlin, Brussels, Budapest, Christiania, Göttingen, Copenhagen, Leipzig, London (R.Soc.), London (B.Acad.), Madrid, Munich, Paris (Belles-Lettres), Paris (Sciences), Paris (Morales et Politiques), St. Petersburg, Rome, Stockholm, Tokio, Washington, Vienna. The English representatives mentioned in NATURE for May 30 were all present with the exception of Sir Norman Lockyer.

The proceedings opened on the morning of May 29 with a brief address from Prof. Suess, the president. Dr. Böhm-Bawerk (Vienna) was nominated vice-president, and the following as secretaries:—German, Gomperz (Vienna), von Lang (Vienna); French, de Lapparent (Paris), Senart (Paris); English, Turner (London), Gollancz (London).

M. Darboux (Paris) then announced that a medal had been struck by the French Government in honour of the first meeting at Paris. He presented the first copy to the Vienna Academy, and said that a copy would be sent to each constituent academy. The assembled representatives of science had been pictured on the medal as young girls, and, though scarcely in accord with the appearances round him at the moment, this representation had at least the merit of suggesting that science was always young.

It was decided by small majorities not to place on the agenda paper either the selection of an auxiliary language or the proposal for a symbolic nomenclature for machinery. Other questions dealt with at this meeting related to statutes and procedure.

On Thursday, May 30, the association met in two sections. In the section of science the report of the Brain Commission was received and placed on the minutes, no vote of approval being necessary since this commission has autonomous powers. A committee appointed in 1904 by the association to "consider the best method of bringing existing organisations into relation with the association" reported that they had made certain suggestions to the International Seismological Association which had been adopted, and that in consequence it had become possible for the United States, Austria, and England to join that association, while the adhesion of France was confidently expected.

Sir George Darwin presented a report on the possible cooperation of the International Geodetic Association in geological researches, by means of the study of anomalies in the value of gravity. There were difficulties (especially from lack of funds) in organising such cooperation; but the apparatus of Baron Eötvös seemed likely to give just the information desired, and it was to be hoped that the Hungarian Government would encourage experiments with this apparatus.

Prof. von Than announced that the Hungarian Government had promised a sum of 60,000 kronen annually for three years for work with the apparatus of Baron Eötvös. This announcement was naturally received with acclamation, and it was resolved to tender cordial thanks to the Hungarian Government. It was also decided to represent to the Italian Government the great importance of similar researches in the neighbourhood of active volcanoes such as Vesuvius.

A report by M. Ch. Lallemand on levelling operations urged the desirability of repeating precise levellings two or three times per century in all countries, in order to determine possible changes.

As bearing on the general importance of the work of the Geodetic Association, M. Darboux referred to the work of Prof. Milne in directing attention to the possible connection between variation of latitude and seismic phenomena.

With regard to the survey of the 30th meridian of longitude, Sir G. Darwin was able to report, on the authority of Sir David Gill, that the survey was now approaching the northern limits of British territory, where it was hoped that it would be taken over by Germany and carried through German territory. Further, that there was a good prospect that certain R.E. officers would be able to survey 2° of the meridian, in the neighbourhood of the Equator, and that Captain Lyons, F.R.S., the director of the Egyptian Survey, was hoping to begin the triangulation of the Nile Valley in the coming winter.

An interesting report of the Marey Institute was received, including the announcement of munificent assistance from the French Government and the city of Paris. Here again the Association hastened to tender cordial thanks for generous Government aid to science.

The proposal of the Royal Society for a committee on lunar nomenclature was adopted without opposition; and the following were nominated to serve on the committee, with power to add to their number:—Lœwy (chairman), Newcomb, Weiss, Franz, Saunder, and Turner.

The International Union for Solar Research successfully solicited the patronage of the association, in token whereof they were to report to it every three years, and to reserve one place on the executive committee (of three members) for a member to be nominated by the leading academy for the time being. It was unanimously decided, on the motion of Prof. Hale (Washington), respectfully to invite the Austrian

Government to consider whether, in view of the number of favourable stations existing in the neighbourhood of Vienna, they could encourage and assist solar observations.

An important resolution concerning the organisation of meteorological stations was moved by Dr. W. N. Shaw (London), and unanimously carried, as follows:—

Consideration of the distribution of meteorological stations over the globe shows that stations in the far north and on islands in the various oceans are of special importance; the International Association of Academies desires therefore to express the hope that the Governments concerned will take any necessary steps for securing the continuance of observations where they already exist; for the modification of their form, if necessary, to bring them into conformity with meteorological usage; for establishing stations where they do not yet exist; and for placing the observations at the service of science by suitable publication. As regards the far north, observations are desired from two or three stations, at least, in the north of Siberia and of the Continent of America respectively, and as regards the islands, the following list is suggested:—Greenland, Færöe Islands, Azores, Madeira, Canaries, Cape Verde, Ascension, St. Helena, Falklands, Fernando Naronha, Staten Island, Fernando Po, West Indies, Bermudas, Sandwich Islands, Carolines, Guam, Bismarck Archipelago, Samoa, Fiji, New Caledonia, Tahiti, Java, Borneo, Seychelles, Maurice, Réunion, Madagascar, Zanzibar, Socotra, Chagos Archipelago, Christmas Island, Karmaluki.

The Association reassembled in the afternoon, for a sitting which it was ultimately found necessary to adjourn until Sunday morning, June 2. The report on the publication of the works of Leibniz was received; already a catalogue of the Leibniz MSS. had been prepared and printed. The Association expressed the hope that the three academies which had prepared this catalogue (the Paris Academies of Science and of Moral and Political Science, and the Berlin Academy) would proceed to undertake and carry through a scientifically complete edition of the works of Leibniz, and that the necessary Government aid would be forthcoming.

The proceedings of the two sections were then approved in detail by the general assembly, including reports from the letters section on the international loan of MSS., on the Greek Thesaurus, and on the Corpus Medicorum Antiquorum.

It was decided to accept the invitation to hold the next meeting in Rome (1910), probably at Easter.

There were, of course, many hospitable entertainments. The Vienna Academy invited the delegates to the annual meeting on May 28; the president entertained them at dinner on May 29; there were delightful expeditions to the Semmering on June 1, and to the Schloss Kreuzenstein on June 2, which the Graf von Wilczek (the organiser of the Polar expedition which discovered Franz Josef land) has rebuilt on the old model, and filled with all the beautiful old pictures and pieces of furniture which can be collected. Finally, the delegates had the honour of being received by the Emperor in person on the evening of June 2, and of being present at the Opera on his invitation.

The success of the whole meeting was attested by the cordial words spoken at its conclusion by MM. Darboux (Paris), Schuster (London), and Kikuchi (Tokio), who joined in congratulating Prof. Suess and the Vienna Academy on the able manner in which the duties of the "leading academy" had been discharged during the last three years.

H. H. TURNER.

THE LEICESTER MEETING OF THE BRITISH ASSOCIATION.

LEICESTER people evidently intend doing their utmost to make the first visit of the British Association to their town as successful as it will be welcome, and the meeting itself promises to be both largely and influentially attended. Many foreign visitors will be entertained as guests by the local committee, the list already including representatives of science from the Cape, Canada, the United States, France, Germany, Austria, Russia, Switzerland, Holland, Prussia, Italy, Norway, Denmark, Sweden, and Greece.

The opening meeting is to be held in the Royal Opera House on Wednesday, July 31, at 8.30 p.m., when Prof. Ray Lankester, the retiring president, will vacate the chair, and Sir David Gill, K.C.B., F.R.S., assume the presidency and deliver his inaugural address. On Friday, August 2, a discourse on "The Arc and Spark in Radio-telegraphy" is to be delivered by Mr. W. Duddell in the same building, and on Monday, August 5, Dr. F. A. Dixey will discourse on "Recent Developments in the Theory of Mimicry" in the Temperance Hall. A lecture to the operative classes will be given on Saturday, August 3, also in the Temperance Hall, by Prof. H. A. Miers, F.R.S., on "The Growth of a Crystal."

Excursions are being arranged to Belvoir Castle, the seat of the Duke of Rutland; Chatsworth, the Duke of Devonshire's Midland home; Haddon Hall, and to Peterborough Cathedral, with an invitation to tea in the Palace grounds from the Bishop. In addition to a general excursion to the Charnwood Forest, there will be a special one both there and to the district of Belvoir for geologists, whilst the botanical section is also planning walks in the same district.

An interesting trip will be that over the Leicester and Swannington railway now forming part of the Midland Railway system. This is one of the earliest railways in the kingdom, and the honoured names of George and Robert Stephenson are closely associated with it. Opened for traffic in 1832, the first object of this railway was the provision of a cheap supply of coal from the district it tapped to Leicester, and there is no doubt its formation greatly influenced the prosperity of the town. From the West Bridge Station, Leicester, the line enters the Glenfield Tunnel, which is 1796 yards long, cut straight and level, 14ft. high, 12ft. 6in. wide, and built of 18in. brickwork. On the opening day a special train conveying the directors left Leicester for Bagworth. In entering the tunnel referred to the chimney of the engine, *The Comet*, was knocked down, with the result that the passengers travelled to the Glenfield end through thick smoke and dust. The train was stopped at the Glenfield Brook to permit of a general washing of faces and hands. At Bagworth an incline of 1 in 29 was originally worked by a rope 1000 yards long, 5 inches circumference, the full wagons of coal pulling up the empties. The Swannington incline, 1 in 17, has since 1833 been worked by a fixed winding engine and rope. The original engine, one of the first to be fitted with a piston-valve, is still in use. From the commencement, three passenger trains ran daily from the West Bridge Station, Leicester, and these still continue to be run, to almost the original times. It was owing to a collision at this station between an engine and a country cart, and the consequent smashing of a lot of eggs, that the engine whistle was invented for the purpose of sounding warnings. The chief boot and shoe and hosiery works in the town are to be visited, as well as the works of the water and gas and electric lighting undertakings

of the Corporation. The principal Council schools will also be open for inspection.

Sectional meetings will be held on four or five days of the meeting at carefully chosen centres. The presidents of the various sections are as follows:—A (Mathematical and Physical Science), Prof. A. E. H. Love, F.R.S.; B (Chemistry), Prof. A. Smithells, F.R.S.; C (Geology), Prof. J. W. Gregory, F.R.S.; D (Zoology), Dr. W. E. Hoyle; E (Geography), Mr. G. G. Chisholm; F (Economic Science and Statistics), Prof. W. J. Ashley; G (Engineering), Prof. S. P. Thompson, F.R.S.; H (Anthropology), Mr. D. G. Hogarth; I (Physiology), Dr. A. D. Waller, F.R.S.; K (Botany), Prof. J. B. Farmer, F.R.S.; L (Educational Science), Sir Philip Magnus, M.P.

Every care is being taken in order to ensure the comfort and convenience of all attending the various meetings, and when the arrangements are completed it is anticipated that the accommodation generally will compare most favourably with that provided elsewhere. The various local secretaries are enthusiastically working with headquarters in the endeavour to make the Leicester meeting one to be long remembered for real usefulness and importance. The ladies of the town have formed a special hospitality committee, and are working to make, as they hope, ample provision for the large number of expected guests.

THE ASWAN RESERVOIR.

THE Egyptian Government has lost no time in arranging for the archæological survey of that portion of the Nile Valley which will be submerged by the Aswan reservoir when the dam has been raised seven metres above its present height.

The archæology of Nubia has not so far been very thoroughly studied, so that a comprehensive scheme of work must include:—(1) The consolidation of the foundations of ancient structures; (2) such repairs as are necessary to ensure their safety; (3) the copying of all inscriptions, and a complete photographic record of these buildings; (4) complete plans of each building, showing all structural details; (5) systematic excavation, together with the preparation of plans and photographs of all ancient sites, cemeteries, &c., which will be damaged by the increased level of the reservoir; (6) a complete topographical survey of the valley, which will also indicate all sites, buildings, &c., of archæological interest.

Under the arrangements which have been made by Sir William Garstin, G.C.M.G., Adviser of the Ministry of Public Works, the first three of these will be carried out by the Department of Antiquities; the last three sections, which constitute a survey, both topographical and archæological, will be carried out by the Egyptian Survey Department.

As the dam in its present condition admits of the water-level being raised 1·5 metres if necessary, the investigation of the area which would be affected by this will be undertaken at once, and preparations have been made to commence work in the early autumn of this year.

The recent cadastral survey of Nubia, 1 : 2500 reduced to the scale of 1 : 5000, will be utilised as the basis of the topographical survey in order to record the position of all ancient settlements, cemeteries, and structures as they are taken in hand, while the slopes of the valley will be surveyed and contoured.

