THURSDAY, JUNE 22, 1905.

THE CHEMISTRY OF PLANTS.

Biochemie der Pflanzen. Vol. i. By Prof. Friedrich Czapek. Pp. xv+584. (Jena: Gustav Fischer, 1905.) Price 14 marks.

THIS work forms a new type among those on physiological botany: in some degree it resembles "Die Pflanzenstoffe" of Husemann and Hilger, and "Die rohen Stoffe des Pflanzenreiches" of Wiesner; but whereas the bias of the former is pharmacological, and that of the latter economic, the subject is treated in this volume more from the chemical standpoint.

The author states that his book is not to be regarded as a treatise or handbook for students, but as a work for reference, and that he has endeavoured to show in it what results the application of chemical methods to the problems of botanical physiology have yielded.

The subject-matter is divided into three parts—a historical introduction of 19 pages; a general part of 62 pages; and a special part of 489 pages. The general part is divided into two chapters, dealing respectively with the substratum of chemical processes in the living organism, and with the processes themselves. The first chapter treats of protoplasm and its constituents, colloids. then protoplasmic structures and their biochemical import; the second of reactions from the standpoint of general chemistry, a survey of the conditions of reactions, ionic reactions in the living cell, the velocities of reactions, catalysis, the general chemistry of enzymes, cytotoxins, and similar substances being here made.

The special part is concerned with the occurrence, metabolism, and metastasis of aliphatic substances in detail. The general arrangement of this part is in the first order chemical: the first section is devoted to fats, lecithins, phytosterins, and waxes; the second to carbohydrates, commencing with the simpler sugars, and ending with the substances forming the skeletal structure of plants. In the second order the arrangement is mixed; the chapters deal in part with the taxonomic, in part with the morphological, anatomical, and histological distribution of substances, and further with the physiology of the various bodies considered.

Photosynthesis receives considerable attention, and is regarded in all aspects; in connection with it the physics and chemistry of chlorophyll are discussed at length, and other pigments are also dealt with. The treatment of the physics and chemistry of starch is also fairly extensive. An index of the subjects and authors will be given at the end of the completed work.

The general nature and structure of the book having been reviewed, passage to criticism of it will now be convenient. A work of this kind, involving the two main ideas of chemistry and plants, requires, if it is to yield its full value, so to be arranged as to enable the composition or metabolism of a plant (in so far as this is known), as well as the distribution of a substance or a process, to be ascertained with equal ease. But this is not the case with this work owing to its arrangement; the mode of treatment is analytic rather than synthetic. In "Die Pflanzenstoffe" one volume deals with the material from the chemical, the other from the taxonomic standpoint; but this method, although very convenient, necessitates duplication. The difficulty could have been here met through use of a suitable and strictly methodical arrangement, had the divisions of various orders of magnitude been formed from different standpoints, and had those which constituted each order been of similar kind and value. The end can be still attained here by aid of a copious and well-arranged index of the subject-matter.

Printers' errors are not very numerous, and occur chiefly in the earlier part of the book.

Discrepancies and slips of the pen are noticeable here and there. For example, on p. 7 Priestley is given as the discoverer of oxygen, but on p. 12 Scheele; on p. 144 *anaërobem* should be *aërobem*; *Bedeutung* on p. 434 should be *Beleuchtung*. From the structure of a sentence on p. 39 one might suppose that ethyl-ether was insoluble in water. Further, the last paragraph on p. 313 is hardly consonant with the author's apparent acceptation of Meyer's hypothesis of the structure of starch-granules on p. 312.

Since the work is one for reference, hence a compilation, and since the author has intentionally almost entirely avoided critical remarks on the subject-matter, the reviewer can only consider the selection from a critical standpoint. It may be said, on the whole, that the selection has resulted in a very representative collection of diverse opinions on controverted questions, and in many cases almost an exhaustive one. As a result of this, condensation is, in the case of many papers, extreme, and at times there is omission; but this is almost a necessary consequence of the mass of literature consulted.

One disadvantage, which is, however, common to all books of this class, is the slight indication of the relative values of the various works cited; all emerge with equal distinctness, except in so far as more space is given to some than to others; beyond this clue there is no guide to their relative worth. This is well shown in the case of the chemistry of starch and some of the pigments; a chemist or botanist who had not devoted any special attention to these substances would rise from a perusal of the epitome here given under the impression that there was only chaos.

In connection with the chemistry of starch the author does not seem to have had at hand all the works of H. T. Brown and his collaborators, G. H. Morris and J. H. Millar, or to have grasped their views quite clearly.

Enzymes are stated to be colloidal catalysors, and their colloidal state is said to be of import. In the opinion of the reviewer there is no sufficient evidence to show that any enzyme is a colloid, and, indeed, considerable reason why many should not be so. There is even no sufficient evidence that enzymes are chemical compounds; they may be essentially mixtures, or merely functions of special conditions.

In the consideration of the action of accelerators

and retarders on amylohydrolysis, there is no mention of Ford's recent work.

Cytase is stated not to occur in resting seeds, but it is present in small amounts in some.

In giving directions for the preparation of Schweizer's solvent for cellulose, the best method, that of dissolving metallic copper in ammonia through which a current of air is passed, is not mentioned.

The function of a critic is to criticise; but he is human, and hence prone to eulogise—or blame. In this case the reviewer can only yield praise. The work fills a void that botanical physiologists have long felt. The wealth of material dealt with is surprising, and the expenditure of labour must have been enormous. There is very little evidence of partiality, whether national or of other kind. The compass of the work is wide, and it is thoroughly up to date.

The reviewer was especially pleased with the general part. For the first time in a botanical work adequate stress is put on the importance of colloids as such, and on the necessity of knowledge of their nature for progress in physiology; and for the first time the principles of general chemistry are given the position due to them in a work of this class. To Prof. Czapek for having done this all botanical physiologists must remain indebted.

In the opinion of the reviewer the value of the work would have been enhanced by incorporation in it of curves illustrating the various processes described, and by citation of mathematical expressions wherever they have been proved or found to be applicable.

If the work should run through subsequent editions, as is most likely, it would certainly be best for different authors to be delegated for various parts, since with the rapid accumulation of material it will soon be impossible for a single author to deal adequately with a work of such dimensions.

F. ESCOMBE.

THE ELECTROMAGNETIC THEORY OF INERTIA.

(1) *Mathematische Einführung in die Elektronentheorie.* By Dr. A. H. Bucherer. Pp. 148. (Leipzig and Berlin: Teubner, 1904.) Price 3.20 marks.

(2) *Experimentelle Elektrizitätslehre.* By Dr. H. Starke. Pp. xiv+422. (Leipzig and Berlin: Teubner, 1904.) Price 6 marks.

(3) *Leitfaden der Physik für die oberen Klassen der Realanstalten.* By Dr. F. Bremer. Pp. viii+294. (Leipzig and Berlin: Teubner, 1904.) Price 3.20 marks.

(1) THE property of matter which has always been regarded as most fundamental is "inertia." This property is adopted as the measure of quantity of matter in dynamics, and the nearest approach to a complete explanation of a physical phenomenon is generally supposed to have been reached when the phenomenon has been shown to be due to the motion of particles possessing inertia. We may say, in fact, that the tendency of nineteenth century physics was to give a purely dynamical explanation of everything. A striking example of this tendency is Maxwell's dynamical theory of the electromagnetic field.

In 1881 it was shown by Prof. J. J. Thomson that a particle charged with electricity possesses some inertia due to its electric charge in addition to the ordinary inertia of the particle. As the result of Kaufmann's measurements, we now know that all the inertia of an electron is of this electromagnetic kind. It is now further suggested that all matter is composed of electrons, so that all inertia is electromagnetic. Density, according to this view, is simply number of electrons per unit volume. Electromagnetic inertia, that is, all inertia, is due to the energy of the magnetic field produced by the moving charge of electricity. The energy of this magnetic field resides in the ether. According to Maxwell's dynamical theory, the electromagnetic energy of the ether is due to motion of parts of the ether, these parts possessing inertia. But the only kind of inertia which we really know is the inertia of matter, which is due to the electromagnetic action of the electrons of which matter is made up. If inertia is due to electrons, then if we ascribe to parts of the ether the property of inertia we ought to say that the ether contains so many electrons per unit volume. But the free ether is not supposed to contain any electrons; in fact, if we explain inertia by the energy of the magnetic fields produced by moving charges, then evidently to explain this energy by inertia in the ether is merely to argue in a circle. The position is, then, that inertia is explained in terms of the electromagnetic field, and that now some explanation of this field is required not involving inertia at all. So far, no such explanation has been offered. Larmor has suggested that the ether has an enormous density or inertia per unit volume, and that it moves along the lines of magnetic force. This explanation must evidently be abandoned if matter is regarded as made up of electrons having only electromagnetic energy, or else we must say that the ether has a sort of inertia, not the same as the inertia of matter, but like the kind of inertia matter was supposed to have before the electromagnetic theory of inertia was put forward.

To say this, however, is merely to ascribe to the ether a property the definition of which is that it explains what it is required to explain; it is, in fact, merely the old process of "explaining" a thing by inventing a name for its explanation. The properties of the ether, then, expressed by Maxwell's system of equations are at present without any explanation, but they have taken the place of inertia as the fundamental thing in terms of which phenomena are to be explained. In these circumstances the appearance of Dr. Bucherer's small volume on "Elektronentheorie" is exceedingly opportune. It contains a concise and readable account of Lorentz's splendid theory and of the electromagnetic theory of inertia. The introduction gives a short account of the properties of kathode rays and radium radiation, which, of course, are the properties of electrons on which the electronentheorie is based. Chapters i. and ii. contain a short account of Lorentz's theory for bodies at rest, and chapters

iii. to v. the theory for moving charges, vector analysis being used throughout. The remaining chapters deal with radio-activity, rotating charges, radiation from electrons, the Zeeman effect, the theory of Röntgen rays, aberration, and dispersion.

The mathematical theory of the properties of electrons appears to be well and clearly dealt with on the whole, and the author has managed to compress a great deal of information into a small space. English readers will probably feel that sufficient credit is not given to some English physicists to whom the initiation of the whole theory is really due. The parts of the book dealing with experimental facts and the theory of things outside the electromagnetic theory are rather superficial and sometimes erroneous. For example, it is stated that the radio-activity of radium emanation diminishes very rapidly with rising temperature, and that this can be deduced thermodynamically from the large amount of energy evolved. This glaring error shows conclusively that the author's acquaintance with the literature of radio-activity is of the slightest. The book will no doubt be welcomed by many anxious to learn about the new views on inertia and matter, and to such it should prove useful.

(2) Dr. H. Starke's book on experimental electricity and magnetism contains a very up-to-date and excellent elementary account of the subject. The explanations of many of the experiments described seem scarcely full enough to enable students actually to work from them, but it is evidently not intended that they should do so without further help. Many good diagrams of modern forms of apparatus are given.

(3) Dr. F. Bremer's book on physics for the upper classes in schools is a rather bad type of school textbook in which it is sought to make things suitable for school children by giving very short and scrappy accounts of everything. It looks like a book which might be useful to a student with a very good memory in cramming for an elementary examination in physics. He might get through the examination, but he would have learnt nothing worth knowing.

HAROLD A. WILSON.

A BOTANIST'S RECREATIONS ON THE RIVIERA.

Streifzüge an der Riviera. By Eduard Strasburger. Revised edition, with 87 coloured illustrations by Louise Reusch. Pp. xxvi+480. (Jena: Gustav Fischer, 1904.) Price 10 marks.

THE Riviera has of recent years become regarded as the playground of wealthy people whose only idea of enjoyment consists in spending hours in the unhealthy atmosphere of the casino at Monte Carlo, raising dust with a motor-car, dining at separate tables, or sitting in an hotel lounge. But such people see nothing of the *real* Riviera, with its wealth of wild flowers, its charming rock villages perched on heights, its olive, orange, and lemon groves, and its torrent beds up which one scrambles from rock to rock, passing a succession of pretty pictures each prettier than the previous one. On first reading Prof. Strasburger's book, the reviewer formed the impression that the descriptions were too prosaic and wanting in sunshine. It cannot be said that the author has succeeded in giving that warmth of colour to his account which characterises Mr. Casey's charming book. But since that impression was formed the present writer re-visited the Riviera, and the feature which he most noticed was how exactly every minute detail tallied with Prof. Strasburger's descriptions. The information contained in this book is just what is wanted to make a visit to the "Côte d'Azur" both enjoyable and instructive.

A large proportion of the text is taken up with historical accounts of the various cultivated plants and trees growing in the district. The most characteristic vegetation of the lower valleys—the vine, orange, lemon, olive, fig, cypress, and palm—is largely the result of "alien immigration." Before the hillsides were carefully terraced and cultivated they were overgrown with small scrub or "maquis" (Italian "macchia") consisting of pines, rosemary, myrtle, tree heath, three species of cistus, mastic, juniper, the characteristic spiked lavender (*Lavandula stoechas*), the remarkable spiny euphorbia (*E. spinosa*), and a number of other plants too numerous to mention. The aromatic perfume of many of these plants is one of the most salient features of the "maquis." In Prof. Strasburger's description of this characteristic undergrowth, the word "Duft" (perfume) occurs over and over again. It is only after walking through such vegetation that one realises that this very repetition makes the description all the more accurate and realistic, and readers of the book will do well to bear in mind the fact that each occurrence of the word usually refers to a different scent. Prof. Strasburger's descriptions of the "maquis" mostly refer to Antibes, where a considerable area of this primitive vegetation still remains untouched. In many places along the coast the "maquis" is being rapidly cut down to make room for unlovely vineyards, and the face of the country is being made less beautiful.

Considerable space is devoted to a description of the gardens at La Mortola, and the scent manufactories at Grasse also occupy many pages. In reading these descriptions one cannot help regarding the author somewhat in the light of a walking encyclopædia. He gives long digressions on the manufacture of chemical perfumes in connection with Grasse, and he makes his account of Sir Thomas Hanbury's garden the opportunity for giving much historical information about many economic plants such as the tea, coffee, and cocoa plants the sugar-cane—and, thence, the introduction of beet-sugar, the ebony and the camphor tree—which can hardly be regarded as the *characteristic* vegetation of the district. On the other hand, several interesting features are mentioned which a casual visitor might overlook. The characteristic flora of Hyères and the comparative absence of dust in the Esterel mountains are associated with the remarkable difference of geological formation as compared with the more frequented and fashionable but dustier winter stations in the limestone districts. The nightly concert of green frogs to which the author alludes is a sound which brings the Riviera vividly back to everyone who has heard it.

On the whole, Prof. Strasburger seems to have devoted most of his attention to studying the plants

growing in gardens and near the towns, and he does not describe many scrambles up into the distant mountains. But of the wild flowers to be found on the hillsides or up the torrent beds no better guide could be afforded than the beautiful series of coloured illustrations distributed throughout the text. It is possibly a pity that the figures are mostly printed with black outlines, and it might be thought preferable to have them printed on plates instead of mixed up with the letterpress. In addition to flowering plants, a number of the characteristic seaweeds have also been illustrated, and several charming little sketches of Riviera coast scenery, in the form of headings to the descriptions of the five different holidays spent by Prof. Strasburger on the Riviera, are a welcome addition. All these illustrations have been tastefully drawn and coloured by Fraülein Reusch.

G. H. BRYAN.

INTERNATIONAL PHYSICS.

Recueil d'Expériences élementaires de Physique. By Henri Abraham. Part ii. Pp. xii+454. (Paris: Gauthier-Villars, 1904.) Price 6.25 francs.

WE have already reviewed the first part of this collection of physical experiments, which has been gathered together under the auspices of the French Physical Society. A large number of physicists from all over the world have participated in the collaboration by sending both descriptions of experiments and bibliographical references, and the editor's work has consisted in giving as much homogeneity as possible to the products of this multiple collaboration.