The Egyptian Government has secured the services of Dr. G. Reisner, who will commence the systematic excavation of ancient sites at the end of September next at the southern limit of the area now submerged. From this point work will be carried on southwards so as thoroughly to examine the valley floor on either bank up to the future level of the reservoir (113 metres above sea-level), and as much above that as may be necessary on account of the water soaking the ground for some distance above it.

The Egyptian Government has included in the estimates for raising the dam a sum of 60,000*l.* for this work, which should suffice both for a thoroughly scientific study of the reach which is to be submerged, and for the necessary work of consolidating the foundations of temples. Facilities will be given to any archæological institutions which may wish to undertake the study of any site, and will thus facilitate the work. All other parts which have not been systematically explored by such institutions will be examined in due course by Dr. Reisner and his staff, and the results will be published so as to form a complete archæological record of this reach of the river.

PROF. ALFRED NEWTON, F.R.S.

WHILE zoological, and more especially ornithological, science has been deprived of one of its most illustrious students and exponents by the death of Alfred Newton, Cambridge has sustained an even more severe blow, both scientifically and socially. For not only has she lost in the late occupant of the chair of zoology a distinguished professor and working zoologist, and a great benefactor to her zoological museum, but likewise a social figure, whose place can never be exactly filled. For the past forty years or so the informal receptions held in term-time by Newton on Sunday evenings at his well-known rooms in Magdalene formed a unique feature in the scientific life of the university. To these gatherings not only were resident zoologists and the more advanced scientific students from all the colleges in Cambridge constant and welcome visitors, but older *alumni* re-visiting their *alma mater*, as well as zoologists educated at other seats of learning, were received and greeted by their host in that genial manner peculiarly his own. Reunions such as these must, unhappily, die with the man to whom they were due; but those in the smoky atmosphere of the old rooms at Magdalene will linger long in the memories of all the kindly old professor's former pupils and friends.

Born in Geneva on June 11, 1829, Alfred Newton belonged to an old East Anglian family, being the fifth son of William Newton, of Elveden, Suffolk, sometime M.P. for Ipswich, by Elizabeth, daughter of R. S. Milnes, of Fryston, Yorkshire, who represented his county town in Parliament. As a boy he was educated privately, but in due course he entered Magdalene College, Cambridge, as an undergraduate, and took his B.A. degree in 1853. In that year, as well as in 1852, he gained the English essay prize at Cambridge; and in 1854 he was elected to a travelling fellowship at his college, which he held until 1863. During the time that he held the travelling fellowship, Newton visited Lapland, Iceland, the West Indies, and North America, while in 1864 he accompanied Sir (then Mr.) Edward Birkbeck to Spitsbergen, then but little known zoologically. To these travels may in all probability be attributed a large proportion of his unrivalled knowledge of the distribution and habits of European birds. At a later period, during a visit to Heligoland, Newton sustained an injury in landing from a boat, which seriously increased a lameness due, we believe, to an accident in childhood. Ornithological observations were, however, continued for many years subsequently during summer yachting cruises, undertaken in com-

pany with the late Henry Evans, on the west coast of Scotland and elsewhere.

The most important and far-reaching event in the life of Newton occurred in the year 1866, when he was elected to the then newly-established professorship of zoology and comparative anatomy, a somewhat poorly paid office, which he held until his death on the 7th day of the present month, although he had for some years given up lecturing. The active part which he (in conjunction with his old friend Mr. J. W. Clark) took in the development of the Zoological and Anatomical Museum, and the energy with which he did all in his power to promote the study of zoology in the university, are known to all Cambridge biologists. As to his lectures, these, despite the fact that he was to a great extent a specialist in ornithology, covered a very wide field, in which, however, the systematic and distributional aspects of his subject loomed large.

So long ago as 1859 Newton was elected a Fellow of the Zoological Society of London; and two years later commenced a long, although, of course, interrupted, service on the council of that body, of which he was also for many years a vice-president. In 1870 he received the Fellowship of the Royal Society, and served on the council from 1879 to 1881, and again from 1889 to 1891, being also a vice-president during the latter period. From the same body he received in 1900 one of the Royal gold medals, while he was also the recipient in the same year of a gold medal from the Linnean Society, of which he was for many years a fellow. It should be added that in 1877 he was re-elected to a fellowship at his old college, which thus remained his home until the end of his days. Needless to say, the Cambridge Philosophical Society claimed him for a long period as a fellow, and subsequently as president.

Two years after his election to the professorial chair, that is to say, in 1868, Newton brought before the British Association the subject of the protection of birds; and he was subsequently for several years chairman of the close-time committee, during which period the first three Acts devoted to bird-protection were passed by Parliament. As the British Government was the first to move in this matter, Newton may be regarded as the father of bird-protection throughout the world, and, indeed, of all legislation of this nature, which had its origin in his early efforts. His endeavours to check the hideous cruelties connected with the collecting of so-called osprey plumes form another of his many claims to the gratitude of posterity. The establishment and maintenance of stations for observing the migration of birds also claimed a large share of his time and attention, and he was for many years chairman of the British Association Migration of Birds Committee. The important results which have accrued (and are still accruing) from these observations are familiar to all naturalists.

The scientific writings of Newton, which relate chiefly to ornithology, are remarkable for their finished and scholarly style, as well as for their extreme accuracy. To ensure both these attributes the author would, in the first place, defer sending his MS. to press as long as possible, and when it was in type he would go on correcting and refining until both printers and publishers must in many cases have been driven to the verge of insanity. As he was also a slow writer, the production of such of his works as were issued in parts extended over unconscionably long periods. Although, as already mentioned, characterised by the excellence of their literary style, Newton's writings in not a few instances were marked, more especially in footnotes, by criticisms of perhaps rather more caustic character than the occasion demanded.

Newton's earliest recorded paper appears to be one on the cedar-bird, published in the *Zoologist* for 1852, this being followed in the next year's issue of the same journal by one on the habits of the kiwi. His visit to the West Indies was marked by the appearance in 1859, in the first volume of the *Ibis*, of a paper on the birds of those islands. This reference to the *Ibis* affords a convenient opportunity of mentioning that Newton took a prominent part in founding that invaluable journal, of which he edited the second series (1865–70). He also took an active share in founding the *Record of Zoological Literature* (now the *Zoological Record*)—a publication without which the study of zoology would now be practically impossible. To the first six volumes Newton contributed the annual record of the class Aves, while he acted as editor from 1871 to 1874 (vols. vii.–ix.). It may be added that his exertions and influence were no less important at a later period in bringing about the establishment of the British Ornithologists' Union.

The fact that during the 'sixties his brother Edward held the post of auditor-general of Mauritius (subsequently becoming governor) seems to have directed the attention of Alfred Newton to the birds, both living and extinct, of the Mascarene Islands. In 1861 and 1863 we find him, for instance, describing certain new birds from Madagascar and Mauritius; while in 1868 he and his brother communicated to the Royal Society a most important paper on the remains of the dodo-like bird from Rodriguez commonly known as the solitaire (*Pezophaps solitaria*), this paper being published in the Phil. Trans. for the following year. The same subject was continued at a later period, when Newton and Mr. J. W. Clark communicated a joint paper, published in the "Zoology of the Transit of Venus Expedition of 1874," a second paper, on the extinct birds of Rodriguez, other than the solitaire, being contributed by Dr. A. Günther and Newton to the same volume. The dodo was also a bird in which Newton was greatly interested, although the description of its remains from the Mare aux Songes was undertaken by his brother, Sir Edward Newton.

At an early period in his career Newton contributed to the *Ibis* (vol. iii., 1861) an epitome of John Wolley's investigations into the history of the extermination of the great auk, or gare-fowl; and from that time to his death the story of that bird was a subject to which his attention was constantly devoted. Indeed, we believe that at the very end of his active career he was engaged on a monograph which should comprise all that is known of that remarkable species.

One of Newton's earliest papers was "Suggestions for forming Collections of Birds' Eggs," published in London in 1860, and from that time onward the study of eggs attracted a large share of his attention. About this time he appears to have come into possession of the magnificent collection made by the late John Wolley—on condition, we believe, that he would write a descriptive catalogue embodying the collector's notes. The first part of "Ootheca Wolleyana" appeared in 1864, while the last was issued only a few months before the author's death. For a long period Newton believed that eggs might afford important clues to many vexed questions connected with avian relations; but this hope he was reluctantly compelled, in the main, to abandon. The Wolley collection of eggs, largely augmented by its late owner, is, we believe, to pass to the University of Cambridge, as is also Newton's valuable ornithological library.

To the general public the late professor is perhaps best known as editor of the first two volumes of the revised and enlarged fourth edition of "Yarrell's British Birds," the first part of which appeared in 1871, although the second volume was not completed

until 1882. On the value of this work (completed by Mr. Howard Saunders) it is unnecessary to dilate.

Not less important were the contributions of Newton to the ninth edition of the "Encyclopædia Britannica," these comprising not only a large series of articles on different groups and species of birds, but likewise the article "Ornithology"; the article "Birds," it should be added, being the joint work of Newton and the late Prof. W. K. Parker. With the assistance of Prof. H. Gadow, these articles were subsequently combined by their author to form the well-known "Dictionary of Birds" (1893–1896), which forms a perfect mine of information on ornithological subjects. To this work a few articles were contributed by Dr. R. W. Shufeldt, Mr. C. S. Roy, and the present writer (by whom it was deemed a special honour to be thus associated with his former teacher). The article "Ornithology," which forms the introduction to this volume, is a perfect model of a classically written essay, and includes practically everything that there is to be said regarding the history of the subject of which it treats; while the one on "Migration" is no less important and philosophical.

As regards the other ornithological work of Newton, it must suffice to refer to a chapter on the ornithology of Iceland, issued as an appendix to S. Baring-Gould's "Iceland" (1863), to one on the birds of Greenland in the "Arctic Manual" (1875), and to a list of the birds of Jamaica in a handbook to that island, published in 1881.

To assume that Newton confined his attention to ornithology would, however, give but an inadequate idea of the scope of his knowledge. From the first he was an enthusiastic student of zoological distribution, and in 1862 he read before the Cambridge Philosophical Society a paper "On the Zoology of Ancient Europe," published the same year as a pamphlet by Messrs. Macmillan. In this he directed attention, for the first time, we believe, in this country, to the fact that the name "aurochs" belongs by right to the extinct wild ox (*Bos primigenius*), and not to the bison. His studies had also convinced him that the separation of the northern portions of the two hemispheres as distinct primary zoological regions—the Palæarctic and the Nearctic—is not supported by the facts; and at his suggestion Prof. A. Heilprin in 1882 proposed to unite them under the name of the Holarctic. That this is the true view (especially if the southern portions of the eastern and western divisions be severally cut off as the Sonoran and Mediterranean transitional regions) scarcely admits of argument. A small zoological text-book, of which the first edition appeared in 1874, likewise bears witness to the breadth of Newton's knowledge.

Although essentially conservative in all matters connected with natural history, Newton could not be termed a bigoted Tory in these matters; and when he saw occasion to change or modify his views, he had no compunction in doing so. He was an early convert to evolution, and in 1888 published a pamphlet entitled "Early Days of Darwinism"; and as evidence of the elasticity of his mind in regard to lines of investigation with which he was personally out of touch, reference may be made to his earnest support of the morphological and embryological investigations of the late F. M. Balfour, and of the Mendelian researches of the present day. As regards ornithological classification, he maintained to the last the advisability of employing generic terms in a wide sense. Whether he would ever have given his approval to modern views on nomenclature and the subdivision of species are questions which need not here be discussed.

The late professor, to quote from the obituary notice in the *Times* of June 8, "was gifted with an affectionate nature, which was not the less real because it found little verbal expression, and, possessed of old-fashioned courtesy of manner, he had the best characteristics of the race of English country gentlemen to which by birth he belonged. Stanch in his friendships, firm in his opinions, and following what he held to be right with dogged perseverance, he was a man of whom anyone might well be proud to be the friend, and one whom a very wide circle is now most genuinely mourning."

To the present writer, if he may be allowed to say so, the loss is a very real one—more so than he cares to state fully in public. R. L.

NOTES.

We regret to announce that Prof. A. S. Herschel, F.R.S., died on Tuesday, June 18, at his residence, Observatory House, Slough.

The French section of the Alliance Franco-Britannique will pay a visit to London from June 30 to July 5, and will be entertained at dinner by the British section on July 1.

The third Prehistoric Congress of France will be opened at Autun on August 12 by the president, Prof. Adrien Guébhard, and will close on August 18. Particulars may be obtained from M. Marcel Baudoin, 21 rue Linné, Paris.

Four lectures on plague are being delivered by Dr. W. J. R. Simpson as the Croonian lectures of the Royal College of Physicians. The first lecture was delivered on Tuesday, and the second is to be given to-day. The two remaining lectures will be delivered on June 25 and 27.

Science announces that at the recent session of the Pennsylvania Legislature the Senate voted 60,000*l.* to enable the American Philosophical Society to erect a memorial to Franklin, but the house did not agree to the Bill.

Mr. W. T. Hornaday has presented to the New York Zoological Society his collections of heads, horns, and tusks, comprising 131 specimens, representing 108 species. These are to form the nucleus of a collection to be exhibited at the New York Zoological Park.

A report from Santiago de Chile states that a severe shock of earthquake occurred at Valdivia on June 13. A violent earthquake was also felt at Kingston, Jamaica, on the same date, at 1.20 a.m. The earthquake was especially severe at Port Royal. A curious turbulence of the sea was noticed. An earthquake was felt at Gibraltar at 5 a.m. on June 16.

Through the generosity of several members of the Pillsbury family, of Minneapolis, Dr. Thomas G. Lee has secured, says *Science*, for the department of histology and embryology, University of Minnesota, the working library of the late Prof. W. His, of Leipzig. This collection comprises more than 8400 monographs and other papers contributed by over 2500 different authors.

An exhibition of engineering models, optical, electrical, and scientific instruments, technical education appliances, and tools, is to be held at the Royal Horticultural Hall, Vincent Square, Westminster, S.W., on October 22–26. In addition to exhibits by leading makers, there will be a loan collection of experimental and exhibition models and apparatus, and also lectures and demonstrations in various branches of applied science.

THE Victoria and Albert Museum has been opened to the public exactly fifty years to-day. On June 20, 1857, Queen Victoria and Prince Albert, accompanied by the Princess Royal (afterwards the Empress Frederick), the Archduke Maximilian of Austria (afterwards Emperor of Mexico), Prince Frederick William of Prussia (afterwards German Emperor), and a numerous suite, attended in the evening the opening of the South Kensington Museum, as it was at that time styled. In it there were exhibited several miscellaneous collections of a scientific character, mainly acquired from the Exhibition of 1851. The whole of the fine art collections which had been exhibited at Marlborough House since 1852 were also removed to South Kensington, and these were supplemented by valuable loans from H.M. Queen Victoria and others. Immediately after the opening of the temporary museum the erection of permanent buildings was commenced, and various portions were completed and opened in successive years. The greater part of the original iron building was taken down in 1868, and re-erected as a branch museum at Bethnal Green. The foundation stone of the new buildings was laid by H.M. Queen Victoria on May 17, 1899, and by her late Majesty's command the name of the institution was changed to that of the Victoria and Albert Museum.

THE Engineering Conference of the Institution of Civil Engineers, which began on June 18, will conclude to-morrow. On Tuesday, June 18, Dr. Francis Elgar, F.R.S., delivered the fifteenth James Forrest lecture, taking for his subject "Unsolved Problems in the Design and Propulsion of Ships." The conference was opened formally on June 19, when the president of the institution, Sir Alexander Kennedy, F.R.S., delivered his inaugural address. This evening a conversazione is to be held at the Albert Hall. The business part of the conference is being carried on in the sections, in connection with which meetings are taking place daily until 1 p.m. There are in all seven sections, which, with their chairmen, are as follows:—Section i., railways, Mr. William R. Galbraith; Section ii., harbours, docks, and canals, Sir William Matthews, K.C.M.G., who is also president-elect of the institution; Section iii., machinery, Prof. W. C. Unwin, F.R.S.; Section iv., mining and metallurgy, Mr. John Strain; Section v., shipbuilding, Dr. F. Elgar, F.R.S.; Section vi., water works, sewerage, and gas works, Sir George T. Livesey; Section vii., applications of electricity, R. E. B. Crompton, C.B. We hope to publish an article on the conference in a future issue.

TWO important additions to the collection in the Natural History Museum were put on exhibition for the first time at the conversazione of the Royal Geographical Society, held in the hall of the museum on Friday last. The first is the mounted skin of a male okapi, obtained during the late Alexander-Gosling expedition on the River Welle, near Angu, in the northern part of the Congo Free State, and presented by Mr. Boyd Alexander. The second is a model of the complete skeleton of the marsupial Diprotodon, based on material obtained by Mr. E. C. Stirling in the Lake Cadibona district of south central Australia. In this skeleton some portions of the limbs and feet are represented by the original bones. Diprotodon, it will be recalled, was named many years ago on the evidence of a lower jaw described by Sir R. Owen. Now that the complete skeleton is known, there is little doubt that the creature was a gigantic relative of the wombats, retaining, perhaps, in its foot-structure evidence of arboreal ancestry. In one of the recesses on the right side of the central hall were also exhibited portraits and relics of Linnæus. The portraits of the great naturalist, represented by small woodcuts, were ten in number. Several Linnæan manuscripts sent from Bloomsbury were shown, as well as several books from the library of Linnæus (the property of the Linnean Society), and certain plants from his herbarium.

IN accordance with previous announcements, the autumn meeting of the Iron and Steel Institute will be held in Vienna on September 23–25. An influential reception committee has been formed, with an executive consisting of Mr. W. Kestranek, central director of the "Prager Eisen Industrie Gesellschaft" as chairman, Max Ritter von Gutmann as vice-chairman, Mr. Richard von Schoeller as treasurer, Baron von Jüptner, A. Ritter von Kerpely, Mr. F. Schuster, and Mr. Hugo von Noot as members, and Dr. Eugen Herz and Mr. H. von Noot, jun., as honorary secretaries. The provisional programme of the meeting is as follows:—On Monday, September 23, the president, council, and members will be welcomed by the reception committee, by the Government and civic authorities, and by the president of the Society of Engineers and Architects, at the headquarters of which the meeting will be held. A selection of papers will subsequently be read and discussed. In the afternoon, members and the ladies accompanying them will be taken for a drive through Vienna and in the Prater, visiting the Municipal Museum and the Town Hall, where they will be received by the Lord Mayor of Vienna, and in the evening a special performance at the Imperial Opera House will be arranged. On Tuesday, September 24, the morning will be devoted to the reading and discussion of papers, and the afternoon to a visit to the Imperial Palace at Schönbrunn. On Wednesday, September 25, the whole day will be devoted to an excursion to the Hoch-Schneeberg. In the evening the members and ladies will be invited to a banquet at the Hall of the Musical Society. At this and at all the other functions, including the visit to the opera, the members and ladies will be the guests of the Austrian Iron Works. On Thursday, September 26, will begin the excursions to the works to be visited in (1) Bohemia; (2) Styria; and (3) Moravia and Silesia.

IT is reported in the daily Press that Prof. von Leyden has arrived at the conclusion that the development of cancer is due to the diminution or absence of certain chemical substances in the liver. Further details will be awaited with interest.

IN the *Bio-chemical Journal* for May (ii., Nos. 5 and 6) Drs. Garrod and Clarke describe a new case of alcaptonuria, Drs. Little and Harris discuss the metabolism in a healthy vegetarian, Dr. Barger and Mr. Dale describe the physiological action of some of the constituents of ergot, Dr. Drabble, Hilda Drabble, and Daisy Scott discuss the influence of neutral salts on the size of the cells of pleurococcus and saccharomyces, and Prof. Moore and Drs. Nierenstein and Todd publish experiments on the treatment of trypanosomiasis with atoxyl, an organic arsenical compound, followed by a mercuric salt, showing that this combination is much more successful than atoxyl alone.

AT a meeting of the Pathological Society of London on June 4, Drs. Sambon and Seligman described a number of hæmogregarine parasites obtained from snakes. Dr. Pye-Smith, the president, gave a valedictory address, for the society as such ceases to exist, being merged (as the pathological section) into the new Royal Society of Medicine.

By the amalgamation of fifteen out of the twenty or twenty-five medical societies of London, the Royal Society of Medicine has been constituted, the incorporated societies forming the sections of the new society. A meeting was held on June 14 for the purpose of receiving and adopting a Royal charter. The meeting was presided over by Mr. Warrington Hayward, the president of the Royal Medical and Chirurgical Society, the wealthiest and principal society of the amalgamation, when Sir William Church was elected the first president. Each society (now a section) will carry on its special work as before. The Royal Society of Medicine will commence with a membership of 4000, an annual income of nearly 8000*l.*, and possesses a library of 80,000 volumes.

A LIST of the palæontological type specimens in the collection of the Boston (U.S.A.) Society of Natural History, by Mr. J. A. Cushman, has been published as No. 6 of vol. xxxiii. of the Proceedings of that body.

BULLETIN No. 4 of the Division of Entomology, Honolulu, is devoted to a further account of the parasites of leaf-hoppers, by Mr. R. C. L. Perkins, together with descriptions of certain new Hemiptera, by Mr. C. W. Kirkaldy, the material having been almost entirely collected in Arizona.

A PAPER on the ants of Saxony, by Mr. H. Viekmeyer, and one on change of function in various animal organs, by Mr. A. Jacobi, form the most important zoological contributions to the *Abhandlungen* of the Dresden Isis for the second half of 1906 (1907).

IN the May number of *Naturen* Mr. O. J. Lie-Pettersen concludes his account of Scandinavian thrushes, in which special attention is directed to the dates of arrival of the migratory species. "F. V. H." figures a horse with a supplemental front toe, which was successfully removed in the Copenhagen Veterinary Institution.

"DWELLERS in our Rock-pools" is the title of a small illustrated booklet describing the common littoral fauna of Folkestone. The author is Mr. F. Rutt, and the pamphlet is published by Messrs. A. Stace and Sons, of Folkestone, at the price of threepence. We have also to welcome a cheap re-issue of Mr. E. W. Wade's "Birds of Bempton Cliffs," published by Messrs. A. Brown and Sons, Ltd., of London, Hull, and York, at one shilling.

THE functions of the "spiracles" in skates form the subject of an interesting article, by Mr. H. W. Rand, in the May number of the *American Naturalist*. Some time ago the author received about half a dozen skates which had been out of the water for nearly an hour, and were consequently presumed to be dead. When salt water was discharged on them from a hose, they gradually, however, showed signs of returning life, and eventually spouted copious jets of water from their spiracles. As such a phenomenon had not been previously noted by the author, he set himself to study the functions of the spiracles generally. Owing to the habit of lying flat on the sand, the spiracle, of which the primary function is to take in water, appears of much more importance to skates than to sharks. In addition to serving as an intake, it also acts as an exhalent orifice, soft substances, such as fragments of seaweed, which have gained an entrance into the gill-chamber, being expelled by spouting through the spiracles. Spouting also appears to be employed as a means of keeping the eyes clean.

IN the May number of the *Zoologist* Mr. C. M. D. Stewart discusses a somewhat mythical snake known to the Zulus as "ndhlondhlo." It was reported to be of huge size, poisonous, very fierce, and furnished with a feather-like crest, while it was also asserted to utter a whistling cry. Its name forms one of the titles of the Zulu king. The main question appears to be whether the creature was a distinct species or whether we have to do with overgrown individuals of the one locally known as the black mamba (*Dendraspis angusticeps*, var.). A snake shot by the Commissioner of Zululand about 1874, measuring about 16 feet in length, and regarded by that gentleman as a black mamba, was declared by the Zulus to be a ndhlondhlo. Certainly naturalists have no knowledge of black mambas of that length, but this by no means proves that such may not have existed. The argument used by the author, that as no such giants are now known the ndhlondhlo must have been a distinct species, does not seem to us to carry much weight.

IN his Huxley memorial lecture for 1903 (NATURE, vol. lxviii., p. 607), Prof. Karl Pearson showed that the mental and moral characters of man are inherited in much the same manner as the physical characters. "We inherit," he said, "our parents' tempers, our parents' conscientiousness, shyness and ability, even as we inherit their stature, forearm and span." This conclusion was arrived at as the result of a prolonged investigation of fraternal resemblance between children, based on the estimates of school teachers. At the Francis Galton Laboratory for National Eugenics, University of London, the inquiry has been extended to material derived from class lists of the University of Oxford and the school lists of Harrow and Charterhouse, and the results are given in a memoir—"The Inheritance of Ability," by Edgar Schuster and Ethel M. Elderton—just published (London: Dulau and Co., price 4*s.*). The definite object of the investigation was to determine as exactly as possible the resemblance between father and son and brother and brother, as indicated by successes or failures in passing the examination for the B.A. degree at Oxford, or by their positions in school at Harrow and Charterhouse at corresponding times. The results obtained from the Oxford material show that the correlation between father and son is represented by 0·312, and that between brother and brother by 0·405, on a scale by which complete resemblance would be indicated by 1 and no resemblance by 0. The public-school material gave the value 0·398, which is in close agreement with the Oxford value, for the correlation coefficient between brother and brother. The general result of the inquiry is therefore to confirm Prof. Pearson's conclusions as to the inheritance of psychical characters in man.