The present and concluding part embraces the subjects of acoustics, optics, electricity and magnetism. On the whole, the experiments in this part are of a more difficult and elaborate kind than those previously described. This is to some extent, no doubt, due to the nature of the subjects treated. General manipulation and mechanics required less reference to be made to complicated and expensive apparatus than the subjects considered here. As a consequence of this the private student who has no access to a properly equipped laboratory will find much greater difficulties in his way. He will still find a field for work in acoustics and light. With a few springs and wires a considerable amount may be done in sound; and, in the experiments on light, homely articles like pins and champagne bottles are freely made use of. But in electricity and magnetism he must be prepared for greater outlay in apparatus. We lay stress on this point, because in our previous reference we recommended the book strongly to the private student with a taste for practical mechanics.

The present part will be found of greatest utility to the schoolmaster eager for hints in the arrangement of class and lecture experiments. One special feature in the descriptions is that in most cases the dimensions of the apparatus which have been found to work well are given. This will certainly save a teacher a great deal of time, which otherwise he would need to spend in experimenting himself in order to discover the suitable size and shape of his apparatus. We do not hesitate to say, however, that time so spent is never lost, and if in the busy workaday world of the teacher some means for saving of time is essential, it has its disadvantages.

It is usually only by the somewhat laborious method of trial and error that one learns the conditions necessary for success.

There does not seem to be much in the volume which is absolutely novel as regards style of experiment. The aim, obviously, has been to describe as simple experiments as possible illustrative of all the common laws of physics. This description is in all cases very brief. There is no introduction of theoretical considerations; nor is there any attempt to make the subject attractive to a general reader. A figure, a short account of the construction and mode of using the apparatus—that is all.

In some cases the suggestions are open to criticism in minor details. Thus, vibrating springs, which ought to be attached to a fairly solid support, are shown screwed to a slender skeleton wooden box. But in the main the suggestions seem excellent, and there are few teachers who will be able to learn nothing from them.

The diagrams are not always clear; nor are they such as to give the book an attractive appearance.

Briefly, the collection is meant for the teacher and not for the student. To the former it is commended, with the hope that he will be able to give life to these somewhat dry bones by instilling his own individuality into them.

LIGHT AND HEALTH.

The Effects of Tropical Light on White Men. By Major Charles E. Woodruff. Pp. vii+358. (London and New York: Rebman, Ltd., 1905.) Price 10*s.* 6*d.* net.

THE title of this book gives little idea of the enormous field traversed by the author, or of the amazing conclusions at which he has arrived. We understand that the work is intended for laymen as well as for medical readers, and particularly for Americans about to reside in the Philippines. No exception can be taken to the advice given by Dr. Woodruff in his concluding chapters. The necessity for opaque white clothing, and of sufficient protection to the head; the paramount importance of the siesta, and of avoidance of work and social functions in the middle of the day are recognised by Europeans living in the tropics. The suggestions as to the selection of suitable recruits for the army in the Philippines are admirable.

But it is impossible to accept many of Dr. Woodruff's deductions from the scientific observations which he so largely quotes. Even if we take it for granted that the "death-rate of a place is proportional to its sunshine and inversely proportional to its latitude, other factors being eliminated," does it follow that the death-rate is dependent upon the amount of light, and have the other climatic conditions, and especially the parasitic insect life, no influence? Dr. Woodruff would have us believe so. He informs us that light is like alcohol, tea, coffee, and other stimulants. In moderation, it is beneficial; in excess, it is harmful. "We can do without it, but our metabolism is too sluggish or defective if we do not get it." Excess of

light, we are told, produces first stimulation and then depression, neurasthenia and even loss of memory. To protect us from these terrible ills we require a skin so highly pigmented that the sun's rays cannot influence our delicate nervous organisation. The want of a sufficiency of pigment in the skin, Dr. Woodruff informs us, has played an important part in the history of the world. The decline and fall of the Roman Empire and the decay of Greece were, in his opinion, due to the fact that the military forces of these powers were largely recruited from the northern blonde races. These dominating blondes, bred under cloudy skies, were reduced to impotence because their skins were insufficiently pigmented to resist the baleful influence of the bright sun of the Mediterranean. Light, and not luxury, was responsible. It is not surprising to learn that the conduct of the schoolboys of New York is worse on a bright June day than on a cloudy day in winter, but we should have thought that the author's reminiscences of his own school days would have suggested that there were other more probable causes than the irritating effect of the chemical rays of light upon the schoolboy's nervous system.

It is difficult to criticise an author who, in considering the experimental work of Ferni, whose opinion differs from his own, says, "it seems certain that he has been misquoted, and that the fact is the reverse of what he is alleged to have said." It is surely usual in a scientific treatise to verify references, but here, as elsewhere, Dr. Woodruff appears to have been rather hurried.

While admiring the author's industry and his courage in advancing his contentions, we cannot but consider many of his conclusions unwarranted. With the remark that it is a pity that our slum babies cannot undergo such "torture," we cannot forbear quoting the following statement of Dr. Woodruff:—

"We moderns of the intelligent classes alone violate the mother's instinct to hide away in the dark with her baby, and we ruthlessly thrust it out into the sun's rays, actually strapping the poor little sufferers into their carriages and torturing them with the direct rays of the sun pouring down into their faces."

OUR BOOK SHELF.

Handbuch der Heidekultur. By Dr. P. Graebner. Pp. viii+296. (Leipzig: W. Engelmann, 1904.) Price 9s. net.

THE German word "heide," like the English "heath," is applied to very different types of vegetation. In the narrowest acceptation it signifies a district covered with dwarf shrubs where ling or heather predominates, and such a formation is not uncommonly associated with loose, sandy soil. But in north Germany "heide" implies a wood, usually a pine wood, and the same conception attaches to it in other parts of Germany, as, for instance, the Dresdener Heide. Heath is therefore not a formation according to the ecological use of the word, but is applied to land where certain physical conditions prevail, and covers not only stretches of open woodland, but also grass and other moors, and may even be extended to peats and bogs. One feature common to these different formations is the presence of humus, and this is included in the definition given by Ramann.

The suggestive views as to the formation of heaths advanced by Dr. Graebner in 1901 have become widely known, and have received very general acceptance. Heaths or moors may develop on sands or under water, but in north Germany, at any rate, and not improbably in other countries, much of the heathland has taken the place of forests. Opinions differ as to the causes which have brought about the change. Borggreve and Krause have attributed the disappearance of forests to destruction by animals, but Graebner attaches more importance to continual draining of salts into the lower layers by percolating water. Another factor, which has not been sufficiently emphasised by Graebner, is the action of those bacteria which give rise to humus in the absence of air. Want of air no less than impoverishment of the soil plays its part.

Although the book is written for the practical man, Dr. Graebner has included a certain amount of purely scientific matter where it has a bearing on economic problems, but the chapter written by Mr. O. von Bentheim is more especially concerned with practical considerations. It is evident that profitable cultivation of heath land requires not only careful and scientific farming, but in some cases success can only be attained by general cooperation of the farmers either as a society or under Government supervision. The preparation of the land for agricultural farming or for tree planting is discussed in detail; as a preliminary deep ploughing is advisable and quite necessary where moor-pan has formed. Moor-pan (Ortstein) is practically a layer of stone, which is formed when percolating water containing humates reaches layers of soil which are rich in mineral salts; the humates are precipitated, and bind the particles of soil into a stratum of stone, which as it thickens cannot be penetrated even by tree roots.

In the latter portion of the book the different formations are considered from the purely botanical standpoint according to the characteristic plants. The problems connected with the cultivation of heaths are complicated but interesting; for this reason the opinions of Dr. Graebner, who has made a careful study of the subject, are the more valuable.

I Nuovi Indirizzi e le Promesse della Odierna Antropologia. By Fabio Frassetto. Pp. 71. (Castello: C. E. S. Lapi, 1905.) Price 3 lire.

THIS little work consists of a series of four lectures which the author delivered as an introduction to his course of anthropology in the 1904–5 session of the University of Bologna, where, after a break of twenty years, he has taken up the work begun by Sergi before his removal to Rome. Appropriately enough, the first lecture of the four deals with Sergi and his principles of skull classification, and sketches very briefly the types and the deductions which Sergi draws from them—Eurasian and Eurafrican forms, and five species of pygmies—at the same time pointing out that many of these views are only provisional. Dr. Frassetto holds that just criteria of race are of the utmost importance, not only for the sociologist, which most inquirers would be prepared to admit, but also for the medical man, who will more readily diagnose the maladies which he has to treat, in proportion as racial morphology and pathology are determined with precision and at the same time it becomes possible to classify the individual patient from an anthropological point of view. If he is too sanguine in this, another point on which Dr. Frassetto insists does not seem beyond the range of practical politics; this is the development of pædagogic anthropology, which shall regulate the education of the individual child by scientific principles. Even here, however, at any rate in our own case, the problem of feeding the child and of providing it with a healthy body will probably

occupy the first place for some time to come, so far as elementary education is concerned.

The second lecture deals with the work of Maggi and the morphology of the cranial bones. This is a subject on which Dr. Frassetto has himself published some valuable studies. He would have done well to indicate in his lecture that some, at any rate, of the new views on the number of centres of ossification are based on what seems to be an unduly small collection of cases. The third lecture treats of de Giovanni and his work in clinical anthropology, which deals with a patient according to his morphological characteristics rather than as an individual. Finally, we have a sketch of the work of Lombroso on criminality and genius. Dr. Frassetto insists on the need for scientific treatment of criminals, especially those of the habitual class.

It goes without saying that in brief studies of this sort we only find the broad outlines, without qualification or hint of difficulties, and herein lies perhaps a certain danger for the unfledged anthropologist who attends the academic courses. The book is, however, readable, and offers an example to English anthropologists who wish to interest a larger public.

N. W. T.

Catalogue of the Lepidoptera Phalaenae in the British Museum. Vol. v. Catalogue of the Noctuidæ in the Collection of the British Museum. By Sir George F. Hampson, Bart. Pp. xvi+634; pls. lxxviii–xcv. (London: Printed by Order of the Trustees, 1905.)

WE congratulate the authorities of the British Museum and the indefatigable author on the steady progress of this important work, of which a fresh volume appears, with almost clockwork regularity, every two years. The present volume is the second devoted to the Noctuidæ, and contains the second subfamily, the Hadeninæ. These are much less showy moths than those dealt with in the first three volumes of the series, and are more subdued in their colouring; but they are perhaps more interesting to British entomologists, for the family is fairly well represented in the northern hemisphere, although in a work devoted to the moths of the whole world, British, or indeed European, species are few and far between. The work is profusely illustrated, the descriptions are full but not too lengthy, and short notices of larvæ, where known (some of which are here published for the first time), have been included. The keys to the genera and the tables of species will also be found very useful by working entomologists. A table of the phylogeny of the 78 genera into which the author divides the Hadeninæ is given on p. 2, but without comment, which we think is wise, for such tables, in the present state of our knowledge, can only be tentative; and comments on the supposed affinities of genera have often a tendency to become too dogmatic.

Synonymy cannot, of course, be given in full in a work of this character, but in the case of European species, which are most burdened with it, the necessity for further details is largely obviated by a reference to Staudinger's last catalogue; still, we think that, in the case of the few British species, Barrett's "Lepidoptera of the British Islands" might have been referred to.

We heartily commend this important book to the working entomologists of all countries. Five volumes have already appeared, but if it is ever completed it will certainly far exceed in bulk the twenty-seven volumes of the "British Museum Catalogue of Birds." Hitherto it has been wholly the work of one man, and we hope that when he finally lays down his pen, a very large proportion of the gigantic task of describing the moths of the world will have been accomplished by his hands.

LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of* NATURE. *No notice is taken of anonymous communications.*]

The Spinthariscope and Retinal Excitability.

I HAVE recently been making a series of observations upon retinal excitability, and have used, among other test stimuli, the well known flashing scintillations of a pocket spinthariscope. The special value of the instrument in this connection is the subminimal or minimal intensity of the retinal excitation judged by the disappearance or appearance of visual sensation. The method used by physiologists for ascertaining whether any given condition alters the excitability of a tissue is that of stimulating periodically the tissue by subminimal or minimal exciting agencies under constant conditions and then changing one of these conditions; if, as the result of such change, the subminimal or inadequate stimulus becomes adequate, the excitability of the tissue has been raised by the change; if, on the other hand, the minimal or adequate stimulus becomes inadequate, then the excitability of the tissue has been lowered by the change.

It is well known that with the ordinary pocket spinthariscope no luminous effects are seen unless the eye has been rendered sufficiently sensitive by some minutes' darkness; this is especially the case during the daytime, the effects at night being almost instantaneously visible. The stimulation of the retina by the scintillating flashes is thus of the minimal order, and becomes subminimal when the eye is exposed to daylight.

It is thus possible to place the eye under different conditions, and to determine by means of the visibility of the flashes in the spinthariscope whether the retinal excitability has been raised or lowered; the method has the merit of great simplicity, all that is necessary being to go into a dark room and immediately look through the instrument; the time necessary for the appearance of the first visible luminosity and for the full appearance of the flashes is longer the lower the general excitability of the retina.

A further point of physiological interest is brought out by simple experiments along these lines. It is well known that when the eyes at night look at groups of stars, faint groups not in the direct line of vision are distinctly seen which disappear when the gaze is directed towards them. There is an accumulating mass of evidence that this familiar experience is the sensory aspect of a modified condition of the retina, the modification consisting in an augmented excitability of the peripheral portions of the retina. It appears probable that such peripheral augmented excitability is localised particularly in the outer segments of one set of retinal elements, the rods, which contain the visual purple discovered by Kühne. The rods are extremely numerous in the peripheral region, and constitute the sole elements in nocturnal birds such as the owl. The visual purple of the rods is blanched by light, especially by the more actinic rays, but the blanching disappears with darkness, and this re-constitution of the substance is associated with the presence of the choroidal pigment. There is thus an adaptation process which renders the dark-adapted eye more excitable than it otherwise would be, and this augmented excitability is especially prominent in that part of the retina which contains large quantities of rods, viz. the peripheral portions. The specialised elements of the central part of the retina (macula lutea) consist in man almost entirely of cones; it is undoubted that in daylight this part is the most excitable region, and that it possesses to a remarkable degree the capacity of localised response, thus enabling two sources of light to be discriminated as distinct when so near together that they subtend an extremely small angle. At night, or with the dark-adapted eye, the whole condition is modified, and the peripheral part of the retina has its excitability augmented more than the central part, so that sources of light of subminimal intensity for the latter are adequate to excite the former; these facts are readily demonstrable by means of the spinthariscope.

Thus if in the day time the observer takes the spin-

thariscope into a dark room he will notice that the first visible effect is a slight general luminosity when the visual gaze is directed down the optical centre of the little tube. If, however, the gaze is shifted to the side of the tube, the whole spinthariscopic display with its scintillating flashes becomes distinctly visible. On opening the door of the dark room and going into the daylight the subsidence of the central and peripheral responses can be followed, whilst on returning to the dark room the re-appearance, first peripheral and then central, can be observed with great distinctness. The essential difference between the light-adapted eye and the dark-adapted eye is thus readily demonstrable, and the rapidity, as well as the efficiency, of such adaptations can be easily followed if the eye is subjected to appropriate periods of darkness and of light.

It is evident that with such a minimal test the influence of a large number of other conditions may be investigated. Without going into these, I may mention one of considerable interest. If the observing eye is kept in the dark-adapted stage by means of a removable bandage, whilst the other eye is subjected to periods of darkness followed by daylight illumination, then the visible effects in the dark room still indicate modification. In my own case illumination of one eye causes a distinct lowering of the retinal excitability of the other one, this being especially characteristic of the peripheral region of the retina. In this connection it should be remembered that the pigment cells alter in the frog as the result of illumination, and that this alteration has been shown by Engelmann and v. Gendre to occur when, the eyes being kept dark, the skin of the frog is illuminated; one eye thus influences the other. The spinthariscope with its constant minimal excitation affords a means of demonstrating this consensual effect. It appears to me that with slight modifications the instrument may become of considerable clinical value. For clinical use it has the merit of being portable and easily used. It furnishes, with no apparent decrease through time, use, &c., a constant and continually recurring stimulus which is of threshold exciting value. It can be easily applied to either the central or peripheral portions of the visual field, and gives indications which are comparable with each other, and are only altered through alterations in retinal excitability. No doubt it can be modified in form so as to be still more useful from the clinical point of view, but even in the form in which, as a scientific toy, it is now presented, its use will show whether the central or peripheral retinal excitability is abnormal, and I anticipate that before any changes can be observed with the ophthalmoscope, it will be possible by its means to ascertain alterations in retinal excitability in the early stages of disease. FRANCIS GOTCH.