A REPRINT has been received of an account of the development of the common mushroom, *Agaricus campestris*, contributed by Prof. G. F. Atkinson to the *Botanical Gazette* (September, 1906). Examination of the very early stages indicated that, except for the universal veil, no differentiation was noticeable until the hymenium or spore-bearing layer develops and marks off the stem and the cap. The author states that he has found two spores only arising from the basidia in cultivated varieties, whereas he has often identified four spores in normal pasture forms.

IN the *Trinidad Bulletin* (April) Mr. J. H. Hart, referring to the packing of seeds for the tropics, discriminates between seeds that can be fully dried without injury, such as the seeds of temperate plants, and the seeds of many

tropical plants that lose their vitality if only a small percentage of water is removed. A botanical irregularity in the shape of a nutmeg-tree bearing both staminate and pistillate flowers is recorded from the island. Allusion is also made to a variety, *longipedunculata*, of the palm *Pritchardia pacifica*, distinguished by the length of the flower stalks, of which plants have been raised from seed originally supplied from British Guiana.

AN irregular series of nuclear changes in the development of the embryo-sac of *Peperomia hispidula*, differing slightly from the development in *Peperomia pellucida*, is described by Prof. D. S. Johnson. Sixteen nuclei are formed in the embryo-sac, of which two become the nuclei of the ovum and one synergid respectively, while the remaining fourteen fuse to form the endosperm nucleus; also the divisions of the endosperm nuclei are at once followed by the formation of cell-walls, so that the endosperm is cellular from the start. A preliminary notice with illustrations is published in the Johns Hopkins University Circular (March), wherein Mr. W. D. Hoyt records the observation of crops of sexual cells of *Dictyota dichotoma* at monthly intervals at Beaufort, North Carolina, as compared with fortnightly crops observed by Mr. J. Lloyd Williams at Bangor.

WE have received from the Engineering Standards Committee copies of the British standard specification for ingot steel forgings for marine purposes (No. 29, price 2*s*. 6*d*. net), and of the British standard specification for steel bars for use in automatic machines (No. 32, price 2*s*. 6*d*. net). The former is based on the present specifications of the Admiralty, the Board of Trade, and the three leading registry societies, whilst the latter is based upon evidence collected from users and manufacturers. The mechanical tests and chemical analyses of steel bars for use in automatic machines are also based on the evidence obtained, supplemented by the results of actual testing. Owing to the widely different results when bars of small diameter are subjected to mechanical tests, it has been decided not to include such tests for steel bars less than half an inch in diameter.

IN 1903 the Canadian Government appointed a commission to investigate the different electrothermic processes for the smelting of iron ores and the making of steel in operation in Europe. Since that date experiments have been made by Dr. P. Héroult at Sault Sainte Marie, Ontario, under Government auspices, in the smelting of Canadian ores in a specially designed electric furnace. The superintendent of mines, Dr. E. Haanel, has now issued a detailed report (Ottawa: Department of the Interior, 1907) containing in 149 pages a statement of the work done and of the results obtained, with analyses of the pig iron and slag produced and of the iron ores employed. Illustrations of the furnace and machinery used are given. The results obtained were most gratifying, and were briefly as follows:—Canadian ores, chiefly magnetites, can be smelted as economically as hæmatites in the electric furnace. Ores high in sulphur can be converted into pig iron containing only a minute proportion of sulphur. The silicon content can be varied as required for the class of pig iron to be produced. Charcoal, which can be cheaply produced from waste material, and peat-coke can be substituted for coke. Nickeliferous pyrrhotite and titaniferous iron ores containing up to 5 per cent. of titanium can be successfully treated. The far-reaching consequences of these results will be apparent. Many magnetites are too high in sulphur to be dealt with in the blast-furnace, and consequently have hitherto been of no commercial value. The introduction of electric smelting, too, will render it possible to utilise water-power that cannot at present be profitably employed for any other purpose, and to utilise peat bogs and mill refuse or sawdust, for which there has hitherto been no use. An appendix contains an account of recent improvements in electric smelting made in Sweden and in Germany.

IN the *Rendiconti* of the Lombardy Institution, xl., 8, Prof. Torquato Taramelli gives a short obituary notice of the work of Dr. Benedetto Corti. This work consists largely in the study of the fossil microzoa of the Tertiary and Quaternary deposits of Lombardy, and forms an important contribution to Italian geology.

DR. GIOVANNI ZAPPA, writing in the *Atti* of the Lincei Academy, discusses the possibility of the instruments in the observatory at Padua being affected by tides in the Adriatic. The author makes calculations of the gravitational effects, based on tide tables, using a method of triangulation as a basis of rough computation, but the results appear to be too small to have any appreciable effect even on the seismographs at Padua.

IN the Bulletin of the St. Petersburg Academy of Sciences, Prince B. Galitzin describes an experimental verification of Doppler's principle for light rays, conducted in collaboration with J. Wilip. Use was made of rotating mirrors, as in the experiments of Bielopolsky, but by means of the graduated spectroscope (Stufenspektroscope) described previously by Prince Galitzin, it was possible to photograph and measure the displacements of the spectral lines of a mercury arc lamp used as the source of light. In this way quantitative results were obtained within the limits of experimental error.

MR. C. E. BENHAM, writing from Colchester, June 4, points out that it is a common practice in lantern demonstrations, when it is desired to minimise the heat radiation, to interpose a cell of alum solution, though distilled water is actually more athermanous than water with alum in solution. The common belief that an alum solution is very opaque to thermal rays was disproved many years ago, but evidently has not yet quite disappeared even at the present time.

THE supplement to *Mitteilungen aus den deutschen Schutzgebieten* (vol. xx., part ii.) contains the observations made in the year ended June, 1906. Taking into account the results from all stations, the rainfall was favourable, but less in amount than in the two previous years. The annual falls vary, according to position, from 27·5 inches to 0·3 inch; May to August are practically rainless months. The largest amount recorded in one day was 4·5 inches, at Seeis, in the central district, on January 30, 1906. The stations now number seventy, against sixty-seven three years previously, notwithstanding that two-thirds of them were destroyed or necessarily abandoned after the outbreak of the war.

OWING to a slight accident, Mr. Francis Galton was unable personally to deliver his Herbert Spencer lecture at Oxford, referred to in last week's NATURE (p. 158), but the lecture was read by his cousin, Mr. A. Galton.

AN illustrated guide to holiday resorts in the United Kingdom has been published under the title of "The Holiday Whitaker" by Messrs. J. Whitaker and Sons, Ltd. The present edition is intended as a guide to resorts for the summer season, and it is proposed to issue another and different edition for the winter season.

ACCURATE and interesting "guides" greatly assist the intelligent visitor to examine and understand the objects exhibited in a museum. The trustees of the British Museum are rendering a great service to natural science in ordering the publication of the excellent series of handbooks to accompany the admirable collections exhibited at the Natural History Museum, South Kensington. The most recent of these volumes is the "Guide to the Fossil Invertebrate Animals in the Department of Geology and Palæontology," which, with its seven half-tone plates and ninety-six text figures, will enable the visitor to the galleries to appreciate the significance and importance of the various fossils on view. We learn from the director's preface that the book has been written by Dr. F. A. Bather, and that the formerly published "Guide to the Fossil Invertebrates and Plants" is partly replaced by the present volume, the price of which is one shilling.

SEVERAL new volumes belonging to the concise and comprehensive series of Hoepli manuals have recently been received from the publisher, Mr. U. Hoepli, Milan. Two volumes by Prof. P. E. Alessandri, entitled "Merceologia Technica," deal respectively with natural and chemical products of commercial and industrial use. Caoutchouc and gutta-percha is the subject of a volume by Dr. L. Settimj, and the preservation of foods of one by Drs. G. B. Franceschi and G. Venturoli. Other volumes are on taxidermy, by Dr. R. Gestro; radio-activity, by Dr. G. A. Blanc; and limnology, or the scientific study of lakes, by Dr. G. P. Magrini.

MANY publications of deep scientific interest have been issued by the Carnegie Institution of Washington and described in the columns of NATURE. A list has just been received of ninety-two works available now or shortly which the institution has published or has in the press. Applications for the list or for copies of the works not out of print should be sent to the Carnegie Institution of Washington, D.C., U.S.A.

THE Proceedings of the Anglo-Russian Literary Society for February, March, and April have now been published in one small volume. The papers read at the monthly meetings of the society, one of the objects of which is to promote the study of the Russian language and literature, are here reprinted. We notice in an obituary of the great Russian chemist, Mendeléeff, the remark, "A prophet is not without honour, save in his own country; Mendeléeff was black-balled at the elections in the Imperial Academy of Sciences."

MESSRS. WEST, NEWMAN AND CO. have published a fifth edition of the late Rev. Joseph Greene's "Insect Hunter's Companion." The little book, which runs to 120 pages, gives instructions for collecting and preserving butterflies, moths, beetles, bees, flies, &c., and has been revised by Mr. A. B. Farn. Its price is 1*s.* 6*d.* net.

OUR ASTRONOMICAL COLUMN.

ANOTHER NEW COMET, 1907*d*.—A telegram from the Kiel Centralstelle announces the discovery of the fourth comet of this year by Mr. Daniel, at Princeton, on June 14. The object was of the eleventh magnitude, and at 14h. 19·1m. (Princeton M.T.) on the day of discovery its position was

R.A. = 23h. 48·53 m., dec. = 1° 8′ S.,

which lies about half-way between λ and 29 Piscium. The daily motion is given as +34′ in R.A. and +14′ in declination.

A second telegram from Kiel states that this comet was observed by Prof. Aitken at the Lick Observatory on June 13, when its position at 15h. 7·2m. (Lick M.T.) was

R.A. = 23h. 59m. 44·4s., dec. = 0° 10′ 16″ S.,

which is about 22·5m. E. and 1½° S. of λ Piscium. This object is apparently becoming brighter at a rapid rate, for Prof. Aitken gives its magnitude as 9·5.

TITANIUM FLUTINGS IN THE SPECTRUM OF α ORIONIS.—From the examination of the spectrum of α Orionis taken with the four-prism spectrograph, Mr. Newall believes that he has discovered the presence of three titanium flutings in the red end of the spectrum of that star. The wavelengths determined for the heads of the flutings, viz. λλ 7053, 7087, and 7124, agree fairly well with those found by Messrs. Hale and Adams in the spectrum of the titanium-arc flame, whilst collateral evidence, based on the analogy between the spectra of sun-spots and third-type stars, suggests that these bands are to be expected in stellar spectra of the α Orionis type, because they have been found in sun-spot spectra. Two other flutings, with heads at λλ 5166·8 and 5447·1 respectively, were also found, and agree with the heads of the two strongest Ti flutings found by Prof. Fowler.

An inter-comparison of sun-spot spectra and the spectrum of α Orionis shows that numerous spot lines occur in the stellar spectrum (Monthly Notices R.A.S., vol. lxvii., p. 482, May).

TIN IN STELLAR ATMOSPHERES.—On examining some spectrograms of α Scorpii for radial-velocity determinations, Mr. Goatcher, of the Cape Observatory, found a persistent discrepancy occurring when measurements of the wave-length of a line at about λ 4525 were reduced, this line always giving a velocity about 6 km. per second too low. This discordance was examined by Mr. Lunt, who arrived at the conclusion that it is probably due to the hitherto unsuspected presence of a tin line, the wavelength of which, according to Exner and Haschek's tables, is λ 4525·00. In the region covered by the spectrum which was examined, the latter observers give only one other tin line, and as this, according to Sir Norman Lockyer's published tables, is an enhanced line, it is not to be expected in the spectrum of α Scorpii (Antarian type). Should Mr. Lunt's conclusion be confirmed, it will be the first occasion on which tin has been shown to exist in the atmosphere of a star (Monthly Notices R.A.S., vol. lxvii., p. 487).

NON-POLARISATION OF THE LIGHT OF PROMINENCES.—In a note appearing in No. 21 (May 27) of the *Comptes rendus*, M. Salet states that, although he was able, during the total solar eclipse of 1905, to show that the coronal radiations down to the edge of the moon were polarised, he was unable to observe any trace of polarisation in the prominence radiations. M. Salet then points out that this result appears to introduce a contradiction to the theory of Prof. Julius, that the monochromatic light of a point on a prominence comes in reality from a point on the photosphere, for, according to Schmidt, such a ray would be strongly deviated by the successive refractions of the solar envelopes, and should then become partially polarised, the quantity of polarisation depending, by Fresnel's theory, only on the value of the deviation. The absence of polarisation seems, therefore, to argue that the light is not deviated, and, consequently, that it does not have to pass through the solar atmospheres from the disc.

NOVA T CORONÆ OF 1866.—Some interesting observations concerning Nova Coronæ are made by Prof. Barnard in vol. xxv., No. 4 (p. 279, May), of the *Astrophysical Journal*. Before its outburst this star was of magnitude 9·5, then it increased to the second magnitude, finally relapsing to 9·5. Novæ generally fade away to a much less brightness than this.

Prof. Barnard has repeatedly examined this star with the 40-inch refractor, but can find no difference of focus such as usually exists between the light from faded Novæ and the stars in general. Estimations of magnitude show that the star still has essentially the same magnitude that it had before 1866; there is no definite indication of motion in the Nova. Prof. Barnard found a faint nebula in the field with the Nova, the nebula being of magnitude 14·0 or 15·0, and having a diameter of 5″ to 10″ with no nucleus.

THE SOUTH-EASTERN UNION OF SCIENTIFIC SOCIETIES.

THE twelfth annual congress of the South-Eastern Union of Scientific Societies, which opened at Woolwich on June 12 and closed on June 15, was in every way a very successful gathering. At the first evening meeting, held in the New Town Hall, Mr. Francis Darwin, F.R.S., the retiring president, introduced his successor, Prof. Silvanus P. Thompson, F.R.S., who delivered the inaugural address. This was an eloquent discourse, mainly on the value of voluntary work in science—such work as is carried on non-professionally by members of local scientific societies constituting the South-Eastern Union. These societies consist chiefly of persons who may be called, in the best sense of the word, amateurs. Exposing the fallacy of the popular saying that "a little knowledge is a dangerous thing," the president advocated the cultivation of scientific hobbies, enlarged on the value of acquiring a taste for studies outside the monotonous round of daily work, and showed how science had frequently been advanced by the work of amateurs. Among examples of famous amateurs, he pointed to William Herschel, originally a teacher of music; Gilbert, of Colchester, who was a medical man; and Joule, a Manchester brewer: nor were Spottiswoode, De la Rue, and Dr. Dallinger overlooked, whilst Sir Edward Fry's study of British mosses was cited as a contribution to science by an eminent lawyer. But to an audience at Woolwich the most telling example was that of William Sturgeon, the inventor of the electromagnet, who lived at one time as a shoemaker at Woolwich. Electricity has indeed been to a large extent a layman's science.

Prof. Thompson dwelt at some length on Goethe's researches on colour, and rather startled his hearers by affirming that in the famous controversy with Newton the poet-philosopher was in some sense right. Looking at natural science with the eye of a poet, Goethe failed to comprehend the value of Newton's work, and obstinately maintained that in the prismatic analysis of light the colour was derived from the prism itself, and not from the white light. But though it is generally held that the *Farbenlehre*, in which he published his views, embodies an elaborate optical heresy, it has, strangely enough, been recently shown by Lord Rayleigh's researches that there is, after all, some truth in Goethe's contention.

As Prof. Thompson proceeded, he rather surprised the naturalists by recalling his early rambles in Yorkshire, and showing himself to be an excellent botanical observer. The preservation of our wild flowers, which are really the property of the community, is an important subject which he commended to the consideration of local societies. It would be true patriotism, he held, to establish a New Primrose League for the protection of this flower, which in some places, as in Epping Forest, has become practically extinct. Another subject which he suggested might be advantageously taken up by the societies of the South-Eastern Union was that of constructing a map of the Weald, which should show the position of all the old furnaces, forges, hammer-ponds, cinder-heaps, and other relics of the iron-making industry for which the Weald was so long famous.

It is interesting to note that by the generous action of the local committee the presidential address of Prof. Thompson was open to the public. This innovation was one of several excellent features that characterised the Woolwich congress.

As it unfortunately happened that Prof. Thompson was unable to attend after the delivery of his address, the subsequent proceedings of the congress were presided over by a former president, the Rev. T. R. R. Stebbing, F.R.S. At one of the meetings an interesting lecture on an experiment in cooperative field-work in botany was given by Prof. F. W. Oliver, F.R.S. A few years ago a party of students acquired a salt-marsh with sand dunes at Erquay, in Brittany, where they have established a laboratory. The vegetation consists chiefly of suæda grass and salicornia, backed by a growth of juncus. The observations have been directed mostly to the study of the way in which the growth of halophytes is affected by variation in the salinity of the soil.

An evening lecture was given by Mr. W. Whitaker, F.R.S., entitled "Some Ideals for Local Geologists," in which he offered excellent advice to the societies in the union, urging upon their members the necessity of cultivating habits of observation and seizing the opportunity of describing every geological section that might be exposed within their area. At other meetings Dr. Treutler, of Brighton, read a paper on Goethe as a naturalist; Mr. Norman Gray brought forward some suggestions for making local scientific societies more efficient; Mr. W. H. Griffin discussed the antiquity of the horse, with special reference to remains found in Kent; and Mr. G. F. Chambers advocated the storage and use of rain-water for domestic purposes.

In the excursions to which the afternoons were devoted Mr. Whitaker was the principal guide when geology was concerned, whilst the archæological remains were described mostly by Mr. W. T. Vincent, the president of the Woolwich Antiquarian Society, who also read a paper at the congress on local archæology.

At a reception given in the Town Hall by the Mayor of Woolwich, two illustrated lecturettes were delivered, one by Dr. G. Abbott entitled "Life in Rocks and Minerals," dealing chiefly with the formation of concretions, followed by one on xerophytes by Mrs. W. Plomer Young, of the Battersea Polytechnic.

An interesting feature of the meeting was the temporary museum, which contained an exceptionally large collection of objects illustrating natural history, under the superintendence of Mr. W. H. Griffin, of Catford. Many of the exhibits showed the results of nature-study in the elementary schools of the London County Council, and by the thoughtfulness and generosity of the local committee the children of the neighbouring schools were brought in parties to visit the museum.

It had been intended to present the delegates of the constituent societies of the union with a local handbook, similar to that sometimes issued at meetings of the British Association. But so large a number of writers had contributed essays on special subjects of local interest that the printing was delayed, and the publication necessarily deferred.

It should be remarked that the conspicuous success of the Woolwich congress was mainly due to the fact that the work of the honorary secretary, the Rev. R. Ashington Bullen, was aided by a powerful local committee, which included such enthusiastic workers as the Rev. C. H. Grinling and Mr. W. T. Vincent.

THE INSTITUTION OF MINING ENGINEERS.

THE forty-sixth general meeting of the Institution of Mining Engineers, which now numbers more than 3000 members, was held in the rooms of the Geological Society, London, on June 13 and 14, and was attended by a large and representative gathering from the various coal-mining districts. Mr. Maurice Deacon gave an admirable presidential address, in which he reviewed the recent improvements in coal-mining practice, and indicated the directions in which further progress might be sought. Mr. H. R. de Salis discussed the improvements required in inland navigation, urging that the authorities controlling the canals should be re-organised. When the works of improvement have been carried out and efficient waterways provided, the problem of mechanical haulage will soon be solved. Mr. W. B. M. Jackson described the by-product coking plant at Clay Cross, a new plant of fifty Simplex ovens with all the mechanical appliances electrically driven. Mr. A. Victor Kochs also read a paper on by-product coking, in which he described the latest forms of the Koppers oven. Water supplies by means of artesian bored tube wells were dealt with at considerable length by Mr. H. F. Broadhurst; Mr. W. J. Kemp and Mr. G. A. Lewis described the occurrence and mining of gypsum in Sussex, in the beds discovered by the sub-Wealden exploration of 1872. The mine is undoubtedly a model of modern practice. The proceedings on Thursday concluded with a paper by the Rev. J. M. Capell, the inventor of the fan bearing his name, in which he urged

that the application of duplicate fans on one upcast shaft would result in great economy.

On Friday Mr. Austin Hopkinson discussed the reform of British weights and measures. Mr. J. T. Brown described the methods of working the thick coal of Warwickshire, expressing, incidentally, the opinion that coal seams exist more or less continuously, but at great depth, under the large tract of country between the South Staffordshire and East Warwickshire collieries. Mr. D. M. Chambers gave an account of the mining of ozokerite at Boryslaw, in Galicia. Mr. C. Sandberg drew some general conclusions regarding the origin of the geological structure of South Africa. His conclusions are as follows:—The main directions of mountain-folding pressures have been north and south and east and west, the result of the former being predominantly evident in the central zone and that of the latter on the periphery of South Africa. These orogenic forces worked simultaneously, and together built up the tectonic structure of South Africa, which may thus no longer be regarded and studied as the outcome of many different and local, that is, comparatively insignificant, causes, that have worked independently of one another. These systems of forces acted on all the strata of the geological systems, from the Primary upwards, either at different periods, or possibly during one long period, when there was active deposition of the younger sediments in one place and denudation of the older in another. The origin of poorten (gaps in mountain ranges), river valleys, and pans is traceable to the same causes which produced anticlines and synclines, brachy-synclines, basins or domes, that is, to fold-producing pressures, the former set of phenomena being, in fact, only modifications or diminutives of the latter.

Another paper on South African geology was contributed by Mr. A. R. Sawyer, who gave some information regarding the general geological conditions obtaining in the New Rand goldfield in the Orange River Colony. The last paper was by Mr. H. W. G. Halbaum, who discussed the contradictory formulæ given by various authorities for the strength of cast-iron tubbing, and proposed a rational formula in which the action of corrosion as well as of the pressure to which the tubbing is subject is taken into account. In connection with the meeting, visits were arranged to the generating station of the Great Western Railway at Park Royal, and to the Portland cement works at Northfleet. The next meeting of the institution will be held at Sheffield on September 4, 5, and 6.

THE PLANET SATURN.

SATURN has now become well visible as a morning star. The rings being turned nearly edgeways to the earth, the belts in both hemispheres may be observed to advantage. The irregular markings can also be satisfactorily seen, as there will be practically no interference from the rings.

This planet is perhaps more utilised as a "show" object than as a subject for critical study by observers. There is no doubt, however, that it is well calculated to repay the most diligent attention. It is true that there is rarely an outbreak of such magnitude on the disc as that which affected the N. temperate region of Saturn in the summer of 1903. In fact, it would appear that really well-marked instances of irregular spots among the dark belts or bright zones are by no means frequent. Prof. Barnard said that the spots which he discovered in 1903 were the first he had ever distinguished upon the planet, and certainly these particular markings were the first that had been clearly and satisfactorily seen by the writer, though he had been observing Saturn for more than thirty-five years.

It is extremely probable that the real surface of Saturn, like that of Jupiter, is hidden from our view. We cannot therefore determine the rotation period of the planet's actual globe, but only of the dense vapours floating above it and forming its atmosphere. These vapours are obviously influenced by great differences in velocity, the period of the N. temperate latitude being twenty-three minutes longer in 1903 than the equatorial region in 1876–7. It is very desirable to ascertain the rates of velocity of the various latitudes, as has been done in the case of Jupiter. To this end the planet should be examined frequently at every opposition, so that, whenever any visible disturbances present themselves, a large number of their transits across the central meridian may be taken. In certain years, according to the best testimony, the belts are apparently smooth and even with no interruptions or irregularities due to dark and light spots. Visible atmospheric disturbances no doubt occur on Saturn more often than is supposed. Jupiter's envelope presents very frequent evidences of eruptions and irregularities capable of producing very conspicuous and in some cases long-enduring spots. To Saturn, therefore, the most beautiful planet of our system, we may naturally look to afford us fuller information as to his surface currents if observers will but keep a critical eye upon the physical aspect of the object as seen in good telescopes. W. F. DENNING.

THE INTERNATIONAL COUNCIL FOR THE STUDY OF THE SEA.

THE sixth meeting of the International Council for the Study of the Sea was held at the Foreign Office in London on June 13 and 14, when delegates and experts representing Norway, Sweden, Finland, Russia, Germany, Denmark, Holland, Belgium, and Great Britain were present and took part in the discussions. The meeting was formally opened at noon on June 13 by Sir Edward Grey, Secretary of State for Foreign Affairs, who was accompanied by Lord Carrington, President of the Board of Agriculture and Fisheries. Prof. Otto Pettersson, of Stockholm, vice-president of the council, occupied the chair in the absence of the president, Dr. Herwig, of Hanover.

Sir Edward Grey said that from the necessities of our geographical situation and of our associations we have a natural interest in everything that concerns the sea. We have a great interest in the practical side of the labours of the Council, and are not deficient in interest in the scientific side as well. The British Government has shown the interest which it attaches to work of this kind by continuing for another year its subscription to the work of the Council. It must be a question of increasing interest as to whether the means of capture of fish in the sea, and the increase of the demand, are tending to overtake the natural supply. It is, of course, impossible to deal with this subject adequately simply by legislation within our own territorial waters, because the territorial limits of the sea have been arranged without any special regard to the habits of the fish, and the habits of the fish have been arranged by nature without any special regard to territorial limits. Therefore, whatever measures may be taken for ourselves, and whatever separate investigations other countries may make for themselves, if any question arises as to how the protection of fish in the North Sea can be controlled, encouraged, and preserved, it must form the subject of discussion between the different countries which are interested in the high seas.