Physiological Laboratory, Oxford, June 10.

Solar Changes and Weather.

IN NATURE of June 8 (p. 129) Dr. Lockyer says:—"*Up to the present time*" (italics mine) "those who have been attempting to explain variations of weather on the supposition of solar changes have been looking for the effect of solar action as either increasing or decreasing simultaneously the rainfall over the whole earth."

This is, I think, somewhat inaccurate. The possibility of a given phase of solar change being causally related to opposite weather conditions in different regions has been recognised by many, if I mistake not, for a considerable time. I might instance M. Angot, who expressly affirms it in his "Traité de Météorologie," published a few years ago; and what he there says on the subject indicates a certain currency of the idea previously, of which (no doubt increasing) currency back volumes of NATURE and other serials give evidence. The idea of a barometric see-saw in Asiatic regions, connected with sun-spots, was discussed in NATURE so far back as the 'seventies, if I remember rightly. A. B. M.

WITH regard to Mr. A. B. M.'s remarks above, may I, in the first place, mention that I am familiar with some of the meteorological researches of such high authorities as Chambers, Meldrum, Blandford, Eliot, Hann, Angot, &c., but still there seems to be a tendency for the solar changes, that is, changes indicated by sun-spots, to be considered as affecting the whole earth simultaneously at any one epoch. It would have been more correct for me to have written "Up to the present time many of those who have, &c.," than "Up to the present time those who have, &c.," but at the time of writing I was considering more the generally conceived impression as to the relation between sun-spots and meteorological changes than the results of investigation of any particular region on the earth's surface.

To take a case in point, two years ago M. Charles Nordmann (*Comptes rendus*, vol. cxxxvi., p. 1047, May 4, 1903) communicated to the Paris Academy of Sciences a paper entitled "La Période des Taches solaires et les Variations des Températures moyennes annuelles de la Terre." This title implied that the solar changes were affecting the whole earth similarly, but the investigation was only restricted to the equatorial regions, where the conditions are most favourable for such an inquiry. Further, I am inclined to think that the result he obtained will be found to apply only to that portion of this equatorial belt lying between about longitude 40° E. and 140° E. The reason for this is that out of the thirteen stations in all which he employed, eight were included in this region (five stations of which were given double the weight of the others), and only five were situated in the other part of the belt. If it were possible to include more stations in the western hemisphere, the relation between temperature and sun-spots which he obtained might probably be reversed. WILLIAM J. S. LOCKYER.

Solar Physics Observatory, South Kensington.

Fictitious Problems in Mathematics.

ON reference to § 156 of "Rigid Dynamics," it will be seen that the definition there given is identical with that contained in Dr. Routh's letter of May 25, with the exception that the words "When the bodies . . ." occur in my edition instead of "When bodies . . . ." No statement is made as to what is meant by saying that *a body* is perfectly rough, and it is against this latter mode of expression that my attack is directed. For this reason it may be maintained that the definition given in the book in which the problem occurs is inapplicable to the problem as at present worded. Otherwise we appear to be dealing with a plank such that in the given circumstances, one of which is resting on a smooth table, the amount of friction necessary to prevent sliding can certainly be called into play, and this is apparently inconsistent with Dr. Routh's interpretation.

I would challenge your correspondent, "An Average College Don," to point to any text-book containing an explicit definition of *a* perfectly rough *body* (not *bodies*); also *a* perfectly smooth *body*. If he succeeds, I anticipate no difficulty in furnishing him with examples of questions which are either inconsistent with his definition, are ambiguously worded, or are open to some equally serious objection. G. H. BRYAN.

History of a White Rhinoceros Skull.

THE interesting specimen of the skull of the white rhinoceros (*R. simus*) referred to by Prof. H. F. Osborn, of the American Museum of Natural History, New York, in NATURE of June 8 (p. 127), was, thanks to the kindness of Mr. Graham, carefully examined by me before its sale. Its chief interest lay in the fact that the horns had never been detached, and consequently showed the true position of the nasal horn in this species; it was at right angles to the downward sloping surface of the nasal bones, thus bringing it into a most efficient position for attack.

There is a fine skull of this species in which the horns have been placed in their true position; it is numbered 2154 in the osteological series of the Museum of the Royal College of Surgeons. The animal was shot by Gordon Cumming.

The length of the nasal horn is 860 mm. (34 inches).

C. STEWART.

The Romance of the Nitrogen Atom.

WITH reference to the interesting letter by Dr. Irving in NATURE of June 15 on "The Romance of the Nitrogen Atom," I should like to point out that ammonia is not so stable as is sometimes imagined. I have shown recently not only that ammonia decomposes slowly at a temperature of about 700° C., but that the decomposition is *irreversible* (*Proc. Roy. Soc.*, June), so that it will proceed until no ammonia remains. The rate of decomposition decreases rapidly with temperature, but it appears probable that even at the ordinary temperature of the air the decomposition must still proceed, although with excessive slowness. A mixture of nitrogen, hydrogen, and ammonia would thus appear to be in "false equilibrium," in the same way as a mixture of hydrogen, oxygen, and water vapour, but in the opposite sense. The "silent discharge" will decompose as well as synthesise ammonia, and brings about a state of equilibrium. Sparking has also the same effect. In these cases the equilibrium is a true one, so long as the experimental conditions remain unaltered, and it ensues when the rates of formation and decomposition of the ammonia are equal. E. P. PERMAN.

University College, Cardiff, June 17.

Notes on the Habits of Testacella.

UNDER the above heading in NATURE, vol. xxxiv. p. 617 (October 28, 1886), Prof. E. B. Poulton recorded the capture of twenty-two specimens of this rare slug upon a wall in Oxford. On that occasion there had been exceptionally heavy rains, and it was suggested that the animals had been driven out of their usual habitat, the earth, as it became sodden with moisture. I am in a position to confirm the accuracy of this suggestion. Last evening I captured five specimens of *Testacella haliotidea* upon a stone wall near Charterhouse. The slugs were apparently crawling out of the ivy which thickly clothes the top of the wall, and were making their way back to the earth. During the previous eight days no less than 3·80 inches of rain fell at this place. It seems probable that the slugs had taken refuge in the dense shelter of the ivy while the soil was unfit for them, and that on the return of hot, dry weather were once again seeking their subterranean quarters. OSWALD H. LATTER.

Charterhouse, Godalming, June 15.

Researches on Ovulation.

I SHOULD be greatly obliged if you would allow me to state in your Journal that the paragraph on "ovulation" in relation to œstrus on p. 517 of my text-book on the "Vertebrata," which was issued in March last, contains references to discoveries which were at that time unpublished, and that by inadvertence I omitted to direct attention to this. The information was supplied to me by Mr. Walter Heape. The facts relating to rabbits were discovered by him, those relating to ferrets and dogs by Mr. F. H. A. Marshall. These observations, with others, have recently been separately communicated to the Royal Society for publication in the Proceedings. A. SEDGWICK.

Trinity College, Cambridge, June 16.

ABORIGINAL METHODS OF DETERMINING THE SEASONS.

AN important and timely confirmation of the astronomical significance attached to the stone circles of Britain, and to the pyramids and temples of Egypt, comes from the Far East. From an interesting paper (*Journal of the Asiatic Society*, Straits Branch, January) by Dr. Charles Hose, who has made a special study of the subject, we learn that the natives of Borneo are at the present day using just the same general principles in determining the advent of their agricultural seasons as were used by the early Britons and the ancient Egyptians between one and two thousand years B.C. It will be remembered that, in Greece, Mr. Penrose observed (see NATURE, April 6) that the Hecatompedon and the older Erechtheum, built about 1495 B.C. and 2020 B.C. respectively, were oriented to the cluster of the Pleiades at its heliacal rising on May morning. In Egypt, Sir Norman Lockyer found that the same asterism, as the deity Nit-Isis, was probably employed as the warning star for sunrise at the vernal equinox ("Dawn of Astronomy," 1894, p. 388).

Although in Great Britain there are a great number of stone circles, their astronomical significance has, until quite recently, not been satisfactorily understood. However, the recognition of Stonehenge as a solstitial temple (*Proc. Roy. Soc.*, vol. lxix. pp. 137–147) led to an inquiry into their possible character as observatories, used by priest-astronomers to determine the advent of the seed-time and other festivals, and the investigation met with gratifying results at the outset. In the case of "The Hurlers," a group of three stone circles situated near Liskeard, in Cornwall, *prima facie* evidence was found that they were arranged in their present positions, and the stones around them placed in accordance, so that the officiating priesthood could announce to the people the arrival of the crucial seasons in the agricultural year. Among the stones used as azimuth marks at "The Hurlers," there is one with an amplitude of E. 11° N., which would mark the exact heliacal rising of the Pleiades on May morning about the year 1600 B.C. (*Proc. Roy. Soc.*, March 30). In addition to the Pleiades, it has been found that the belt of Orion was frequently used as the warning sign.

Now we learn from Dr. Hose's researches that, at the present time, the natives of Borneo, more especially the Dyaks, are using the same stars in much the same way to determine the season of the year ordained by the local meteorological conditions as the time for the preparation of the ground on which they hope to grow their food supply for the ensuing twelvemonth. During the semester October to April the prevailing wind in Borneo is from the north-east, and brings rain with it; during the other six months of the year the direction of the prevalent wind is changed, but it brings none of the month-to-month variations of conditions which—in lieu of more refined knowledge—would lead the agriculturist of the temperate zones to a more or less approximate knowledge of the season.

In Egypt it was the advent of the Nile flood which fixed the seed-time, and for which the celestial heralds were observed; in Britain it was, as it is now, the advent of the warm, sunny weather that was the matter of importance; in Borneo it is the commencement of the driest season that has to be recognised, because the land which is to be cultivated is overgrown by jungle or forest, and, before seed may be sown thereon, a clearance must be effected. Like the Malayans, the Dyak might use the moon as his indicator, but then, like the Malayans, he would probably get about eleven days wrong every year, a serious matter where the dry season is of short duration. The variation of the length of the day is too small in the tropics to give a definite cue as to the commencement of any special season. Consequently, the Dyaks and many of the smaller neighbouring tribes have recourse to the stars, and the stars chosen as the heralds are the Pleiades ("bintang banyak") and Orion's belt ("bintang tiga"). The native names are borrowed from the Malays, and this probably indicates that the similar use of these stars is not totally unknown among the latter. The alternative expression used by the Dyaks in naming the Pleiades is "Apai andau," meaning "the father of the day," probably so called because it is the heliacal rising of them that the natives watch for before commencing their clearing process. In Borneo it is, at present, merely an observation of the Pleiades

themselves that is made; the subsequent sunrise has no urgent interest for them; but in Egypt and Britain the stars were simply the heralds of the greater luminary for which the religious sacrifice had to be prepared by the priests.

The method of making the determination is as follows:—The surrounding terrestrial phenomena suggest the approach of the dry season, and two men are then sent into the jungle—which probably means any open space with a clear horizon—to await the celestial sign. After watching for a few nights, may be a month, the Pleiades are seen on the horizon just before the light of the rising sun overcomes that of the stars. Then the messenger-astronomers return to their village and announce the fact, and the work on the forest is commenced. Should the tribe have been so misled by the workings of terrestrial nature as to delay the making of the observation until Orion's belt rises before daylight, it means that they must work "double-shift" in order to get their ground cleared in time for the vegetable matter to dry thoroughly ere the season for burning it comes round. After this recognition of the season the interest of the tribe in celestial phenomena becomes dormant until the services of the latter are again required. Not until the Pleiades reach the zenith before sunrise do they consider it advisable to set fire to the refuse, for unless the latter has had enough time to dry thoroughly it will not be completely consumed, and the ground will be of no use for rice-growing.

With the neighbouring tribes, the Kenyahs and the Kayans, the method of determining the seasons is rather more scientific, exhibiting an advanced state of knowledge. These people are acquainted with the various phenomena attending the apparent diurnal and annual movements of the sun. They know that the noon shadow is the shortest, and that it always lies in the same straight line, sometimes to the north, sometimes to the south. Consequently, they utilise this knowledge by measuring either the length of the shadow cast by a gnomon set up vertically on levelled ground, or else the length of a beam of sunlight projected through a small hole in the roof of a hut upon a plank, laid horizontally on the floor by packing it up until round discs will not roll when placed on edge on its surface. The shadow, or beam of light, is measured by means of a stick, on which there are a series of notches. The distance of each notch from the end of the stick represents the length of shadow which experience, tinged, maybe, with superstition, has taught these people to recognise as favourable, or the reverse, for the prosecution of their various agricultural operations. The stick, known as "asa do," is carefully preserved in the keeping of an older member of the tribe, duly elected to this office on account of his superior wisdom and his incapacity for more strenuous manual labour, and it is he who watches that the beam is not measured obliquely, and announces the advent of the favourable season for sowing operations to commence.

A striking phase of the question, showing how limited is the original knowledge, possibly appears in the selection of the Pleiades and Orion's belt as the "warners." Why should these two groups be selected by so many different tribes in so many widely separated ages? A plausible explanation seems to be that their forms are instantly recognisable. Whilst the aboriginal watcher would probably not be able to recognise the isolated, though bright, stars of the large constellations, especially if, as is the case with the Dyaks, no azimuth marks were employed, he could not possibly confuse either of these with any other group of stars.

WILLIAM E. ROLSTON.

THE FOURTH INTERNATIONAL ORNITHOLOGICAL CONGRESS.

THE International Ornithological Congress assembled in London on Monday, June 12, under the presidency of Dr. R. Bowdler Sharpe, and continued in session to the end of the week. The congress was instituted at Vienna in 1887 under the patronage of the Crown Prince Rudolph of Austria. The second congress was held at Buda-Pesth, and the third at Paris in 1901, so that the London congress was the fourth of the series. It was well attended by both British and foreign ornithologists—to the number of rather more than 300. They commenced their work on June 12 by an informal meeting at the Imperial Institute, South Kensington, which was the headquarters of the congress during its session.

The British ornithologists were well represented by Dr. Hartert, of Tring, and Mr. Bonhote, of Cambridge, who acted most efficiently as secretaries, while Mr. C. E. Fagan, of the British Museum, looked after the finances as treasurer. These gentlemen were assisted in their duties by Dr. Godman, Mr. Meade-Waldo, Mr. Ogilvie-Grant, Dr. Penrose, the Hon. Walter Rothschild, Dr. Sclater, and Mr. Witherby, who were all members of the organising committee. Many other well known British ornithologists attended the meetings, such as Sir Walter Buller, Dr. Butler, Mr. Dresser, Colonel Godwin-Austen, Mr. Harting, Mr. Pearson, Mr. Pycraft, Mr. Howard Saunders, and Mr. D. Seth-Smith. The French ornithologists were represented by Dr. Oustalet and Dr. Burcau, the German by Graf Hans v. Berlepsch, Dr. Blasius, and Prof. Reichenow, the Dutch by Dr. Büttikofer and Baron Snouckaert van Schauburg, the Austrian by Dr. Lorenz and Dr. Reiser, and the Italian by Dr. Giglioli and Count Arrigoni degli Oddi. From America came Mr. F. M. Chapman and Dr. Stejneger, from Switzerland Prof. Fatio and Dr. Studer, from Russia Dr. Bianchi and Baron Loudon, from Bulgaria Dr. Paul Leverkühn, from Canada Mr. Fleming, from Hungary Dr. Herman, and from Belgium Dr. A. Dubois, all names well known in ornithological science.

The first general meeting of the congress took place in the morning of June 13, when Dr. Oustalet, the last president, gave up the chair to Dr. Bowdler Sharpe, the new president, who delivered a most instructive address on the origin and progress of the great national bird-collection in the British Museum, which is under his charge. The meeting was then divided into five sections:—(1) systematic ornithology and distribution; (2) migration; (3) biology and oology; (4) economic ornithology; and (5) aviculture, which sat at stated periods throughout the week. To the first section, which was presided over by Dr. P. L. Sclater, F.R.S., about fourteen communications were made, among which were papers by Graf v. Berlepsch on new neotropical birds, by Mr. Pycraft on the importance of the study of nestling birds, which was illustrated by various pregnant instances of the secrets they have already revealed and are likely to betray in the future, and by Padre Schmitz on the birds of Madeira. In this section also, Dr. Reiser, of Serajevo, exhibited the series of North-Brazilian birds which had been obtained during Dr. Steindachner's recent expedition to the Rio St. Francisco, and Mr. Walter Rothschild showed his unique copy of "Les Voyages de Sieur B.," with the map attached, which contains much information on the now extinct birds of the Mascarene Islands.

In the second section, which met on Tuesday and Saturday, with Dr. Herman, of Buda-Pesth, in the chair, Mr. J. H. Fleming gave particulars of an unusual migratory visit of Brunnich's murre to the

interior of Canada, and Dr. Helm brought forward some new observations on the migration of the starling in Germany.

The third section, for biology, nidification and oology, was presided over by Dr. Victor Fatio, of Geneva, and received communications from the Rev. C. R. Jourdain on erythrism in eggs, and from Dr. R. Blasius on the bird-life of the Pyrenees. In this section also, Mr. Frank M. Chapman, of New York, delighted his audience by his vivid description of the breeding-places of the scarlet flamingo and brown pelican in the Bahamas, which he had lately visited, and by his excellent photographic illustrations of these birds and their nests.

Mr. H. E. Dresser took the presidential chair in the fourth section, which was devoted to economic ornithology and the protection of birds, and was well attended. Papers were read here by Dr. Herman on his recent observations on the constituents of the food of birds, by Sir John Cockburn on the legislation that had taken place in Australia for the preservation of bird-life, and by Mr. T. Digby-Pigott on the present state of the laws on the same subject in Great Britain and Ireland, which seem to require careful revision. Mr. Frank E. Lemon, secretary of the Royal Society for the Protection of Birds, also lectured on the same subject.

In section five (aviculture) the communications were not so numerous, but Mr. D. Seth-Smith, the editor of the *Avicultural Journal*, did not omit to urge the importance of his special branch of ornithology as an aid to scientific study, which, indeed, is now generally admitted.

Besides the sections, general meetings were held on the Wednesday and Friday, at which various ornithological topics of general interest were discussed. Papers were read by Dr. Paul Leverkühn, of Sophia, on the breeding-places of the vultures and eagles in the Balkans, by Dr. Herman on the state of ornithology in Hungary and on the theory of the migration of birds and its origin, and by Mr. J. L. Bonhote on the hybridisation of ducks; while Mr. W. S. Bruce gave an interesting account of the ornithological results of the Scottish Antarctic Expedition which are now being worked out. Besides these papers, Dr. Edward Wilson gave an excellent lecture on the birds obtained and observed in the Antarctic seas and lands during the recent National Antarctic Expedition, and showed off the manners and customs of the penguins in a long series of photographs.

Thursday, June 15, was entirely devoted to a visit to the great zoological museum at Tring, of which the birds (under the curatorship of Dr. Hartert) form one of the most prominent features. It is needless to say that the ornithologists were most hospitably received and entertained by Mr. Walter Rothschild, who further delighted the visitors by a lecture on birds extinct or likely soon to become so, one of his pet subjects of study. This lecture was illustrated by the exhibition of a splendid series of specimens of the birds in question, for which the Tring Museum is celebrated, and by numerous drawings collected from every quarter whence information on this subject could be obtained.

At the final meeting, held on Saturday, June 17, it was agreed that the next assemblage of the International Ornithological Congress should take place in 1910 in Germany, with Dr. Reichenow, of Berlin, as president, and Dr. R. Blasius and Graf Hans von Berlepsch as vice-presidents. It was hoped that the meeting would be held at Berlin, but the president and vice-presidents were authorised to select any other city in Germany as the place of assemblage in case they should find it more expedient to do so. It was also agreed, on the motion of Mr. Walter Rothschild, to send telegrams to the Governments of Tasmania and New Zealand requesting them to interfere with the destruction of the penguins in the Antarctic islands now carried on in order to obtain the small quantity of oil which is contained in the bodies of these unfortunate birds.

THE THAMES FLOW AND BRITISH PRESSURE AND RAINFALL CHANGES.

DURING the years 1903 and 1904 there appeared two reports dealing with the flow of the Thames in relation to the rainfall of the river's basin, the first being published by the London County Council and the second by the Thames Conservators. The material dealt with extended over the period 1883 to 1903, and the very close association between rainfall and flow was clearly brought out.

In a recent communication to the Royal Society by Sir Norman Lockyer and the writer, an attempt has been made to discuss data from the year 1860 up to the present time, involving not only statistics of rainfall over a wider area than that dealt with in the above mentioned inquiries, but changes of barometric pressure in Great Britain and certain distant areas.

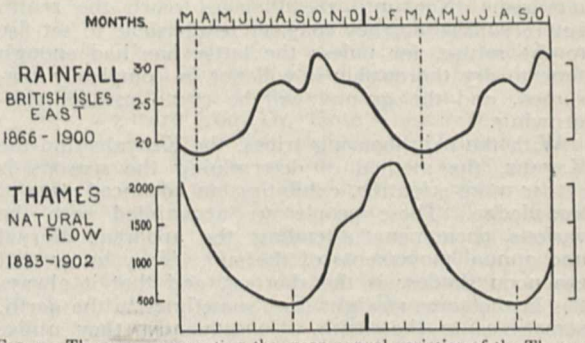

FIG. 1.—The curve representing the mean annual variation of the Thames flow lags five months behind that of the mean annual rainfall of the British Isles.

In consequence of the fact that the British annual variation of rainfall is at a minimum in about April and a maximum in about October, the rainfall observations have been grouped into twelve months extending from April to the following March, both months inclusive. The annual variation of the river flow (see Fig. 1) for similar reasons necessitated a different grouping of the twelve months; in this case the year was taken to cover the period September to the following August, both months inclusive. The flow of the river will thus be seen to lag five months behind the rainfall.

In the following curves here reproduced the rainfall for each group of twelve months (April to March) is compared directly with the river flow for the twelve months commencing in September of the same year.

Re-computing the rainfall and river statistics, published in the above mentioned reports, according to these new divisions of the year, the changes from year to year can be seen in Fig. 2 (curves iii. and iv. continuous lines). To investigate variation in the river flow previous to 1883, an application to the Thames Conservators resulted in securing original data which have enabled the curve to be traced back to the year 1860 (Fig. 2, curve iii., dotted portion). As a check on the whole of this curve another series of gauge readings was similarly treated, and these are shown in curve ii. The synchronous variations in

the two curves thus indicate that either curve may be taken to represent the flow changes.

In the above mentioned reports the curve representing the rainfall of the river basin from 1883 (curve iv.) was deduced from the statistics of twelve stations covering a comparatively small area. It happens, however, that these rainfall variations in this valley are not restricted to this region alone, but are similar to those which occur over a very large area in the British Isles. By employing the Meteorological Office records, and computing them according to the present adopted system of grouping of months, curves can be obtained which commence in the year 1866. Investigation has shown that this type of variation is nearly common to England S., Midland Counties, and even the combination of Scotland E., England N.E. and E., and the Midlands, as can be gathered from the curves in Fig. 2 (curves v., vi., vii.).

The other districts in the British Isles (with the exception of Scotland N., which is different from all other districts in these isles) are of a type similar to each other, but present variations which, although not widely different from the eastern and other districts, are sufficiently unlike them to be classified apart.

The rainfall of the British Isles is produced mainly by the passage of areas of low pressure travelling over the country in a north-easterly or easterly direction. It should therefore be expected that on the average the greater the rainfall the more numerous the cyclones, and consequently the lower the mean value of pressure. In the United Kingdom, therefore, the rainfall variations from year to year should correspond very closely with the *inverted* pressure changes. That this is so can be seen by comparing the *inverted* Oxford pressure curve in Fig. 2 (curve viii.) with the rainfall curves underneath. Instead of Oxford, any other town in the United Kingdom, such as Armagh, might have been taken (curve ix.), for the pressure changes are so remarkably similar over a very wide area.

It will thus be seen that the pressure, rainfall, and river flow are all intimately related, and any method of forecasting pressure would make it possible to determine beforehand the rainfall. Since the Thames flow has a lag of five months on both rainfall and pressure, a means is possibly available of stating the "expectancy" of excessive or deficient amount of water in the river.

It may here be pointed out that it does not seem necessary to collect and discuss the data over the whole of this region before any deduction *for practical purposes* can be made regarding the flow of the Thames. The barometric and rainfall observations made at the Radcliffe Observatory, Oxford, exhibit variations from 1860 up to the present time so very similar to those of the Thames flow that all three curves are very nearly interchangeable.

So striking is the agreement that they are here reproduced (Fig. 3).

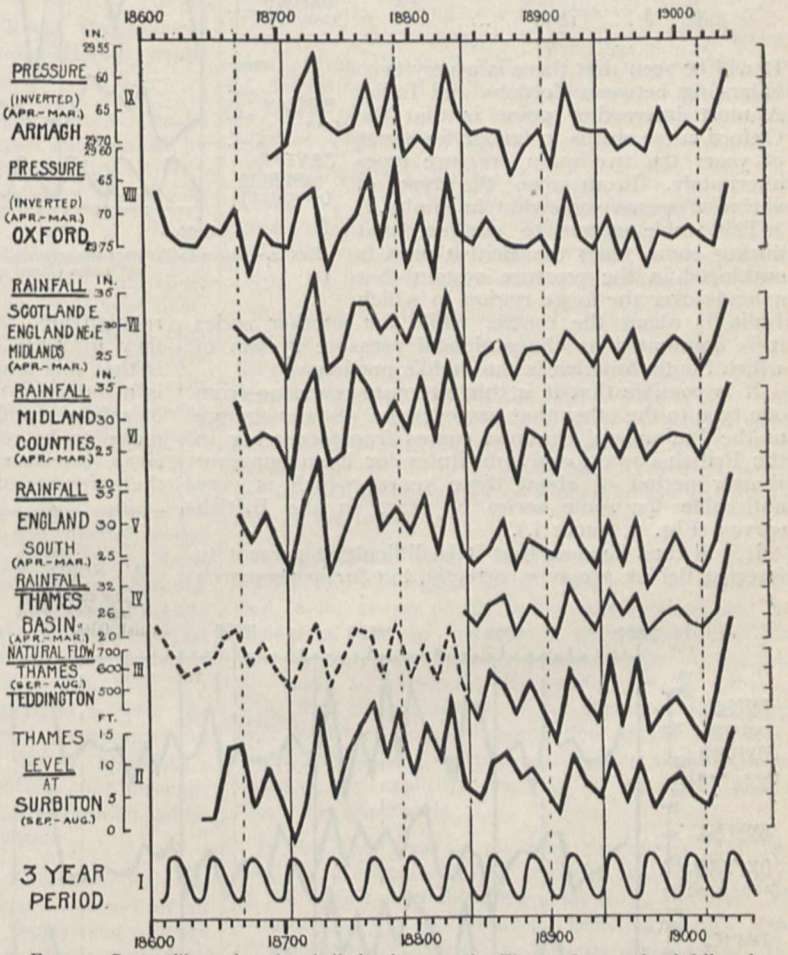

FIG. 2.—Curves illustrating the similarity between the Thames flow, and rainfall and pressure (curves inverted) in the British Isles. [The continuous and dotted vertical lines represent the epochs of sun-spot maxima and minima respectively.]

The question now arises, can British pressure be forecasted?

It has been previously pointed out in this Journal (vol. lxx. p. 177, June, 1904) that there exists a world-wide barometric see-saw between two nearly antipodal parts of the earth, the one region about India and its neighbourhood behaving in an *inverse* way to that of South America and the southern parts of the United States. In some regions, and the British Isles was one of them, the pressure variation curves were found to be a distinct mixture of both the Indian and South American types, and it was difficult to classify them.

To illustrate this, the accompanying figure is given (Fig. 4). The upper curve represents an hypothetical curve with a period of 3·8 years, and beneath it the South American (Cordoba) pressure curve. At the very bottom is given the *inverse* of this hypothetical curve, and above this the Indian (Bombay) curve. Between the Bombay and the Cordoba curves is given that of Oxford. It will be noted that the Cordoba curve disagrees with its hypothetical curve in the years 1892 and 1900 to 1903, while the Bombay curve shows anomalies in 1892 and 1901 to 1903.

If, now, the Oxford pressure be compared with those of Cordoba and India, and a list made showing the years in which high pressure at Oxford coincides with years of high pressure at Cordoba or India, or low pressure at Oxford with low pressure at Cordoba

or India, the following table is the result (omitting average conditions):—

Agreement between Oxford and	Years of simultaneous excess: High pressure	Low pressure
Cordoba ...	1874 ...	—
,, ...	1875 ...	—
,, ...	— ...	1877
India ...	— ...	1878
,, ...	1880 ...	—
,, ...	— ...	1882
,, ...	1884 ...	—
,, ...	— ...	1886
Cordoba ...	1893 ...	—
,, ...	— ...	1895
India ...	1896 ...	—
,, ...	1899 ...	—

It will be seen that there is a very even balancing between Cordoba and India. A most interesting point is that the Oxford curve seems to favour for series of years the two main pressure types alternately. From 1900 the type of variation seems somewhat indefinite.

This table seems to suggest that during some years the British area is enveloped in the pressure system that extends over the large region in which India is about the centre, while for another series it is dominated by the antipodal pressure system of which South America is the middle portion.

It is possible that it is this alternate reversion from one type to the other that prevents the 3·8-year change of the Indian and Cordoba curves from occurring in the British curves, and substitutes for it an apparent shorter period of about three years, which is very noticeable for some series of years in the British curves (Fig. 2, curve i.).

It will thus be seen that it is difficult at present to forecast British pressure correctly, but further research will very probably render it possible when more is known about the mechanism of the atmosphere.

In conclusion, it is interesting to note that in addition to this short period variation the curves (Fig. 2) indicate one of longer duration. An examination of these statistics, when the curves are smoothed by taking three-year means to eliminate the short period changes, shows that when the river flow was greatest, *i.e.* between about the years 1873–1883, the rainfall was highest and the pressure lowest, which is exactly what was to be expected from the relationship between pressure, rainfall, and river flow in these islands. Another point here indicated is that this long period change is real, and that there is a tendency now for the low river levels, deficiency of rainfall, and excess pressure of the last decade or more to be replaced by a greater mean flow of the river, increase in the rainfall, and a diminution in the barometric pressure. WILLIAM J. S. LOCKYER.

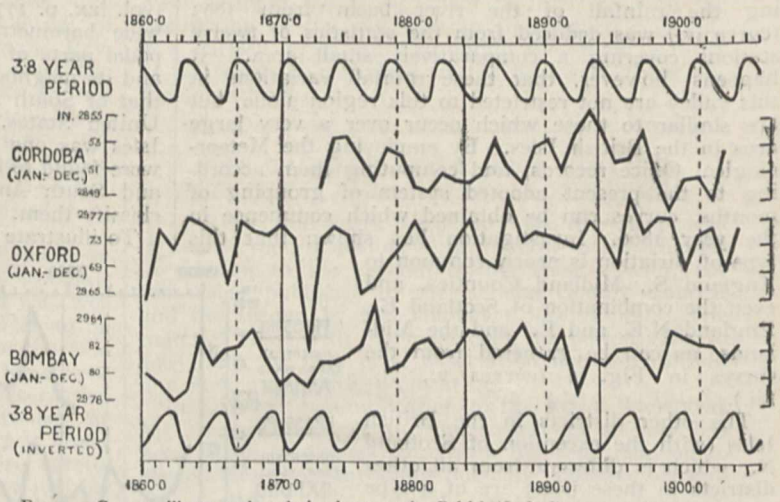

FIG. 4.—Curve to illustrate the relation between the British (Oxford) pressure change and those of India (Bombay) and S. America (Cordoba).