Prof. Pettersson said that five years have passed since the commencement of the international investigation of the sea and eight years since the lines of the researches were laid down by the conference in Stockholm. The bounty of the Governments has supplied the means to carry on the work of investigation on a larger scale than has perhaps ever before been employed in scientific enterprise. The Council is convinced that the statesmen of Great Britain were well advised when they engaged their country to participate in this international work, of the ultimate success of which the Council feels assured. The British Government has taken the wise and just decision to devote a year to an inquiry in order to gain a sure ground for its future action. This work the Council leaves in the hands of the British Government with the utmost confidence.

Dr. Lewald (Germany) said that the German Government was of opinion that investigations must be continued, and that some form of international cooperation was required. M. Hamman (Belgium) and Commander Drechsel (Denmark) also spoke. The subsequent proceedings of the Council were conducted in private.

In connection with the meeting of the Council, Prof.

Otto Pettersson delivered a lecture on Monday, June 10, before the Royal Geographical Society, on "Oceanic Circulation," in which he elaborated his theory of the influence of melting ice in the polar regions upon the general circulation of the oceans. In the course of the discussion which followed, Dr. Nansen gave a short account of the Norwegian hydrographical results and the nature of the actual currents which had been found to exist in the Norwegian Sea. He directed special attention to the cyclonic nature of the currents, which had been found to exist in that area. Prof. Gilson (Belgium), Prof. Homen (Finland), and Dr. Hjort (Norway) also spoke.

From June 10 to June 13 the delegates and experts were engaged on the work of the various committees of the Council, when arrangements for the conduct of the investigations during the coming year were elaborated.

The very full programme of festivities in connection with the conference, which was referred to in our last week's issue, was most successfully carried out, and it was felt by all who took part in the proceedings that much benefit would result from the friendly intercourse which took place during the week between the representatives of science on the one hand and those of the official and fishing interests on the other.

On Friday, June 14, the delegates and experts were received at Buckingham Palace by the King, who expressed his sense of the importance of the work in which they were engaged.

INTERNATIONAL CONFERENCE ON SLEEPING SICKNESS.

REUTER'S Agency announces that, at the invitation of the Colonial Office, a conference of various African colonies and protectorates has been summoned to discuss concerted international measures for dealing with sleeping sickness. This conference met at the Foreign Office for the first time on Monday, Government delegates being present from Germany, Congo Free State, France, Great Britain, Portugal, and the Sudan. The delegates are as follows:—Germany, Herr von Jacobs, Dr. Ehrlich, and Dr. Fulleborn; Congo Free State, Colonel Lantonnais, Vice-Governor General, Commandant Tonneau, M. Rutten, and Dr. van Campenhout; France, Dr. Kermorgant, Dr. Paul Gouzion, Prof. Blanchard, and Dr. Laveran; Great Britain, Lord Fitzmaurice (president), Sir W. Foster, Mr. A. W. Clarke, Mr. H. J. Read, and Sir Patrick Manson; Portugal, Dr. Correa Pinto; Sudan, Colonel Hunter and Dr. Balfour, of the Gordon College, Khartoum. The work before the conference includes the question of the holding of regular conferences, the establishment of a central bureau of information, and the assignment of definite points for investigation to particular countries or individuals. Lord Fitzmaurice, president of the conference, made the following remarks at the opening meeting to describe the objects in view:—

We are met together in the hope that it may be possible to concert measures which will enable the Powers which we represent to wage a more effective warfare against that terrible epidemic of sleeping sickness, which has already devastated so great a part of Africa, and which appears to be assuming even greater and greater proportions. This disease, as you are aware, has decimated the natives in large areas of the Congo Free State; it has levied a heavy toll on the natives of Uganda, of whom 200,000 out of a total population of 300,000 in the infected area have fallen victims to it. It has invaded portions of the French Congo and the Portuguese possessions; it has appeared the Sudan, and is now threatening German East Africa, Rhodesia, and the British Central Africa Protectorate. Already not a few Europeans have died of the disease, and many of those still alive are known to be infected.

By a bitter irony the European administration of Africa, while producing a more settled state of affairs than formerly existed, has led to more frequent and more extended travel on the part of the natives, and so helped to diffuse and spread the infection. In view of this state of affairs, which is little less than a calamity for tropical Africa, His Majesty's Government has been endeavouring, by subsidising and otherwise encouraging investigation into the nature and cause of sleeping sickness, to acquire the necessary knowledge on which to base a scheme or schemes for the prevention, and possibly the cure, of this disease. Happily these efforts have met with considerable success. It has been definitely ascertained that *Trypanosoma gambiense* is the cause of the disease, and it is all but proved, both experimentally and by analogy, and also by considerations of distribution, that this parasite is conveyed from the infected to the uninfected by at least one species of tsetse-fly (*Glossina palpalis*), and that the distribution of this fly is strictly limited to the close neighbourhood of open water. It has further been ascertained experimentally in animals, and therapeutically in man, that the infection, once acquired, can be controlled to some extent by various substances—arsenic, certain colours, dyes, and combinations of arsenic and colour dyes—*e.g.* atoxyl—and by mercury. Lastly, though sometimes difficult to diagnose in its incipient stages, symptoms have been discovered which enable the expert to recognise the earlier, and, from the point of view of infection, equally dangerous stages of the disease. It may be that we are already, in these respects, in possession of the knowledge which, if energetically applied, would enable us to prevent the spread and possibly to exterminate sleeping sickness. It is by no means improbable that there are other factors at work determining the spread of the disease, of which we are at present in ignorance, and which, if ignored, might render futile any efforts, founded on a limited knowledge, we might take.

As our several countries are responsible for the good government and prosperity of tropical Africa, His Majesty's Government, feeling sure that they would be willing to cooperate in the struggle against sleeping sickness, has asked them to send you here to devise some scheme directed to this end, and by way of initiating discussion on the subject, I would submit for your consideration the following outline:—(1) Annual or biennial conferences of delegates from the several countries interested in sleeping sickness; (2) a central bureau to extract and circulate all new literature on the subject; (3) assignment of definite points for investigation to particular countries or individuals—*e.g.* (*a*) to determine whether *Glossina palpalis* is a direct or an indirect conveyer of the trypanosome; (*b*) if the trypanosome undergoes necessary developmental changes in the *Glossina palpalis*; (*c*) if such be the case, whether the developed germ be conveyed by the original Glossina or by its larva, when the latter arrives at its imago stage; (*d*) how long an infected Glossina continues infective; (*e*) whether other species of Glossina can convey the trypanosome; (*f*) the geographical distribution of the infecting species and their habits; (*g*) the *rôle* the vertebrate fauna other than man play in the spread of the infection; (*h*) the best methods for exterminating Glossina; (*i*) the best methods for preventing the introduction of the infection into virgin country; (*j*) the best methods of controlling the spread of the disease in an infected country, including segregation of the infected and removal from the infected area of those as yet uninfected; (*k*) the experimental study on animals of drugs which destroy the trypanosome; (*l*) the therapeutical application of these drugs to man.

Doubtless other points for consideration will occur to the delegates. The foregoing have been suggested merely to start discussion. In conclusion, His Majesty's Government feels sure that, unless cooperation is secured, not only will time and labour be lost by the superfluous overlapping of the uncoordinated studies of men of science, but that it will be impossible to carry out anything like a general plan in the nature of quarantine or the restriction of the movements of the native population more immediately interested in this important disease. Much money and effort are now being expended by the different European administrations, but as there is no common plan of action there must be a considerable waste of energy. It is in the hope of organising the forces of those administrations to the best advantage against the common enemy that His Majesty's Government has invited the Powers concerned to send their representatives to this conference.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—The following are the speeches delivered on June 12 by the Public Orator, Dr. Sandys, in presenting the three recipients of the degree of Doctor of Science *honoris causa* :—

(1) SIR CLEMENTS MARKHAM, K.C.B., F.R.S.

Sequitur deinceps Regiae Societatis Geographicae per annos quinquaginta quidem minister indefessus, per duodecim praeses praeclarus, cuius sub ductu Societas illa diu floruit, et non modo Britannorum in doctrinae sedibus honoris locum est adeptus, sed etiam terras remotissimas, et praesertim regionem polo Australi propinquam, exploravit. Idem quot iuuenes rei naualis peritos trans maria longinqua scientiarum finibus proferendis excitauit! Quam feliciter ipse ex intimis Peruuiae penetralibus arborem contra febrium impetus ui salutari praeditam, etiam in Indiam, populi totius cum magno commodo, transtulit! Quot regiones peragrauit, peragratas litterarum lumine illustrauit! Ergo, et sibi ipsi, et collegis suis orbem terrarum totum explorantibus, nemo melius poëtarum Latinorum uerba illa potest arrogare :—

" Quae regio in terris nostri non plena laboris! "
" Viximus insignes inter utrumque "—polum.[1]

(2) COLONEL SIR THOMAS HUNGERFORD HOLDICH, K.C.M.G., K.C.I.E., C.B.

Societatis Geographicae praesidi emerito nemo potest opportunius succedere quam praesidis ipsius uicarius, miles fortissimus, Indiae totius explorator audax, qui praesertim in tellure Russorum imperio contermina, montium arduorum inter ambages, gentium barbararum inter arma, animo intrepido regionis difficillimae, regionis prope inextricabilis, fines designauit. Idem in America Australi inter respublicas duas confines controuersiam magnam de limite communi exortam, populi utriusque non sine magno commodo, terminauit. Is autem qui scientiarum doctor hodie nominabitur, itinerum suorum libris stilo facili et facundo conscriptis, non immerito etiam laudem litterarum est adeptus.

(3) PROF. SIR THOMAS RICHARD FRASER, F.R.S.

In Uniuersitate Edinensi iam per annos triginta materiam medicam est professus uir in remediorum ui et usu inuestigando iamdudum exercitatus. Abhinc annos plus quam quadraginta de magica illa faba, physostigmate uenenoso, disputauit, et propterea Franco-gallorum ab Instituto laurea insigni est coronatus. Quid dicam de pestilentia illa per Indiam quondam grassante, ab hoc uiro per triennium audacter inuestigata? Quid de serpentium ueneno ab eodem fortiter explorato? Quid de atropia et strophantho? In medicina etiam uenena nonnumquam prodesse ne antiquis quidem prorsus ignotum. Talium autem uirorum auxilio disciplina illa, " quondam paucarum scientia herbarum," " in hanc peruenit tam multiplicem uarietatem."[2]

The election of a professor of zoology and comparative anatomy will take place on Tuesday, July 23, at the University Offices, St. Andrew's Street. Candidates for the said professorship are requested to communicate with the Vice-Chancellor on or before Tuesday, July 16.

Prof. Newton has bequeathed to the University his natural history collections and library, together with the cabinets, cases, and apparatus thereto belonging, including all his copyrights, books, pictures, prints, drawings, letters, and papers relating to natural history, to be attached, so far as is convenient, to the department of zoology. He has also left the sum of 1000*l.* to apply the annual income to the keeping up and adding to the library.

The Harkness scholarship in geology and palæontology has been awarded to L. J. Wills, scholar of King's College. The Wiltshire prize in geology and mineralogy is not awarded this year.

The general board recommends that, in place of the present lectureship in physiological and experimental psychology, a university lectureship in the physiology of the senses be established from Michaelmas, 1907, in connection with the special board for biology and geology, and that a university lectureship in experimental psychology be established in connection with the special board for moral science from the same date.

It is proposed to confer the degree of Doctor of Science *honoris causa* upon Prof. W. C. Brögger, University of Christiania; Prof. H. Credner, University of Leipzig; Prof. L. Dollo, Brussels; Prof. A. de Lapparent, Paris; Prof. A. G. Nathorst, Stockholm; and Prof. H. Rosenbusch, Heidelberg, in connection with the centenary of the Geological Society, London, in September next.

OXFORD.—The following is the text of the speech delivered by Prof. Love in presenting Prof. Paul Ehrlich for the degree of D.Sc. *honoris causa* on June 18 :—

Antiquis ea erat medendi ratio ut angores levarent vel varia molestiarum genera minuerent medicamentis usi quæ affectus contrarios excitarent: recentes id propositum habent ut abdita morborum semina iam inolescentia et in vivis medullis concreta deprehendant et exstinguant. Ita non solum morbo quo quisque laboret mederi sed ipsum corpus quasi præsidiis occupare et inexpugnabile facere conantur. In maximo hoc bello quod hodie geritur contra febres varias, velut διφθερίαν quam vocant, contra cancros, vel noxiis seminibus vel ipsius carnis corruptione ortos, nemo melius vel viam munivit vel in acie præliatus est quam Paulus Ehrlich. Victoria quidem nondum reportata est: quamvis multi hostes fusi sint, restant alii mox superandi: huic certe viro summa diligentia et prudentia prædito, salubritatis patrono et præsidi, si quid bene gestum est acceptum referre debemus: huius opera et eorum qui sub eius signis militant novos triumphos reportari posse speramus.