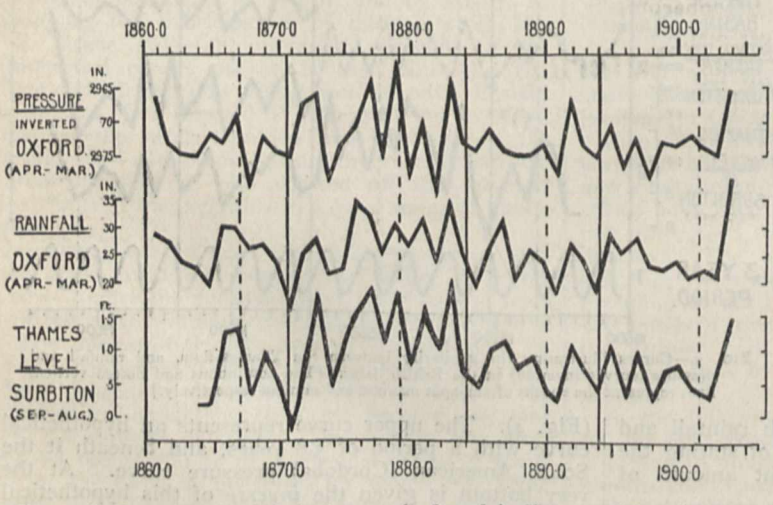

FIG. 3.—Curves to show the similarity between the flow of the Thames and the rainfall and pressure (inverted) changes at one station, namely, Oxford.

NOTES.

A ROYAL garden party was held on Wednesday, June 14, and was attended by about six thousand guests. At the end of the official record of notable people present, supplied to the *Times* by the "Court Newsman," we read:—"Invitations were issued to their Excellencies the Foreign Ambassadors and Ministers, with the *personnel* of their Embassies and Legations, the members of the Government, the Households of the King and Queen and of the Royal Family, and to many peers, members of Parliament, naval and military officers, clergy, and representatives of the musical, dramatic, and literary professions, many of whom with their wives and daughters were present at the party." We believe His Majesty the King is interested in the scientific as in the other activities of his subjects; but if so, it is clear that he is very badly served by the Lord Chamberlain's office, which is responsible for the issue of the invitations. Apparently, this department of the State has not yet realised that science is the only true basis of a nation's welfare and progress, and that scientific men exist in Britain. A few of the most distinguished Fellows of the Royal Society would represent the best interests of the nation even more effectively than actors and musicians.

THE Royal Society's annual conversazione, to which ladies are invited, will take place on Friday, June 23.

PROF. E. RAY LANKESTER, F.R.S., has been elected president of the British Association for the meeting to be held at York next year.

THE Stephen Ralli memorial—a laboratory for clinical and pathological research—will be opened at the Sussex County Hospital, Brighton, on Thursday next, June 29.

AT the Borough Polytechnic Institute on Wednesday next, June 28, marble busts of Joseph Lancaster and Michael Faraday (the work of Mr. H. C. Fehr), presented to the institute by Mr. Passmore Edwards, will be formally unveiled by Prof. S. P. Thompson, F.R.S. Mr. Edric Bayley, chairman of the governors, will preside.

THE annual conversazione of the Royal Geographical Society will be held at the Natural History Museum, South Kensington, on Tuesday next, June 27.

AT the meeting of the Royal Geographical Society to be held in the evening of June 26, a paper will be read by Dr. Charcot on the French Antarctic Expedition. Dr. Charcot has just been created a Chevalier of the Legion of Honour.

WE learn from the *Times* that the Government of India has ordered the introduction of a standard time, with effect from July 1, on the railways (other than small local lines, where the change might be inconvenient) and in all telegraph offices in the country, and also in Burma. Hitherto Madras time has been adopted by most of the Indian railways. The standard now to be introduced is nine minutes in advance of the "railway time," as it is called in all parts of India, and is thus 5½ hours in advance of Greenwich, being the local time of longitude 82° 30′. The standard for Burma is to be exactly an hour earlier, viz. 6½ hours in advance of Greenwich and five minutes earlier than Rangoon local time. In inland places it has been found convenient generally to follow railway time; but the great seaports of Calcutta, Bombay, and Karachi have followed the local time of their respective longitudes. The Government of India does not prescribe the new standard for these and other places following local time, but if a general desire to adopt the new standard is evinced, the Government will be prepared to support the change and to cooperate in bringing it about. In all probability, therefore, there will, ere long, be a uniform time throughout India exactly 5½ hours in advance of Greenwich, while that of Burma will be 6½ hours in advance.

THE death of Mr. James Mansergh, F.R.S., on June 15, at seventy-one years of age, deprives applied science of an acknowledged authority upon water supply and sewage disposal. Mr. Mansergh had unique experience and knowledge of these subjects, and was associated for many years with almost every important construction connected with them in this country. The extensive schemes which he initiated and directed for the improvement of water supply and drainage will long remain as monuments to his memory. He was the designer of the waterworks and sewerage of Lancaster (where he was born in April, 1834), Lincoln, Stockton, Middlesbrough, Rotherham, Southport, Burton-on-Trent, Melbourne (Australia), Birmingham, and many other large towns. These designs include some of the largest schemes of water supply and drainage ever carried out, such, for instance, as the sewerage scheme for the metropolitan district of Melbourne, embracing an area of 133 square miles, and the supply of water to Birmingham from a source in Radnorshire seventy-three miles away. This scheme utilises water from the rivers Elan and Claerwen, and natural reservoirs have been formed for the water by constructing immense dams below the point where the two rivers meet. Mr. Mansergh was the author of about 150 reports upon schemes of water supply, sewerage, and sewage disposal for many large towns. He was also the author of "Lectures on Water Supply: Prospecting for Water, Prospecting and Boring," delivered at the School of Military Engineering, Chatham, "The Water Supply of Towns," and other works. While president of the Institution of Civil Engineers in 1900–1, the Engineering Standards Committee was formed, and Mr. Mansergh was elected chairman. At the time of his death, as chairman of the main committee, he had more than thirty committees working on standardisation in different branches of engineering. Mr. Mansergh was a member of the Royal Commission on Metropolitan Water Supply, and he was on the council of the Institution of Mechanical Engineers. He was elected a Fellow of the Royal Society in 1901 for his eminent work as a hydraulic engineer.

IN the *Irish Naturalist* for June Dr. R. F. Scharff records the capture of two female bottle-nosed dolphins in Dublin Bay in April last. The only other record of the occurrence of *Tursiops tursio* in Irish waters dates from 1829. Dr. Scharff figures one of the Dublin specimens.

WE have received a copy of the March issue of the Bulletin of the Cracow Academy, to which Mr. V. Kulczyński contributes the continuation of an article on certain spiders, treating in this instance of *Araneus curcubitinus* and its allies. In other articles Mr. T. Browicz discusses the secreting function of the nucleus in the cells of the liver, while Mr. K. Wójcik describes the infra-Oligocene strata of Riszkania, near Uzsok, with lists of the fossils.

A NOTICEABLE feature in the report of the Zoological Society of Philadelphia for the past year is the attention paid to the causes of the deaths which take place in the menagerie. In 140 instances a pathological examination was instituted, mostly with definite results in determining the cause of decease. The results are tabulated, and show that tuberculosis is by far the most fatal ailment, next to which comes inflammation of the stomach and intestines, followed, with a considerable diminution in the numbers, by nephritis, necrosis of the liver, and non-tubercular pneumonia.

IN the April issue of the *Emu* the editors continue the excellent practice of giving coloured illustrations of some of the more remarkable Australian birds, the plate, which is drawn by Mr. H. Grönvold, depicting in this instance representatives of Xerophila, Mirafra, and Amytis. In the case of *Xerophila castaneiventris*, one cannot help wondering what is the purpose of the pair of yellow eye-like spots at the root of the beak. Among the articles is an interesting account, with photographs, by Mr. A. J. Campbell, one of the editors, of that remarkable bird the kagu of New Caledonia, in the course of which attention is directed to the danger of extermination now threatening that species. Thirty years ago it had already disappeared from the more settled parts of Caledonia, and the writer urges that steps should be taken, while there is yet time, to preserve such an interesting bird (the sole representative of its genus) from extermination.

THE problems of "vitalismus" are discussed by Mr. K. C. Schneider, of Vienna, in *Biologisches Centralblatt* of June 1 at considerable length; while in another article Dr. H. Schmidt, of Jena, enters on the consideration of the fundamental law of biological development. In a

third communication Dr. R. Rössle insists on the importance of immunity-reactions (that is to say, serum reactions and blood-immunity) in determining the systematic affinities of the higher animals, pointing out that by this method the intimate affinities respectively existing between fowls and pigeons, horse and ass, fox and dog, and sheep and goats, have already been established. The translation of an article by Prof. Marcus Hartog, published in the *Proceedings of the Royal Society*, constitutes the next most important part of the contents of this issue.

THE most important articles in *Indian Public Health* for May (vol. i., No. 10) deal with the milk question in India and the Calcutta milk supply.

SOME interesting observations on the influence of the root nodules upon the composition of soy beans and cow-peas have been made by Messrs. C. D. Smith and F. W. Robison (Bulletin No. 224 Michigan State Agricultural College Experiment Station). The conclusion is arrived at, after two years' work, that while on fairly fertile soils the root nodules may not notably increase the yield, they do cause an important and pronounced increase in the relative and absolute amount of nitrogen in the plants.

BULLETIN No. 23, by Dr. Herzog, of the Bureau of Government Laboratories, Manila, is devoted to a consideration of plague, and a description of the pathological findings in twenty cases which occurred in Manila. A new species of rat flea (*Pulex philippensis*) is described. Bulletin No. 24, by Dr. Wherry, gives a report of two cases of human glanders which occurred in Manila, and some notes on the bacteriology and morphology of the *Bacillus mallei*.

IN the *Bull. Internat. de l'Acad. des Sciences de Cracovie* (No. 1, January) M. Panek contributes a chemical and bacteriological study of the Polish "barszcz," a product of the fermentation of red beetroot. It is brought about by a micro-organism, named by the author *Bacterium betae viscosum*, which causes a fermentation of the cane-sugar with the production of viscous substances and mannite. M. Tochtermann describes the action of thionyl chloride on thiobenzamide, M. Niemczycki discusses syntheses effected by means of zinc chloride, and Madame Krahelska the merogonic development of the egg of *Echinus microtuberculatus*.

THERE has been a considerable amount of uncertainty with regard to the blackwood of southern India, whether it was possible to distinguish two species. Mr. T. E. Bourdillon, writing in the *Indian Forester* (March), is able to show that *Dalbergia sissoides* and *Dalbergia latifolia* should be regarded as distinct species. The natives recognise dark blackwood, species latifolia, and pale blackwood, species sissoides, and although there are several points of distinction, the wood forms the best means of identification.

TO the Cowthorpe oak which grows near Wetherby, in Yorkshire, and was illustrated in NATURE of May 11 (p. 44), is generally assigned the honour of being the largest tree in the British Isles. The claim is based upon the girth and spread of the tree, as it is doubtful whether it ever attained a great height. The *Yorkshire Herald*, May 29, provides an illustration, reproduced from a painting, which is believed to be an accurate representation of the tree as it appeared sixty years ago, and extracts are given from a pamphlet issued with the picture. There is no doubt that this oak passed through its seedling stage several centuries ago; Dr. Jessop, in 1829, suggested an age exceeding 1500 years, but this is mere conjecture, as the tree has been hollow for at least two centuries.

THE eighteenth and latest volume of the *Transactions of the Royal Scottish Arboricultural Society* contains the accounts of the society's meetings during 1904, the jubilee year. The president, Mr. W. S. Fotheringam, in reviewing the progress of the society, announced that the list of members had reached a thousand. The yearly excursion which was held in France provided an opportunity of visiting some of the magnificent State forests. At Champenoux and Haye the forests are principally oak, but beech and hornbeam are also grown, since they provide useful cover. Previously the system adopted was coppice-with-standards, but in both cases this is being converted into high forest. A very fine forest of silver-fir worked with a rotation of 144 years was inspected at Celles, in the Vosges.

PROF. E. WIEDEMANN, of Erlangen, sends us a short statement of observations described in his work on electric discharges (*Wied. Ann.*, xx., p. 793, 1883) relating to the effects referred to by the Rev. F. J. Jervis-Smith in our correspondence columns on May 4 (p. 7). He agrees with Mr. Jervis-Smith as to the action of ozone, and advises persons who work for a long while with influence machines not to have these machines situated in the working room. "Ozone belongs to the poisonous gases and is the more dangerous, since the injurious effects are not manifest at the time; on the contrary, breathing the gas produces at first a feeling of exhilaration, but afterwards it has a depressing effect on the nervous system. Binz has shown that it may cause sleep. I may add to what I have mentioned that during my observations I have suffered somewhat severely from nervous disturbance (hyperasthesia of the feet) due to breathing ozone. These lasted for one or two years. Moreover, I always experience discomfort after performing experiments in my lectures on Tesla discharges."

SINCE March, 1904, several meteorological stations have been established by the Japanese Government along the coast of Korea. In April of that year the Japanese meteorological observatory in Chemulpo commenced to record observations. Mr. H. Mukasa, writing from Chemulpo, informs us that a new building for the observatory was completed lately on the top of the highest hill in Chemulpo (lat. 37° 29′ N., long. 126° 37′ E.), seventy metres above mean sea-level, where observations have been taken since January 1 last. At the invitation of Dr. Y. Wada, the director, the important residents of Seoul and Chemulpo visited the observatory on March 25 last. Various pieces of apparatus relating to meteorology, as well as the horizontal seismograph devised by Prof. F. Omori, were exhibited. Among the visitors were the Japanese, French, and British Ministers, and several Korean dignitaries. The exhibition succeeded in arousing the interest of the visitors in meteorology, and made a deep impression on the Korean guests.

WE have received a copy of the first report of the Transvaal Meteorological Department, containing observations for one year ending June 30, 1904, with an appendix giving monthly and seasonal rainfall records for a number of years, from observations taken before the establishment of the meteorological department. This was only constituted in April, 1904, consequently the records are very incomplete, so far as official stations are concerned. In some cases a complete year's observations are pub-

lished, thanks to the courtesy of volunteer observers. The department has, however, lost no time in obtaining properly verified instruments, but the difficulties may be gathered from the fact that out of two consignments of grass minimum thermometers only one instrument survived the transport. The heights of the stations are not yet accurately known; many of them have an altitude of 5000 feet to 6000 feet.

THE thirteenth yearly report of the Sonnblick Society for the year 1904 contains an interesting account of some of the results obtained at the highest mountain meteorological stations of Europe, with photographic illustrations; the arduous work done in the interest of meteorological and physical science at some of these inhospitable localities has from time to time been referred to in our columns. In the present report A. Edler von Obermayr discusses the frequency of sunshine at the summit of the Sonnblick (3106 metres) with that at other mountain stations. The tables exhibit some peculiarities:—on Ben Nevis the greatest frequency occurs in June, on the Obir and Säntis in July and August, but on the Sonnblick the greatest frequency occurs exclusively in the winter months, from November to February. A useful index is given in a separate paper of the various items and unusual occurrences contained in the Sonnblick reports for the twelve years 1892–1903.

IN his earliest researches on the properties of gaseous fluorine, M. Henri Moissan showed that it reacted vigorously with nitric acid, fluorine and the vapour of the acid producing a violent explosion. In the current number of the *Comptes rendus* MM. Moissan and Lebeau give an account of a systematic research on the reactions between fluorine and the compounds of nitrogen and oxygen. Nitrogen peroxide and nitrous oxide proved to be perfectly indifferent towards fluorine, but a lively reaction, accompanied by flame, was found to take place between fluorine and nitric oxide. With the nitric oxide in excess, the gaseous products proved to be nitrogen, nitric oxide, and nitrogen peroxide, the fluorine appearing in the form of a solid product of indefinite composition containing platinum (from the tube by which the gas was led in) and nitrous compounds. But with the fluorine in excess, the reaction appeared to be more definite, and a gaseous compound containing fluorine, nitrogen, and oxygen was produced, the substance being solid at the temperature of boiling oxygen. This solid, when allowed to boil off, could be condensed to a colourless liquid at −80° C., and further work is being carried out with the view of establishing its composition and properties.

A SHORT report has been received upon the present state of the work done in connection with the "Technolexicon" of the Society of German Engineers. In the compilation of this universal technical dictionary for translation purposes (in German, French, and English), which was commenced in 1901, about 2000 firms and individual collaborators are assisting at present. Up to now 2,700,000 word-cards have been collected; and this number does not include hundreds of thousands of cards that will result from the working out of the original contributions not yet taken in hand. The editor-in-chief of the "Technolexicon" is Dr. Hubert Jansen, Berlin (NW. 7), Dorotheenstrasse 49, and he will be glad to give any information concerning the work.

A KEY to the first part of "A New Trigonometry for Schools," by Mr. W. G. Borchardt and the Rev. A. D. Perrott, has been published by Messrs. Geo. Bell and Sons.

OUR ASTRONOMICAL COLUMN.

STARS WITH PECULIAR SPECTRA.—Mrs. Fleming has discovered several more new variable stars and other objects having peculiar spectra whilst examining the Henry Draper memorial plates. The designation, position for 1900, magnitude and spectral peculiarities are given for each of these in No. 98 of the Harvard College Observatory Circulars. Several of the objects mentioned have bright lines in their spectra, and one or two call for special remark. For example, a star in Cepheus at R.A.= oh. 7·6m., dec.=+71° 32′, was found to have a spectrum containing five bright bands at λλ 3869, 4101, 4340, 4688, and 4861. The first of these coincides with the bright band seen in certain gaseous nebulæ, the second, third, and fifth will be recognised as due to hydrogen, whilst the fourth, the brightest of all, corresponds to the characteristic line seen in fifth-type stars. The chief nebula line at λ 5000 was not seen. Prof. Pickering suggests that this object may have arrived at an intermediate stage between a nebula and a fifth-type star.

Another star situated in the position R.A.=1h. 50·2m., dec.=+62° 49′, in the constellation Cassiopeia, is now classed as a gaseous nebula, its spectrum consisting of the chief nebula line at λ 5000.

A second table in the same Circular describes the spectra of twenty-one known variables, and Prof. Pickering states that in most cases of long-period variables the bright hydrogen lines are not seen during the epochs of minima.

VARIABLE STARS IN THE CLUSTERS MESSIER 3 AND 5.—The hundredth Harvard College Circular contains a discussion by Prof. Bailey of the variable stars discovered in the clusters Messier 3 and Messier 5. These two clusters contain a greater proportion of variable stars than any other hitherto examined. Of every seven stars in the former one is a variable, whilst in Messier 5 the ratio is 1 : 11. Periods have been determined for most of the variable stars, and their similarity is remarkable. Only two stars, Nos. 42 and 50 in Messier 5, having periods of 25·74d. and 105·6d. respectively, appear to depart from the rule, all the other variables in both clusters having periods differing but little from 13h. The average deviation from the mean (13h.) in Messier 3 is 1h. 0m., and in Messier 5 (mean 12h. 45m.) 1h. 13m. All the variables are of nearly the same magnitude, varying from 13·0m. to 16·0m., and there is a slight suggestion that the periods of them undergo a secular variation in length.

SPECTROHELIOGRAPH RESULTS.—In No. 4, vol. xxi., of the *Astrophysical Journal*, Mr. Phillip Fox, of the Yerkes Observatory, discusses the observations made with the Rumford spectroheliograph during 1904. The plates secured with the H_2 radiation, *i.e.* the radiation of the centre of the H calcium line, show a decided increase of activity in the flocculi over that observed during 1903, and are being measured in order to determine the solar rotation period at the height, above the photosphere, of the high-level flocculi.

Many series of plates, on which the individual exposures were made at intervals of a few minutes, the successive settings of the secondary slit being made in ten or twelve steps from λ 3952·4 to λ 3968·6, were secured, and Mr. Fox briefly discusses these in regard to the distinction between faculæ and flocculi in the calcium vapour images. Such a series of photographs, taken on August 25, is reproduced on one of the plates accompanying the paper, and shows that few, if any, flocculi appear in the high levels without their bases appearing, although usually diminished, in the lower levels. Even the bright patches designated "eruptions" by Messrs. Hale and Ellerman can be traced as such as far down as the photograph taken with the secondary slit set at λ 3967. The photographs secured with the hydrogen radiations Hβ, Hγ, and Hε generally show flocculi coincident with those seen on the calcium photographs, and in nearly all cases where the eruptions could be traced to the limb associated prominences were discovered above the flocculus.

No prominences of great height or unusual form were photographed on the limb during 1904, but some of the plates show a fair number, and one or two beautiful examples are reproduced on the second plate of the paper.

VISIBILITY OF D_3 AS A DARK LINE IN THE SOLAR SPECTRUM.—At a recent meeting of the Royal Astronomical Society, Prof. A. Fowler stated, in a paper on the spectrum of the great sun-spot of February last, that he had, on February 2, observed the helium line D_3 as a dark and distorted line in the spectrum of the sun in the region about the spot disturbance. This observation was regarded as unusual, but according to a letter written by Mr. A. Buss to the *Observatory* (No. 358) it is not at all an uncommon phenomenon, and can be seen frequently if the solar spectrum be closely watched. In fact, Mr. Buss states that, according to his observations with a curved slit spectroscope, D_3 may be seen as a dark line in every really agitated solar disturbance.

WEST HENDON HOUSE OBSERVATORY.—No. 3 of the Publications of the West Hendon House Observatory (Sunderland) is devoted to the observations of variable stars made by Mr. Backhouse during the years 1866–1904. The observations of each of the forty-nine stars discussed are set out in detail in tables showing the times of observation, the comparison stars, and the magnitudes according to other catalogues. For a number of stars the observed magnitudes are plotted on a series of curves placed at the end of the volume, with a diagram showing the various gradations of colour employed in the descriptions.

NATURE AND MAN.

THE annual Romanes lecture was delivered by Prof. E. Ray Lankester, F.R.S., in the Sheldonian Theatre, Oxford, on June 14, on the subject of "Nature and Man." The complete lecture has been published by the Clarendon Press (London: Henry Frowde), and the following abstract indicates a few of the points considered in it.

Prof. Lankester remarked that the subject of his discourse is one which has largely occupied the attention of biologists during the five-and-forty years in which he has followed the results of scientific discovery. Much misconception prevails as to the signification attached to the word "Nature," but the lecturer used it as indicating the entire cosmos of which this cooling globe with all upon it is a portion. Until the eighteenth century the study of nature—nature-knowledge and nature-control—was the appropriate occupation of the learned men at Oxford, and the present peculiar classical education is a modern innovation.

During the latter half of the nineteenth century, the observations of nature-searchers made it possible to establish the general doctrine of the evolution of the cosmos, with more special detail in regard to the history of the earth and the development of man from a lower animal ancestry. The general process by which the higher and more elaborate forms of life, and eventually man himself, have been produced was shown by Darwin to depend upon heredity and variation. By the process of natural selection, those organisms survive which are most fitted to the special conditions under which they live. Man eventually emerged from the terrestrial animal population strictly controlled and moulded by natural selection. The leading feature in the development and separation of man from other animals is the relatively large size of his brain, which has five or six times the bulk (in proportion to his size and weight) of that of any other surviving Simian. The development of the mental qualities has given rise to attributes which are peculiar to man, and justify the view that man forms a new departure in the gradual unfolding of nature's predestined scheme.

"Civilised man has proceeded so far in his interference with extra-human nature, has produced for himself and the living organisms associated with him such a special state of things by his rebellion against natural selection and his defiance of nature's pre-human dispositions, that he must either go on and acquire firmer control of the conditions or perish miserably by the vengeance certain to fall on the half-hearted meddler in great affairs." It is practically certain that all epidemic disease could be abolished within a period so short as fifty years if the State cared to take the matter in hand and employ the means at the command of science. If more men were encouraged to study and experiment on this matter, there would soon be an end of all infectious disease.

By the exercise of his will, man has done much to control the order of nature, and it is urgent for him to apply his whole strength and capacity in gaining further control. Little, however, is being done in this direction, but when a knowledge of the situation reaches the masses of the people, "the democracy will demand that those who expend the resources of the community, and as Government officials undertake the organisation of the defence and other great public services for the common good, shall put into practice the power of nature-control which has been gained by mankind, and shall exert every sinew to obtain more. To effect this, the democracy will demand that those who carry on public affairs shall not be persons solely acquainted with the elegant fancies and stories of past ages, but shall be trained in the acquisition of natural knowledge and keenly active in the skilful application of nature-control to the development of the well-being of the community."

The concluding subject of the lecture was the influence exerted by the University of Oxford upon the welfare of the State and of the human community in general. Oxford by its present action in regard to the choice of subjects of study "is exercising an injurious influence upon the education of the country, and especially upon the education of those who will hereafter occupy positions of influence, and will largely determine both the action of the State and the education and opinions of those who will in turn succeed them." Is it desirable to continue to make the study of two dead languages the main, if not the exclusive, matter to which the minds of the youth of the well-to-do class are directed by our schools and universities? In view of modern needs it would be more sensible to make the chief subject of education for everybody "a knowledge of nature as set forth in the sciences, which are spoken of as physics, chemistry, geology, and biology." The ablest youths of the country should be encouraged to proceed to the extreme limit of present knowledge of one of these branches of science so that they might become makers of new knowledge, and the possible discoverers of enduring improvements in our control of nature. The great prizes of life ought to be given to the young man who pursues nature-knowledge successfully rather than to him who takes up less important subjects. In other words, it is desirable that our scheme of education should centre round a knowledge of nature and not continue to be mainly classical and historical.

Though men of science would make natural knowledge the core of education, they would consider it incomplete if a serviceable knowledge of foreign languages, and a real acquaintance with the beauties of English and other literature, were not added. "The studies of the past carried on at Oxford have been charming and full of beauty, whilst England has lain, and lies, in mortal peril for lack of knowledge of nature."

The suggestion "that Oxford should resign herself to the overwhelming predominance given to the study of ancient elegance and historic wisdom within her walls" is an insult to her and an impossibility. Only a few decades have passed since Oxford sent out Robert Boyle and Christopher Wren. Moreover, Oxford exerts an immense influence on the schools, and for this reason men of science cannot be content with the maintenance by the university of the compulsory study of Greek and Latin, and the neglect to make the study of nature an integral and predominant part of every man's education. For "the knowledge and control of nature is man's destiny and his greatest need."

SCIENCE AND THE STATE.

THE seventh of the series of weekly pamphlets which are appearing under the editorship of Mr. W. T. Stead, with the general title of "Coming Men on Coming Questions," is by Mr. R. B. Haldane, and is entitled "The Executive Brain of the British Empire." Mr. Haldane is an enthusiast for higher education. He is a thorough believer in the policy which has been advocated

consistently by NATURE, that the surest and best way to secure national efficiency is to educate our manufacturers and merchants liberally along scientific lines, and to enlist the cooperation of distinguished men of science in the work of national administration.

In considering the task that lies before a progressive political party, Mr. Haldane has much of interest to the man of science to say about things the party has to accomplish in the process of winning complete public confidence in its capacity to direct national business. He points out that the importance of each Department of State depends mainly on the personality of the Minister who presides over it. But apart from personality there are other forces —such as clear conception and resolute purpose—which profoundly affect administration. To bring into play greater brain power in administration is, Mr. Haldane insists, a task of the first magnitude, and he proceeds to show its importance and how it may be accomplished.

The appointment of the Explosives Committee by Lord Lansdowne in 1900 is the first illustration taken by Mr. Haldane. After the outbreak of the South African war, it came to light that the British military and naval guns were being corroded rapidly by the chemical action at high temperatures of the products of combustion of the nitroglycerin in the cordite. Lord Lansdowne, who summoned outsiders to advise him, was told that an expert committee on the national explosives required the best scientific brains in the country, and, following the earlier example in France, a committee, presided over by Lord Rayleigh and including Sir Andrew Noble and Sir William Crookes, was appointed. The committee has solved the problems presented to it, made further discoveries, and is now a permanent body. But the committee is performing its work under great difficulties, due entirely to our system of administration. As Mr. Haldane says, "the Army gives its rewards to genius on the field, and not to genius in the laboratory." He says later:—"If the British Government is to have adequate command of scientific talent of the highest order, it must make arrangements which will enable it to reward and honour that talent on an adequate scale, without exciting ill-feeling."

There ought, in fact, Mr. Haldane contends, to be an advisory body with a *corps scientifique* attached to it, which should include the exceptional talent which the State stands more and more in need of every day. Not only would such a scientific committee provide a new opening for talent, but, more important, prove a source of new strength to the nation. As a further instance of the good results which promptly follow the application of scientific methods to national problems, Mr. Haldane cites the case of the discovery among miners of the disease ankylostomiasis, after the Home Office had obtained the permission of the Treasury to appoint a committee of investigation, and indicates how great would have been the saving of suffering and money had there been a *corps scientifique* to appeal to as a matter of course.

Referring to the fall in the amount of exports in some branches of industry, Mr. Haldane traces this to the need for more mind in the process of manufacture, that is, for the improvement of higher education in this country, and goes on to remark that comparatively little State aid has been devoted to this important necessity. Exception is taken, too, to the somewhat mechanical methods of distribution of the present grant from the Treasury to university colleges, and it is urged that in this direction also the executive brain ought to be strengthened.

The Centralstelle of Germany, the function of which is to put at the disposal of inquirers, in the solution of problems arising in manufacture, the best scientific knowledge available which cannot otherwise be obtained by the private manufacturer, is an example of Germany's appreciation of men of science. Not only are such central research institutions established in Germany, but also in the United States and in France. The same principle has been conceded among us, for the State gives a small grant —just about a tenth of what the Germans give to their corresponding institution—to the National Physical Laboratory, an invaluable institution which is at present being starved. Well may Mr. Haldane say that "it is time for the State to take the lead in this direction also, if we are to hold our own in the international competition which is more and more coming to depend on the application of science to industry."

The essay as a whole is a powerful plea for the introduction of the methods of science into every department of national life, and should convince every reader that disregard of scientific method and procedure is of necessity accompanied by a want of national efficiency and well-being.

CORAL ANATOMY AND DEVELOPMENT.[1]

IN writing this account of his observations and researches on Siderastræa, Dr. Duerden has added an important contribution to his already extensive publications on the anatomy and development of the Madreporaria. Siderastræa is a common West Indian coral forming colonies of 10 cm. to 60 cm. in diameter, which encrust stones and sometimes the shells of hermit crabs on the coral flats. It appears to be exceedingly hardy, as it will suffer exposure to the hot sun at low tide and partial burying in the mud without injury, and it is often found living under conditions on the reef which very few corals of other species could withstand. This hardiness renders it an admirable type for thorough investigation, as it enables it to live and grow and reproduce itself freely in the unfavourable conditions of an aquarium in the tropics.

Siderastræa, although a colonial coral having a general superficial resemblance to the Astræidæ, or star corals, is allied to the Fungidæ, or mushroom corals. The tissues of the expanded zooids are so transparent that the white

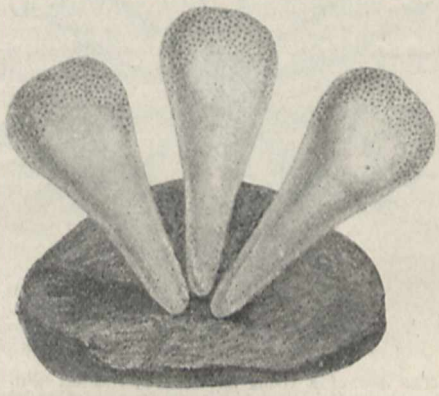

FIG. 1.—Three larvæ of Siderastræa settling down upon a stone, in close proximity, by their narrow aboral poles.

skeletal structures can be seen through them. Each zooid has, in the adult state, two rows of capitate tentacles, and several of the members of the inner row are bifurcate. This remarkable and, among corals, unique condition of the tentacle is brought about by the growth of a common peduncle for a pair of neighbouring tentacles of the entocœlic series which are primarily distinct.

In all the zooids that were examined anatomically only ova were found; Dr. Duerden, however, gives reasons for believing that the coral is not strictly diœcious, but protogynous, a point of some interest when compared with the case of *Flabellum rubrum*, which Mr. Stanley Gardiner has shown to be protandrous.