DR. R. K. MCCLUNG, who has been senior demonstrator in physics in McGill University, Montreal, for the past three years, has been appointed to the chair of physics in Mount Allison University in Sackville, New Brunswick, Canada.

THE following recent appointments are announced :—Dr. Kriemler, to be professor of applied mechanics at the Technical College, Stuttgart; Mr. H. Maschke, to be professor, and Mr. L. E. Dickson, to be associate professor, of mathematics at Chicago University; Mr. W. L. Reid, to be professor of mathematics at Haverford College; Dr. Philipp Furtwängler, to be professor of mathematics at the Technical College, Aachen; Dr. Wilhelm Bjerknes, to be professor of mechanics and mathematical physics at Christiania; Dr. Karl Wieghardt, to be professor of mathematics and mechanics at the Technical College, Hanover.

THE Berlin correspondent of the Times reports that the German Colonial Secretary, Herr Dernburg, recently visited Hamburg to inspect the Institute for Tropical Diseases, the Botanical Museum, and the Museum for Ethnology and Anthropology with a view to ascertain whether the city possessed facilities enough for the study of colonial and tropical questions to justify the foundation of a colonial training college. Herr Dernburg decided to recommend the establishment of such an institution, and the courses at the new college are to be open to those who desire to engage in private commercial or industrial enterprise in the German colonies, as well as to Government officials. The new institute will be modelled on the plan of existing German technical colleges. The promoters of the scheme hold that the intercourse between intending officials and young business men will contribute to the benefit of the German colonies. The State of Hamburg will for the present be responsible for the scheme, and, if the results prove satisfactory, the institution will receive official recognition in the form of an Imperial subsidy.

THE King and Queen will visit Bangor on July 9, when the King will lay the foundation stone of the new buildings of the University College of North Wales. The site of the new college, at Penrallt, is at present occupied by the residence of Principal Reichel, and this interesting feature of old Bangor will have to be demolished in order to make way for the buildings. The permanent build-

[1] Virgil, *Aeneid*, i. 460; Propertius, iv. 5 (11), 46.
[2] Seneca, *Ep.* 95, § 15.

ings fund has now reached a sum that will suffice for the erection of the arts and administrative portions, and this will enable the present college buildings (formerly the Penrhyn Arms Hotel) to be handed over entirely to the requirements of science. Thus, for a time, the college will be conducted on the lines of certain foreign universities, where the faculties of arts, science, law, and medicine are housed in separate buildings. It is hoped, however, that the completion of the new college by the erection of buildings for the faculty of science will not be long delayed. A considerable moral obligation rests on the Government to assist in this matter, more especially in view of the fact that the death duties arising out of the estate of the late Lord Penrhyn, while representing a heavy financial loss to the people of North Wales, would far more than suffice to build and equip the new college.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, May 23.—"Chemical Reaction between Salts in the Solid State." By E. P. **Perman.** Communicated by Principal E. H. Griffiths, F.R.S.

Experiments have been made on the following pairs of salts:—lead chloride and potassium iodide, mercuric chloride and potassium iodide, sodium carbonate and barium sulphate, sodium sulphate and barium carbonate. The chief points investigated were the effect on certain of these salts of (1) traces of moisture; (2) great pressure; (3) heat.

It was found that reaction always took place unless the salts were very carefully dried, and that the reaction was accelerated by shaking the mixture, and by the application of heat or great pressure; further, that the velocity of the reaction is much influenced by the solubility and volatility of the salts.

The effect of small quantities of some other solvents was also tried. It was found that methyl alcohol caused a reaction between lead chloride and potassium iodide in the same way as water, whilst benzene, chloroform, and ammonia were without result.

Finally, it would appear that reaction between solid salts is of essentially the same nature as that between salts in solution, and it is suggested that the water (or other solvent) present forms a film on the surface of the salts, and that in this film minute quantities of the salts dissolve, and there react. In the absence of an ionising solvent there is no chemical reaction, even when the substances are heated or subjected to great pressure.

Physical Society, May 24.—Prof. J. Perry, F.R.S., president, in the chair.—The measurement of mutual inductance by the aid of a vibration galvanometer: A. **Campbell.** Carey Foster's method of comparing a mutual inductance with a capacity is one of the most convenient. The advantage gained by the use of a *vibration galvanometer* in methods for measuring capacity or inductance led the author to apply it to the Carey Foster and the Hughes-Rayleigh methods. He found it was necessary with alternating currents to modify the Carey Foster method by adding a series resistance in the condenser branch; this gave an additional formula involving the ratio of a mutual and a self-inductance. This modification has been suggested by Rowland. The modified method is convenient, the two adjustments required for a balance being independent, and the result not involving a knowledge of the frequency; the use of the vibration galvanometer is an improvement, making the method independent of the wave-form of the current used. The author discussed vibration galvanometers. They belong to the class of tuned instruments. If the detecting instrument used in a null method (with alternating current) is adjusted so that its natural period is in tune with that of the applied voltage, it will be set into strong resonance and will be enormously increased in sensitivity for this particular frequency, practically ignoring in comparison all the other components of the wave-form. Thus in any method in which the tuned instrument is used, a sine wave-form may be assumed. The author exhibited a vibration galvanometer of another type, having a moving coil controlled by an adjustable bifilar suspension. By adjusting the tension of this the tuning is easily effected. For measuring the frequency to which a tuned instrument is responding, it is convenient to use the Hughes-Rayleigh method. The author showed such an arrangement in which the slide-wire was graduated directly in frequency. The author gave results of tests of a standard mutual inductance of 0·05 henry. The Kirchhoff method with direct deflection on a ballistic galvanometer, of measured time of swing, gave a mean of 0·05014 henry, while the Carey Foster method gave 0·05009 henry; the probable error of the latter was much smaller than that of the older method.—Note on the rate of decay of the active deposit from radium: W. **Wilson** and W. **Makower.** In some experiments in which the ionisation produced by the α rays from radium C was balanced against that produced by the more penetrating β and γ rays, it was found that after a short time these two ionisations were no longer exactly equal, however carefully they had been adjusted to equality at first. A similar effect had been noticed by Brousson, and was attributed to the slowly moving β rays emitted by radium B which is present with the radium C. Since these rays are emitted by radium B, whereas the α and more penetrating β rays are emitted by radium C, it is to be expected that the rate of decay as measured by these two types of radiation will be different. The authors' experiments confirm the view that the observed difference in the rate of decay as measured in the two vessels is due to the slowly moving β rays emitted by radium B.—Apparatus for relay working of long submarine telegraph cables: S. G. **Brown.** This relay system consists of three parts:—(1) the actual relaying device or drum relay; (2) an inductive shunt with closed iron circuit for use across the receiving coil to curb the signals and straighten out the zero; and (3) a method of applying a local current possessing suitable time-lag to the receiving coil to correct the tendency of signals made up of two or more impulses of the same polarity to fall away to zero due to the charging up of the receiving condenser itself.

Faraday Society. May 28.—Prof. A. K. Huntington in the chair.—Contributions to the chemistry of gold: F. H. **Campbell.** Aurous iodide, AuI, was prepared and found to decompose at 25°, according to the equation

$$2AuI \rightleftharpoons 2Au + I_2.$$

Since this equation contains only one variable, namely, the iodine, there must be a particular pressure of iodine at which AuI, Au, and I_2 are in equilibrium. This was found to be 0·943 of that of pure iodine; any solution of iodine will therefore act on gold if more than 0·943 saturated, but not if below this strength. When gold is acted on by a solution of KI and iodine, part is converted into insoluble AuI and part dissolves. The experimental results with various solutions agree with the equilibrium equations only when the gold is assumed to enter the complex ion in the monovalent condition, *i.e.* to yield AuI_2 ions. The action $3AuCl = AuCl_3 + 2Au$ was found to occur at ordinary temperatures and in absence of moisture.—Reduction of some oxides and sulphides by means of metallic calcium: Dr. F. Mollwo **Perkin.** The author first referred to the well-known powerful reducing action of aluminium, as, for example, its use in the preparation of chromium, ferrosilicon, and other metals and alloys, and its use in the form of "thermite" for welding purposes. He finds that metallic calcium is a still more powerful reducing agent than aluminium. For example, when molecular proportions of aluminium and ferric oxide are mixed together and ignited by means of a fuse of aluminium and barium peroxide, intense reaction ensues, and continues until all the oxygen has been removed from the ferric oxide, and aluminium oxide and metallic iron produced in its stead. When metallic calcium in the form of fine turnings is mixed with ferric oxide and ignited in a similar manner, the reaction is so intense that the mixture is in large part ejected from the crucible. The reaction can be brought under control by mixing 30 per cent. to 40 per cent. of calcium fluoride or 10 per cent. to 20 per cent. of calcium oxide with the contents of the crucible. Boron can be obtained by igniting a mixture of boron trioxide with the calculated quantity of calcium and 5 per cent. to 10 per cent. of calcium oxide. Attention was

directed to the difficulty experienced in causing silica in the form of fine sand to react with metallic aluminium which was in the form of a rough powder. A similar difficulty was met with in the case of boric anhydride and aluminium. Galena does not yield metallic lead and calcium sulphide, but a greyish mass which gives off sulphuretted hydrogen when acted upon with acids, lead in the form of a salt being left in solution. Red phosphorus and calcium unite with explosive violence. Sulphur and calcium also react with great vigour.

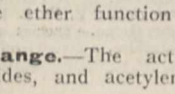
Society of Chemical Industry, June 3.—Mr. R. J. Friswell in the chair.—The nature of the changes involved in the production and setting of plaster of Paris: W. A. **Davis.** The contradictory character of the present knowledge of this problem is first discussed. Data are then adduced to show that the first change occurring in the dehydration of gypsum is the formation of a new, orthorhombic form of the dehydrate, $CaSO_4,2H_2O$, which by loss of water subsequently gives the half hydrate $CaSO_4,2H_2O$ (the essential constituent of ordinary plaster). The so-called "soluble anhydrite" is produced from gypsum, not directly as supposed by van 't Hoff, but as a product of the further dehydration of the half hydrate. The conditions under which this change occurs and the manner in which it may be reversed are dealt with in detail. In the setting of plaster, gypsum is not immediately regenerated, but the second form of the dehydrate referred to above is first produced; it undergoes change into gypsum subsequently.—Analysis of white lead: W. A. **Davis** and C. A. **Klein.** The authors have investigated the sources of error in the different methods used in the analysis of white lead. These errors are much smaller in the case of dry white lead than in that of white lead ground in oil.—Calorimeter for volatile liquid fuels. Specially adapted for petrol: W. Hansen **Rawles.** A development of the Darling calorimeter. The calorimeter, which was made for the author by Messrs. A. Gallenkamp and Co., is applicable to solid and liquid fuels.—The influence of temperature of dyeing on resolution: W. P. **Dreaper** and A. **Wilson.** Basic colours are absorbed by silk fibre in two ways. Above 40° a more permanent absorption of part of the dye takes place which increases up to 100°. A similar effect is noticed with acid dyes on silk. Preliminary boiling with water or acid does not influence subsequent dyeing at low temperatures. A similar result is obtained with direct colours on cotton, so the reaction is a general one. The effect is absent when dyeing in alcohol. Fastness against light does not follow the temperature in same way.—The loss of nitre in the chamber process, part iii.: J. K. H. **Inglis.** The author, in continuation of earlier papers, has again analysed samples of the exit gases from sulphuric acid chambers by means of fractional distillation at low temperatures. Indirect analyses were almost completely avoided, and the results show the presence of small quantities of nitrous oxide and of appreciable quantities of higher oxides, the quantity of nitric oxide being considerable when the sulphur escape is high. There is still a considerable quantity of nitre unaccounted for, its loss being either due to reduction to nitrogen or to the whole of the nitric acid not being collected in this method of analysis.

MANCHESTER.

Literary and Philosophical Society, April 23.—Sir William H. Bailey, president, in the chair.—Coal mines in Sutherlandshire: Dr. M. C. **Stopes.** The mines are of Mesozoic and not of Palæozoic age, as is the case with the vast majority of coal seams.—Science and poetry: C. L. **Barnes.** The author enumerated the principal poems handed down by antiquity, enshrining the scientific knowledge of the age which gave them birth. Among these were the "Phænomena" and "Prognostica" of Aratus, originally written in Greek, but made more familiar in Latin and French translations; Lucretius, "De Rerum Natura"; the "Georgics" and "Bucolics" of Virgil; the "Astronomicon" of Manilius; Marbodus, "De Gemmis"; Alexander Neckam, "De Laudibus Divinæ Sapientiæ"; and Philippe de Thaun, "Le Livre des Créatures." Allusion was also made to the "Canon's Yeoman's Tale," Milton's "Paradise Lost" and "Natura non pati senium"; Cowley's "Plantarum Libri Duo" and "Ode to the Royal Society"; Phineas Fletcher's "Purple Island"; Erasmus Darwin's "Botanic Garden" and "Loves of the Plants"; Rowbotham's "Human Epic," and other poems of less note.

May 7.—Prof. H. B. Dixon, F.R.S., president, in the chair.—A series of photographs illustrating the flora of Corsica, particularly the characteristic bush flora of the mountain slopes: Prof. F. E. **Weiss.** This "macchia" or "Magius" is made up largely of hard-leaved shrubs, such as the arbutus, rock-rose, tree-heath, and shrubby oaks. A comparison with the bush of Table Mountain shows certain similarities between the two floras, both in the manner of growth and in the constituent orders, such as Ericaceæ, &c.—Science and poetry: C. L. **Barnes.** Conclusion of paper read on April 23. Poems were read by Prof. J. C. Maxwell, Prof. Rankine, Archbishop Whately, and others.—The compression of gases by means of hydraulic apparatus: J. E. **Petavel.**

PARIS.

Academy of Sciences, June 10.—M. Henri Becquerel in the chair.—The petrographic constitution of the volcanic *massif* of Vesuvius and Somma: A. **Lacroix.** The petrographic constitution of these rocks has hitherto been considered as extremely simple. It is found, however, that the old volcano is not simply constituted by basic rocks and their projection products. Other rocks are present in abundance, a detailed study of which is given, showing their complex nature.—Observations made at the summit of Mont Blanc from August 31 to September 5, 1906: A. **Hansky** and M. **Stefánik.** Details are given of the atmospheric conditions, attempts at the determination of the rotation of Venus, observations on the sun, Mercury, and Jupiter.—Observations concerning the form of the satellite I. of Jupiter: José Comas **Sola.** The disc of this satellite appears distinctly elongated. This was confirmed by observations made on the night of February 28, when the conditions were exceptionally favourable. The shadows of both satellites I. and II. were seen close together on the planet. The shadow of II. was clearly circular, that of I. being elongated; the flattening is fixed provisionally at $\frac{1}{4}$.—A new Giacobini comet: M. **Giacobini.** This comet was first seen on the night of June 1 at Nice. It is badly defined, 1′·5 to 2′ extent.—A new class of surfaces: G. **Tzitzéica.**—The application of the formulæ relating to molecular volumes to the calculation of the variation of the maximum pressure of water vapour with temperature: A. **Leduc.**—The electric discharge in gases: P. **Villard.**—Some oxidising and decolorising properties of graphite: Henri Louis **Dejust.** A comparison of the decolorising powers of animal charcoal, natural graphite containing 79 per cent. of carbon, and purified graphite containing 93·1 per cent. of carbon, litmus being used as the colouring matter. The activity of the graphite is reduced by purification. Graphite shows an oxidising power analogous to that noted by M. Cazeneuve for animal charcoal.—Modified nickel acetate, a new type of excitor of oxidation for hydroquinone: André **Job.** Pure nickel acetate, heated for a long time at 100° C., loses some acetic acid, but remains completely soluble in cold water. This product acts as an oxydase towards hydroquinone, its activity in this respect being greater than that of manganese acetate. The cause of this remains unknown.—Contribution to the study of the ammonio-mercuric base: H. **Gaudechon.** This base is formed at once by the action of precipitated mercuric oxide upon aqueous ammonia solution, forming hydrates of $(NHg_2)_2O$. The hydrate with one molecule of water is stable at the ordinary temperature in a dry atmosphere, that with four molecules of water stable in a moist atmosphere at 15° C. The hydrate with $5H_2O$ can only exist in the presence of water.—The combinations of hypovanadic acid with some acids containing oxygen: Gustave **Gain.**—The relation between the diagram of the binary alloys and their malleability: Léon **Guillet.**—The mechanism of the synthesis of quinoline derivatives (Döbner's reaction): L. J. **Simon** and Ch. **Manguin.**—The ether function of diphenol,  : R. **Delange.**—The action of hydroxylamine on nitriles, amides, and acetylenic esters, and on the corresponding

β-ketonic compounds: Ch. **Moureu** and I. **Lazennec.**—The hydrolysis of salts: A. **Rosenstiehl.** From a consideration of the phenomena of the hydrolysis of esters and salts, the author concludes that the hypothesis of ionisation is unnecessary.—The existence of a tyrosinase in wheaten bran: Gabriel **Bertrand** and M. **Muttermilch.** Wheaten bran is shown to contain at least two ferments, tyrosinase and peroxydiastase.—The basic rocks of the Tschissapa range, northern Ural: L. **Duparc** and F. **Pearce.**—The pleural cavity in the elephant: Guillaume **Vasse.** A fully grown elephant killed in the province of Gorongoza showed on dissection lungs easily detached. There was no point of adherence.—An improved apparatus permitting of staying and working for a long time in irrespirable atmospheres: J. **Tissot.** In a previous note the author has detailed the conditions which should be realised in an apparatus of this kind. The present paper gives an account of an apparatus fulfilling these conditions, together with an account of its actual use in practice.—The digestion of chlorophyll and the stomachic excretion in rotifers: P. **de Beauchamp.**—The hypertensive action of the cortical layer of the supra-renal capsules: O. **Josué** and Louis **Bloch.** The cortical layer has been found to contain substances strongly hypertensive which are chemically different from adrenaline. It is possible that these substances are destined to form adrenaline later, and researches are being carried on to determine this point.—Radioscopy and radiography applied to the inspection of tuberculous meat: H. **Martel.** It is shown that the Röntgen rays may serve to detect tuberculous lesions in meat. The cutting into sections necessitated by the ordinary method of examinations is avoided, thus saving time and preventing the depreciation of the meat. Fat does not interfere.—The geosynclinal Miocene of southern Tell (departments of Algiers and Constantine): J. **Savornin.**—The Dinosauria of the Jurassic in Madagascar: Armand **Trévenin.**—The characteristics of the leaf trace of *Ankyropteris Bibractensis*: Paul **Bertrand.**

DIARY OF SOCIETIES.

THURSDAY, JUNE 20.

ROYAL SOCIETY, at 4.30.—Bakerian Lecture, On the Atomic Weight of Radium: Dr. T. E. Thorpe, C.B., F.R.S.—On the Origin of the Gases Evolved by Mineral Springs: Hon. R. J. Strutt, F.R.S.—On the Presence of Sulphur in Some of the Hotter Stars: Sir J. Norman Lockyer, K.C.B., F.R.S.—The Fluted Spectrum of Titanium Oxide: A. Fowler.—Preliminary Note on a New Method of Measuring Directly Double Refraction in Strained Glass: Dr. L. N. G. Filon.—Studies of the Processes Operative in Solutions, II., The Displacement of Chlorides from Solution by Alcohol and by Hydrogen Chloride, III., The Sucroclastic Action of Nitric Acid as Influenced by Nitrates; IV., The Hydrolysis of Methylic Acetate in Presence of Salts; V., The Discrimination of Hydrates in Solution: Prof. H. E. Armstrong, F.R.S., and others.

CHEMICAL SOCIETY, at 8.30.—Some Properties of Radium Emanation: A. T. Cameron and Sir W. Ramsay.—The Affinity Constants of Aminosulphonic Acids as Determined by the Aid of Methyl Orange: V. H. Veley.—Azo-derivatives of 1:3-Diphenylbarbituric Acid. Dynamic Isomerism among the Coloured Hydrazones of 1:3-Diphenylalloxan: M. A. Whiteley.—A Series of Coloured Diazo-salts Derived from p-Aminoaceto-α-naphthalide: G. T. Morgan and W. O. Wootton.—(1) Colour and Constitution of Azo-compounds, Part I.; (2) Colour and Constitution of Azo-compounds, Part II.: J. T. Hewitt and H. V. Mitchell.—The Oxidation of Hydrazines by Free Oxygen: F. D. Chattaway.—Calmatambin, a new Glucoside: F. L. Pyman.—The Decomposition of Hyponitrous Acid in Presence of Mineral Acids: P. C. Rây and A. C. Ganguli.—The Chemical Composition of Petroleum from Borneo: H. O. Jones and H. A. Wootton.—(1) The Synthesis of Phenonaphthacridines. Trimethylphenonaphthacridines; (2) The Condensation of Aldehydes with Mixtures of α-Naphthol and α-Naphthylamine; Synthesis of 7-Aryl $\begin{matrix}\alpha\text{—}N\text{—}\alpha\\ |\\ \beta\text{—}CH\text{—}\beta\end{matrix}$ Dinaphthacridines: A. Senier and P. C. Austin.—(1) An Improved Form of Apparatus for the Rapid Estimation of Sulphates and Salts of Barium; (2) The Determination of Sugar by Fehling's Solution: W. R. Lang and T. B. Allen.

LINNEAN SOCIETY, at 8.—On the Distribution of Conifers in China and Neighbouring Countries: the late Dr. M. T. Masters, F.R.S.—Lithothamnia of the *Scalark* Expedition: M. Foslie.—The Pre-Glacial Flora of Britain: Clement Reid, F.R.S., and Mrs. Reid.—Report on the Results obtained during the Cruise of the *Silver Belle*: Dr. R. Norris Wolfenden.—On a Small Collection of Amphipoda, and Two New Species: W. M. Tattersall.—On *Pyrosoma spinosum*: G. P. Farran.—Rare or Little-known Fishes taken by the *Silver Belle*: E. W. L. Holt and L. Byrne.—*Scalark* Coccidæ: E. Ernest Green.—Species and Ovicells of Tubucellaria: A. W. Waters.—Doridoeides, a New Genus of Nudibranchs, from the *Scalark*: Sir C. Eliot and T. J. Evans.—Stomatopoda of the *Scalark*: L. A. Borradaile.—On Triassic Species of Zamites and Pterophyllum: E. A. N. Arber.—Introduction to the Voyage of H.M.S. *Scalark*," Part ii.: J. Stanley Gardiner.—Cephalopoda of the Sudan: Dr. W. E. Hoyle.—Descriptions of Plants from Ruwenzori: E. G. Baker, S. Moore, and A. B. Rendle.—The Anatomy of the Julianiaceæ: Dr. E. F. Fritsch.—On Critical Freshwater Algæ: Prof. G. S. West.

TUESDAY, JUNE 25.

ANTHROPOLOGICAL INSTITUTE, at 8.15.—The Kanaka Skull: Dr. D. Waterston.—Instruments employed to obtain Contour Tracings of Different Aspects of the Skull: Prof. D. J. Cunningham, F.R.S.—Notes on Australian Aboriginal Paintings: F. S. Brockman.

FARADAY SOCIETY, at 8.—The Thermo-chemistry of Electrolysis in Relation to the Hydrate Theory of Ionisation: W. R. Bousfield and Dr. T. Martin Lowry.—The Influence of Non-Electrolytes and Electrolytes in the Solubility of Gases in Water. The Question of Hydrates in Solution: J. C. Philip.—The Dissociation of Hydrates as indicated by their Equilibrium Curves: Dr. A. Findlay.—Hydrates in Solution: Discussion of Methods proposed for determining Degree of Hydration: Dr. George Senter.—The Reading of the Papers will be followed by a General Discussion on "Hydrates in Solution."

PHYSICAL SOCIETY, at 8.

WEDNESDAY, JUNE 26.

BRITISH ASTRONOMICAL ASSOCIATION, at 5.

THURSDAY, JUNE 27.

ROYAL SOCIETY, at 4.30.—*Probable Papers*: On the Dynamical Theory of Gratings: The Lord Rayleigh, O.M., P.R.S.—On the Surface Tension of Liquids investigated by the Method of Jet Vibration: S. D. Pedersen.—Cases of Colour Blindness, No. VI. to No. XVIII., together with Eleven Selected Examples of Normal Colour Sensations: G. J. Burch, F.R.S.—On the Occurrence of Post-tetanic Tremor in Several Types of Muscles: Dr. D. F. Harris.—On the Pressure of Bile Secretion and the Mechanism of Bile Absorption in Obstruction of the Bile Duct: P. T. Herring and S. Simpson.—Further Studies of Gastrotoxic Serum (Progress Report): Dr. C. Bolton.—And other Papers.

FRIDAY, JUNE 28.

PHYSICAL SOCIETY, at 5.—Demonstration of the Uses of his Hot Wire Oscillographs and Hot Wire Wattmeters: J. T. Irwin.—(1) A Cosine Flicker Photometer; (2) Some Phenomena in Colour Vision: J. S. Dow.—Description and Exhibition of Students' Apparatus for Measuring Permeability and Hysteresis: Prof. W. E. Ayrton and T. Mather.—Design of Chokers: Prof. W. E. Ayrton and T. Mather.

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