The early stages of the development of the coral take place within the cavity of the parent zooid, and the ciliated top-shaped larvæ are discharged with four pairs of mesenteries already developed. The larvæ can be kept alive in the aquaria for several weeks, but unless they settle down within the first two or three days from liberation it seems impossible for them to fix themselves, and they ultimately perish. In general the larvæ fix themselves at the same time and in groups. So close do they cluster together that they are often in touch with one another,

1 "The Coral *Siderastraea radians* and its Post-larval Development." By Dr. J. E. Duerden. Pp. 130+plates. (Washington: Carnegie Institution, December, 1904.)

and by mutual pressure produce a distortion of the normally circular base. There can be no doubt that in this coral, as in others investigated by Dr. Duerden, these clusters of larvæ become organically connected, and form aggregated colonies.

In dealing with the later stages of the development, the author discusses many questions of great interest to those who have made a special study of the anatomy of corals. We may refer especially to the light thrown upon the vexed question of "theca" and "epitheca," to the demonstration that the primary ectosepta do not become entosepta as they were supposed to do in some other corals, and to the valuable suggestion as to the scientific method of writing the septal formulæ of corals. These and other matters, which are fully discussed, render the memoir of greater value than a mere record of facts and observations of the natural history of a single species of coral would be. There is a great deal to be said in favour of the old type system, the system of presenting to the reader a plain, unvarnished tale of the natural history of a species and leaving him to draw his own conclusions; but the dangers of the system may be clearly recognised

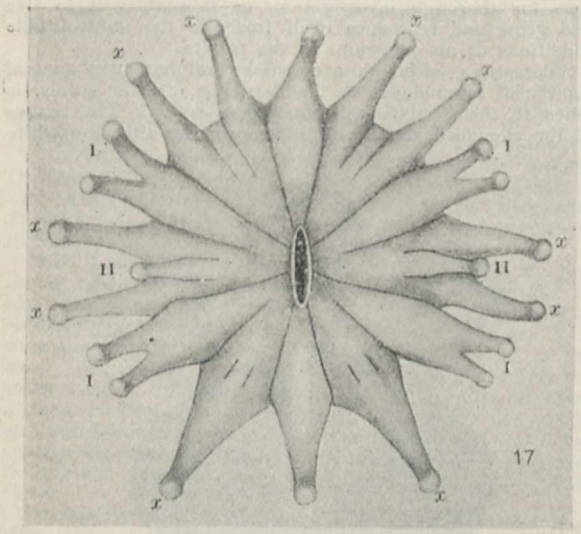

FIG. 2.—The disc of a young Zooid of Siderastræa with expanded tentacles showing (I.I.) the four bifurcate tentacles of the inner row.

in this memoir. The coral under review is a common, and many might think a common-place, coral, and if the author had thought fit to limit himself to a description of facts only, it would probably have been chosen as a type of its order by writers of the conventional text-book. Fortunately, however, we are warned on almost every page that Siderastræa is not a type, but in many respects an exceptional and rather archaic form.

In conclusion, a word of praise must be said for the manner in which the memoir is presented to the public. Like the other scientific treatises that have been recently published by the Carnegie Institution at Washington, the paper, printing, and illustrations are all of first-rate quality.

S. J. H.

GAS CALORIMETRY.

IN the recent report of the Departmental Committee appointed to consider the question of the control of the gas supply of the metropolis, a proposal was made that the calorific power of the gas should be regularly determined, thus recognising the growing importance of the heating value of gas as distinguished from its illuminating power. The use of gaseous fuel both for heating and power purposes having led to a demand for exact gas calorimetry, several types of calorimeter have come into use. In those of the Junker type, the gas is burned at a measured rate, and the products of combustion are cooled down by a stream of water also flowing at a known rate, the ingoing and outgoing temperatures of which can be accurately measured. In spite of the difficulties of securing accurate measurements of the rate of flow of gas and water, on account of the speed with which consecutive determinations can be carried out instruments of this type are mostly used by gas engineers. Their chief defect is want of portability, and as an alternative a sample of the gas is frequently analysed, and the calorific value deduced from the results of the analysis. Apart from the difficulty of exactly determining the constituents of such a complicated mixture as coal gas, this method implies that the exact calorific value of each substance present is accurately known, and this, unfortunately, is far from being the case.

Most of the data regarding heats of combustion in actual use are derived either from the experiments of Berthelot and his pupils with the calorimetric bomb, or from the experiments of Julius Thomsen, and in the case of gaseous substances the differences between these two experimenters may amount to as much as 2 per cent. In the current number of the *Zeitschrift für physikalische Chemie* Julius Thomsen has a critical paper on the causes of these differences, and comes to the conclusion that for gases the explosion with compressed oxygen in a bomb gives quite untrustworthy results. His chief argument is based on the comparison of the values obtained for the heats of combustion of homologous series of hydrocarbons and their halogen derivatives, and it is shown that whereas the method of combustion at ordinary atmospheric pressure gives remarkably constant differences between the consecutive members of such a series, the results obtained by means of the calorimetric bomb lead to differences between consecutive members which are quite irregular. It follows that the values obtained for heats of formation, which lie at the basis of all theoretical speculations in this field, are still more irregular in the case of figures obtained with the bomb, since they are based on the differences between the heats of combustion. The weak point in most physical work on gases is usually on the chemical side, and on account of the extreme practical and theoretical importance of the subject and the great advances made in the last ten years in the methods of preparation of pure gases, there is still room for a re-determination of these constants. In this connection it may be pointed out that the ultimate mode of calibration of gas calorimeters of the Junker type is the combustion of a known quantity of a pure gas the heat of combustion of which is taken as known.

G. N. H.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

OXFORD.—The following is the text of the speech delivered by Prof. Love in presenting Prof. E. Ray Lankester for the degree of D.Sc. *honoris causa* on June 13:—

Salutat Academia nostra Edwinum Ray Lankester, alumnum suum. Hic ille est, cuius magna apud nos est memoria Anatomiæ Comparativæ cathedram olim tenentis, quod et discipulis ardorem suum miro modo inspirare potuit, et specimina in usum Musæi nostri diligentissime congesta ita novis rationibus collocavit ut Historiæ Naturalis principia luce clariore illustraret: qui hanc Academiam ut suos mores emendaret toties hortatus est, quæ ad inauditam perfectionem iamdudum pervenisset si monitori amicissimo in Actis Diurnis contionanti obtemperare voluisset. Hic est cuius ex repertis laudis aliquid ad suam Almam Matrem redundavit, cum inter insignissimos doctores qui hodie de animalium figuris disputant fere princeps sit et in omnibus virorum doctorum societatibus summo in honore habeatur.

Nihil profecto quod ad Anatomiam Comparativam pertinet non in huius viri scientiam cadere videtur. Neque enim huic satis erat edendi curam suscipere cum Acta illa, quæ summæ auctoritatis in hoc genere apud nos sunt, labore per quinque et triginta annos iam continuato, tum luculentissimorum librorum seriem, e quibus plures iam typis impressi in manibus omnium habentur, quod onus

pergrave videri plerisque potuit: sed de omnigenum animalium figuris et mutationibus, sive in ipsa mundi iuventa sive hodie exstantium, commentarios fere innumerabiles ipse conscripsit. Nullum est animalium genus de quo aliquid non scripserit, neque quicquam scripsit nisi præclare. In hoc viro admiramur cum summi artificis patientiam nullam rem tenuiorem esse docentis quam ut scientia dignum sit, tum doctrinam latissimam et subtilissimam nova inventa cum prioribus colligantis et suo quidque loco reponentis. Sed ulterius etiam progressus est. Quid enim? Incrementum fit scientiæ non solum ex indefessa diligentia et doctrina coacervata summorum veri indagatorum: quin ipsa diligentia et doctrina parum fertilis est nisi conclusiones ita verbis et tabulis expressæ sint ut in memoria nostra hæreant et novissimum quodque repertum suo loco residere patiantur. Veluti hic noster, qui iuvenis adhuc rationes a Ioanne Müllero et Huxleio excogitatas, quo melius omnia ad Historiam Naturalem pertinentia subtilissime litteris mandarent, se optime callere ostenderat, postea novos modos invenit, nova nomina commentatus est, veteres etiam rationes correxit et excoluit: quæ omnia iam adeo omnibus comprobata sunt ut nemo inquirat a quo fonte emanarint. Quod si ex hac præclara supellectili unam quasi margaritam potissimum sumere fas sit, eos commentarios singulari laude ornaverim, quibus Limulum illum aquatilem scorpiones et araneas terrestres inter se similes esse ostendit. Nihil profecto in hoc genere perfectius, nihil quod posterorum imitatione sit dignius.

Following the announcement in the *University Gazette*, the age limits in the examination to be held on August 29 for the selection of probationers for the Indian Forestry Service were stated in our note on June 8 (p. 139) to be from eighteen to twenty years on January 1, 1905; Prof. Schlich writes to point out that the correct age limits are from eighteen to twenty-one years on that date.

Dr. W. T. Brooks (Christ Church) has been appointed Litchfield clinical lecturer in medicine for two years from June.

A statute has been passed in Convocation establishing a diploma in anthropology, and providing a committee to organise the course of study in that subject, and to make regulations for the diploma examination. The committee will consist of seventeen members, including the professors of anthropology, comparative anatomy, moral and metaphysical philosophy, comparative philology, the reader in mental philosophy, the keeper of the Ashmolean Museum, and the curator of the Pitt Rivers Museum. Candidates who are not already members of the university will be admitted under the same conditions as candidates for the degrees of B.Litt. and B.Sc.

Magdalen College has announced a fellowship in chemistry, election to which will be made next October term after an examination. Further details will be published shortly.

CAMBRIDGE.—The following are the speeches delivered by the Public Orator, Dr. Sandys, on June 14, in presenting the two recipients of the degree of Doctor in Science *honoris causa*:—

CAPTAIN ROBERT FALCON SCOTT, R.N., C.V.O.

Poli australis e regione salvum sospitemque nobis redditum laetamur virum intrepidum, cui disciplina et gloria navalis ab avo velut hereditate obvenerat. Abhinc annos quinque navis magister designatus est, rerum naturae miraculis prope polum australem explorandis destinatae. Illic, primum terrae Victoriae montes asperos conspicatus, deinde ex transverso oppositum glaciei velut murum immensum diu praetervectus, tandem nivis aeternae regionem quandam excelsam detexit, detectam Regis Edwardi nomine nuncupavit. Quid commemorem navem illam prope montem Erebum, prope ipsa Volcani spiracula, glaciei solidae in mediis molibus per biennium compressam? Quid geographiae, geologiae, meteorologiae, biologiae denique in studiis, scientiarum fines, talium virorum auxilio, feliciter propagatos? Quid itinera longa glaciei perpetuae inter pericula tolerata? Tot virorum fortium de duce intrepido illud primum dixerim:—omnium mortalium nemo umquam ad ipsum polum australem propius penetravit. Deinde, "numquam" sociis suis "plus laboris imposuit quam sibi sumpsit; ipse cum fortis, tum etiam felix."

SIR FRANCIS YOUNGHUSBAND, K.C.I.E.

Hodie corona nostra suprema viro destinata est, qui matris suae fratrem, exploratorem indefessum, olim aemulatus, omnium mortalium solus, oceani Pacifici a litore trans Asiae mediae recessus intimos septem milia passuum milies emensus, montium formidolosorum per ambages prope inextricabiles, Indiae demum ad castra prima pervenit. Idem nuper, Britanniae legatus, cum copiis nostris fortissimis, Indiae per Alpes silvasque, post moras infinitas fortiter et prudenter devictas, per apertam portam, Tibetorum ad loca praecelsa ultra lacum illum caeruleum progressus, tandem, inter nemora late virentia, arcis summae tecta aurea conspicatus, religionis antiquissimae sedem sacram, tot laborum, tot itinerum metam ultimam, intravit. In legatione vero illa obeunda, viri huiusce potissimum auspicio, terrae spatia immensa accuratissime explorata sunt; fluminum ingentium cursus patefacti; saeculorum denique priorum monumenta plurima aut intacta relicta aut diligenter conservata. Iuvat autem recordari regionem illam remotissimam cum exercitu nostro legatum nostrum ita peragrasse, ut nullum crudelitatis, nullum inhumanitatis vestigium reliquerit, sed benevolentiae mutuae, etiam foedere ipso potioris, fundamentum iecerit.

Mr. E. T. Whittaker, of Trinity College, has been appointed a university lecturer in mathematics.

The Home Secretary has approved the university for the purposes of the Coal Mines Regulation Act (1887) Amendment Act, 1903, in respect of its diploma in mining engineering.

The Harkness scholarship in geology and palæontology has been awarded to Mr. F. A. Potts, of Trinity Hall, and the Wiltshire prize for geology and mineralogy to Mr. A. McDonald, of Emmanuel College.

The treasurer to the Sedgwick memorial fund, which was inaugurated in the Senate House on March 25, 1873, has issued a final balance sheet. The original subscription list amounted to 11,157*l.* 1*s.* 6*d.*, and this sum increased by investment to 27,453*l.* 2*s.* 4*d.* A thousand guineas were spent on the bronze statue of Sedgwick, and 26,125*l.* on the Sedgwick Museum; the balance was mainly expended on printing, but a small sum left over has been paid to the financial board.

DR. JAMES GOW will distribute the certificates and prizes at King's College, London, on Wednesday, July 5. The museums and laboratories of the college will be open to visitors upon this occasion.

DR. A. B. W. KENNEDY, F.R.S., will deliver the foundation oration of the Union Society of University College, London, on June 29; his subject will be "The Academic Side of Technical Training."

AMONG the honorary degrees accepted by the Senate of the University of Dublin on June 17 was the degree of Sc.D. to be conferred on Prof. E. A. Schäfer, F.R.S., and on Prof. Sydney Young, F.R.S.

MR. G. F. CARSON, formerly on the staff of the University College, Sheffield, has been appointed head of the department of mathematics in Battersea Polytechnic, and Miss Lilian J. Clarke has been appointed lecturer in botany.

AT the entrance examination for the day courses in engineering to be held next September, the governing body of the Northampton Institute, Clerkenwell, has decided to offer three scholarships for open competition. These scholarships will give exemption from fees, amounting to 52*l.*, during the whole of the four years' course in mechanical or electrical engineering.

DURING December next, in the department of physics of the Columbia University, New York City, a course of fifteen lectures will be delivered by Prof. V. F. Bjerknes, professor of mechanics and mathematical physics in the University of Stockholm. The subject will be "Fields of Force," including the discussion of hydrodynamic analogies of the electrostatic and electromagnetic fields. A similar

course will be delivered in March and April, 1906, by Prof. H. A. Lorentz, professor of physics in the University of Leyden.

UNDER the title "The Education of the Examiner," Dr. Charles E. Fawsitt publishes, in the *Proceedings of the Royal Philosophical Society of Glasgow*, an interesting note on the statistics of examination marks as revealed by graphic methods. Most examiners who have had to draw curves showing the distribution of marks in any examination know the difficulty of obtaining an even uniform curve rising continuously to a maximum and then descending continuously. However carefully the scale of marking is adjusted, the curve has an unpleasant habit of showing two maxima, usually of unequal height, instead of the one maximum of the generally recognised standard curve. Dr. Fawsitt, as the result of observations on class examinations conducted at Edinburgh, brings forward the welcome suggestion that this irregularity is not the fault of the examiner, but is due to the fact that the candidates naturally divide themselves into two sets, namely, workers and non-workers, and that while the students in either set vary in every conceivable way in respect of *ability*, a marked line of division is drawn with regard to work. The superposition of two error curves, in accordance with this theory, gives results closely agreeing with those of common experience.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, March 16.—"On the Dimorphism of the English Species of Nummulites, and the Size of the Megalosphere in relation to that of the Microspheric and Megalospheric Tests in this Genus." By J. J. **Lister**, F.R.S.

The results obtained in this investigation are summarised as follows:—

(1) Both microspheric and megalospheric forms of *N. variolarius* and *N. Orbignyi* var. *elegans* are present in the Eocene beds of the Isle of Wight and Hampshire, as the author believes they will be found to be present elsewhere, except when the materials of a bed have been re-arranged under the influence of currents.

(2) In these species and in *N. laevigatus* and *N. gizehensis* the size of the microsphere is nearly constant—the diameters in the specimens measured being between 15 μ and 20 μ.

(3) In the nine species and one variety of Nummulites which the author has examined, the size of the megalosphere is approximately proportional to the volume of the contents of the microspheric form.

By this result additional proof is given of de la Harpe's conclusion, founded on the mode of occurrence in the beds, and on structural features of the tests of the two forms, that these are in each case truly members of "a pair," or, as we now say, are related as alternating or recurring forms in the life-history of a species.

By (2) and (3) the two modes of reproduction come into marked contrast, the asexually produced megalospheres being proportional in size to the protoplasmic volume of the parent, while the microsphere, probably arising as a zygote, is uniformly small throughout.

(4) In several of the species examined, as the microspheric member of the cycle preponderates in the life-history, the megalospheric (or gamete-producing) member decreases, not only in proportion to the size of the microspheric form, but in proportion to the megalospheric members of other species in which the two forms attain approximately equal sizes.

April 6.—"Ovulation and Degeneration of Ova in the Rabbit." By Walter **Heape**. Communicated by Adam Sedgwick, F.R.S.

This paper is an abstract of several years' experimental work. The growth of the graafian vesicle and ovum, and the modification of the adjoining ovarian tissue, are referred to. The maturation of the ovum takes place in the ovary. It is dependent upon coition, and follows a cessation of the supply of nutriment to the ovum. Ovulation occurs ten hours after copulation, and does not occur if coition is prevented.

The cause of the rupture of the graafian vesicle is probably due to the stimulation of ovarian contractile tissue, to effect which, in the domestic rabbit, the excitement of sexual contact appears to be necessary.

The prevention of coition results in the degeneration of ripe follicles, and the production of false corpora lutea. Such degenerate follicles do not rupture, and the ovum contained therein is not discharged. The structure and fate of the true and false corpora lutea are briefly described.

The persistent prevention of breeding causes degeneration of young as well as ripe follicles on a large scale, and results in more or less obstinate sterility.

Degeneration of young follicles occurs normally. While this may be due to want of nutriment, caused by competition of neighbouring follicles, it may also be due to incapacity to assimilate the nutriment which is supplied.

In this latter case, failure is due to a peculiarity in the constitution of the ovum, constituting it a "sport." As there is evidence that the production of variable offspring depends upon the quality or quantity of nutriment supplied to the mother, it is urged that the study of nutrition from this point of view becomes a matter of very great interest and importance to students of heredity.

A brief review of the evidence concerning the forces which influence breeding results in the conclusion that changes are induced in the constitution of the blood by means of a "generative ferment" of extraneous origin; the effect of which upon the generative glands causes their secretion of "gonadin," which exercises a profound effect upon the rest of the generative system.

"On the Nature of the Silver Reaction in Animal and Vegetable Tissues." By Prof. A. B. **Macallum**.

When fresh preparations of animal and vegetable tissues are treated with a solution of nitrate of silver containing free nitric acid and then exposed to light, they become coloured, the colour varying in intensity and tint. The author endeavoured to determine to what the reaction is due, and how far one may go in employing it for microchemical purposes. It was found that of the organic constituents of tissues, the only ones which form compounds with silver "reducible" under the action of light are sulphocyanic acid, creatin, and taurin. As creatin is present only in vertebrate muscle fibre, and not at all in invertebrates, while the other compounds mentioned occur in tissues only in infinitesimal, and, therefore, in negligible, quantities, the silver reaction cannot be attributed to their presence. It was further ascertained that neither phosphates, carbonates, nor sulphates give "reducible" silver compounds in the presence of free nitric acid. There remained, among organic compounds in tissues, only the proteids, and as these have been, and are, generally held to form, with silver salts, compounds which are "reduced" in light, it was necessary to determine whether the coloured compounds so formed are "albuminates" or simply the subchloride of silver. For this purpose proteids were freed from chlorides by repeated precipitation with pure ammonium sulphate, and it was found that egg and serum albumins and globulins, as well as the gelatins, after the eighth precipitation give no colour reaction whatever with nitrate of silver under the influence of light, and that the compounds eliminated by the precipitation, and to which the silver reaction is due, are chlorides. Nucleo-proteids also were found to be reactionless. In the case of vegetable proteids the methods employed were different, but the result was the same. Silver nitrate may, consequently, be used as a microchemical reagent for determining the presence of chlorides in animal and vegetable tissues, and its use for this purpose has already furnished some important results. Amongst these may be mentioned the absolute freedom of the nucleus from chlorides, the absence of the latter from the head of the spermatozoon, and the demonstration that they alone are the cause of the silver reaction in the "cement substance" (of von Recklinghausen) as well as in ordinary cell protoplasm.

May 18.—"Reciprocal Innervation of Antagonistic Muscles." Eighth Note. By Prof. C. S. **Sherrington**, F.R.S.

Exhibition of strychnine converts reflex inhibition of muscles into excitation; so also, more gradually, but just as potently, does *tetanus-toxin*. This conversion sets in before and under smaller doses of strychnine or toxin than are required to produce the convulsive seizures characteristic of strychnine poisoning or general tetanus.

The conversion of inhibitory effect into excitation effect by strychnine is more easily obtained in the case of some nerves than of others.

The conversion of spinal inhibition into excitation by strychnine explains the simultaneous contraction of large inharmonious groups of muscles in strychnine convulsions. It also explains the occurrence, under a given stimulus of reflex contraction, of muscles that previously do not seem, under superficial examination, to be reached by the reaction. These muscles are really included in the reflex effect normally, but the effect on them then being *inhibition*, it passes unnoticed, unless special means are adopted for seeing it. Thus, in the ordinary "flexion reflex," initiated, say, from the right foot, the flexion of the homonymous knee is easily seen to be due to contraction of its flexor muscles, also the concomitant extension of the crossed knee is easily seen to be due to contraction of its extensor muscles. But it requires special preparations to detect that, with the contraction of the right knee-flexors, there goes reflex inhibition of the right extensor, and that, with the contraction of the left knee-extensor, there goes reflex inhibition of the left knee-flexors. This being so, when under strychnine, the reflex is suddenly changed in character, both flexors and extensors being in both legs thrown into contraction together, it appears to an observer, unaware of the previous inhibitions, that, under the strychnine, the reflex action reached muscles which it did not reach before, *e.g.* right knee-extensor and left knee-flexor. Hence arises the hypothesis that the alkaloid breaks down a supposed spinal "resistance," previously intervening between the afferent nerves and various motor spinal cells ordinarily inaccessible to them. Strychnine does lower the threshold stimulus for spinal reflexes at one stage of its action; but the central fact of strychnine effect appears to the author that it destroys spinal taxis for the skeletal musculature by upsetting the fundamental coordination of reciprocal innervation. It upsets reciprocal innervation because it transforms inhibition into excitation.

On the view advanced in these notes previously that the cortex of the brain exercises reciprocal innervation of antagonistic muscles, strychnine and tetanus-toxin should transform the functional topography of the "motor" cortex. This on examination proves to be the case.

Strychnine and tetanus-toxin change cortical flexion of leg and arm into extension. Reflex "opening" of the jaw is in the decerebrate animal converted into reflex closure by tetanus-toxin and by strychnine, the inhibition of the predominantly powerful closing muscles being converted into excitation of them.

Similarly, when the "face-area" of the monkey's cortex is tested by faradisation after exhibition of strychnine or tetanus-toxin, the points of surface that, prior to the drug, yield regularly the free opening of the jaw, yield strong closure of the jaw instead. Closure of the jaw is, comparatively, an infrequent movement to obtain from the cortex of the monkey. On the other hand, *opening* of the jaw is always readily and regularly elicitable from a large field of the "face-area." Under tetanus toxin and strychnine the whole of this area not only ceases to yield opening of the jaws, either maintained or rhythmic, but yields closing of them instead.

The foregoing observations give an insight into the essential nature of the condition brought about by tetanus and by strychnine poisoning. These disorders work havoc with the coordinating mechanisms of the central nervous system, because, in regard to certain great groups of musculature, they change the reciprocal inhibitions, normally assured by the central nervous mechanisms, into excitations. The sufferer is subjected to a disorder of coordination which, though not necessarily of itself accompanied by physical pain, inflicts on the mind, which still remains clear, a torture inexpressibly distressing. Each attempt to execute certain muscular acts of vital importance, such as the taking of food, is defeated because exactly the opposite act to that intended results from the attempt. The endeavour to open the jaw to take food or drink induces closure of the jaw, because the normal inhibition of the stronger set of muscles—the closing muscles—is by the agent converted into excitation of them. Moreover, the various reflex arcs that cause inhibition of these muscles not only cause excitation of them instead, but are, periodically or more or less constantly, in a state of hyper-excitement, and yet attempt on the part of the sufferer to restrain, to inhibit, their reflex reaction, instead of relaxing them, only heightens their excitation further, and thus exacerbates a rigidity or a convulsion already in progress.

"The Structure and Function of Nerve Fibres.—Preliminary Communication." By Prof. J. S. **Macdonald**. Communicated by Prof. C. S. Sherrington, F.R.S.

In contradiction to certain conclusions[1] arrived at by the author as a consequence of his experimental observation of the "injury current" of nerve, it has recently been denied[2] that inorganic salts occur in any appreciable quantity within the internal structure of the nerve-fibre. This conclusion has been formed as the result of observations made with the use of a reagent—cobalt nitrite—which precipitates potassium salts in a manner open to investigation with the microscope. It has been shown that the reagent does not give rise to precipitates at every point in the length of the nerve-fibre, but only at certain points of infrequent occurrence. The author has checked this statement, also using microscopical methods, and confirms it. He draws, however, an entirely different conclusion from these observations, since he has further observed that these points of infrequent occurrence are points at which the axis-cylinder has been injured in the course of preparation. He concludes that potassium salts are really present in very considerable quantity uniformly distributed along the axis-cylinder, but that they appear in a state of simple solution only at injured points.

The author directs attention to the possible general importance acquired by this observation, when account is taken of the parallelism between injury and "excitation." The sudden appearance of inorganic salts (electrolytes) in a state of simple aqueous solution at an excited point means a transitory increase in local osmotic pressure, new processes of diffusion, and disturbances of electrical potential. In this he sees a sufficient explanation of nerve-conduction. In the case of muscle, also, the influence of similar phenomena is considered, and a possible relation between such an increase in local osmotic pressure and "contraction." He also refers to the possibility of the influence of this factor in the conditions determining the flow of water in plant structures.

June 8.—"The Perturbations of the Bielid Meteors." By Dr. A. M. W. **Downing**, F.R.S.

As the general result of the calculations described in this paper, it appears that the most probable date for the centre of a shower of Bielid meteors this year is November 18, 10h., G.M.T. If there be a shower at that date, it will indicate that the meteor stream is, in this part, of sufficient length to occupy at least thirty-three days (October 16 to November 18) in passing a definite point in its orbit—or that there is another swarm following the main swarm at this interval—and is also of sufficient extent in the direction sun-earth to allow of some of the meteors encountering the earth, although the centre of the stream is more than 1,000,000 miles outside the earth's orbit at the time.

"Chitin in the Carapace of *Pterygotus osiliensis*, from the Silurian of Oesel." By Dr. Otto **Rosenheim**. Communicated by Prof. W. D. Halliburton, F.R.S.

Fragments of the carapace of certain fossil Eurypterids found in Oesel in rocks of Silurian age, from specimens

[1] J. S. Macdonald, "Thompson-Yates Laboratory Reports," vol. iv., part ii., pp. 213–348, 1902; *Proc. Roy. Soc.*, vol. lxvii., pp. 315–324; *ibid.*, pp. 325–328; *Proc. Physiol. Soc.*, December 17, 1904; *ibid.*, March 18, 1905.

[2] A. B. Macallum, *Journal of Physiology*, vol. xxxii. p. 1.

in the British Museum (Natural History), have been examined by the author for chitin.

The conclusion drawn from the experiments is that the general behaviour of the substance towards acids and solvents is such that it is probably chitin, and this is confirmed by the fact that, after such treatment, it yielded, on hydrolysis with concentrated hydrochloric acid, a strongly reducing substance which is presumably glucosamine.

"On the Magnetic Qualities of some Alloys not Containing Iron." By Prof. J. A. **Fleming**, F.R.S., and R. A. **Hadfield.**

For the purposes of exact magnetic measurements two homogeneous rings of regular form of alloys not containing iron were made at the Hadfield Steel Works, Sheffield, and sent to the Pender Electric Laboratory of University College, London. These two rings were respectively numbered No. 1871 and No. 1888/7. The ring No. 1871 had the following composition:—manganese, 22·42 per cent.; copper, 60·49 per cent.; aluminium, 11·65 per cent. There is a certain amount of intermingled slag, probably 2 per cent. or 3 per cent., mostly consisting of MnO and SiO_2 and slight traces of other metals. Analysis showed that there was present also:—carbon, 1·5 per cent.; silicon, 0·37 per cent.; and iron, 0·21 per cent. Hence it may be said that nothing but a trace of iron occurs in this sample of alloy. The other ring, No. 1888/7, had an approximate composition:—manganese, 18 per cent.; copper, 68 per cent.; aluminium, 10 per cent.; lead, 4 per cent. These alloys unfortunately have poor mechanical properties and are brittle and cannot be forged. Rings were cast from the material and turned in the lathe to the desired form.

From the observations the following conclusions are drawn:—

(1) The alloy No. 1871, composed of copper, aluminium, and manganese in the proportion mentioned above, exhibits magnetic properties which are identical with those of a feebly ferro-magnetic material. (2) The magnetisation (or B, H) curve is of the same general form as that of a ferro-magnetic metal such as cast iron, and indicates that with a sufficient force, a state of magnetic saturation would most probably be attained. (3) The alloy exhibits the phenomenon of magnetic hysteresis. It requires work to reverse the magnetisation of the material and to carry it through a magnetic cycle. (4) The material has a maximum permeability of 28 to 30, which is not greatly inferior to that of the values reached for cobalt or a low grade of cast iron for small magnetic forces, and occupies a position intermediate between the permeability of the ferro-magnetic and the merely para-magnetic bodies, such as liquid oxygen and ferric chloride. (5) The material exhibits, therefore, the phenomenon of magnetic retentivity and coercivity. It is not merely magnetic, but can be permanently magnetised.

The authors are led by these results to conclude that the magnetic properties of this alloy must be based on a certain similarity of molecular structure with the familiar ferro-magnetic metals.

Experiments on the magnetic qualities of the alloy No. 1888/7 give results similar to those of the alloy No. 1871. For both alloys No. 1871 and No. 1888/7 the hysteretic exponents are not very different, being respectively 2·238 and 2·288, whereas the hysteretic constants are very different, being respectively 0·0005495 and 0·000776. It is clear, therefore, that both these alloys, although magnetic, have far greater hysteresis than pure iron, nickel, or cobalt for corresponding cycles of magnetisation.

"Note Supplementary to a Paper 'On the Radio-active Minerals.'" By the Hon. R. J. **Strutt**, F.R.S.

In a paper read before the society on February 28, the author directed attention to the fact that all thorium minerals, so far as could be ascertained, appeared to contain uranium and radium. Since then he has examined a number of additional minerals, in order to test the induction further. The result has been quite confirmatory of the original conclusion. The author, in this further investigation, contented himself with determining the thorium and radium, for it may now be considered proved that radium is a product of uranium, and it is much easier to establish the presence of radium by its emanation than to detect uranium by chemical analysis. The experimental methods explained in the former paper were employed. The results are as follows:—

Mineral	Locality	Thorium oxide, per cent.	Radium, millionths of 1 per cent.
Thorite ...	Ceylon	61·0	1·00
,, ...	Brevig, Sweden ...	53·9	0·81
Monazite ...	Johannesberg	5·94	1·06
Alvite	Raade Moss, Norway	4·95	1·81
Xenotime ...	,, ,,	3·89	0·90
Monazite ...	N. Carolina[1]	3·79	0·53
,, ...	Nigeria	2·98	3·78
Anerodite? ...	Ceylon	2·27	9·80
Monazite ...	Malay Straits	1·53	4·02
Fergusonite	?	1·31	26·7
Malacone ...	Hitteroe, Norway ...	1·15	1·40
Allanite ...	Amherst Co., Virginia	0·492	1·08
Yttrotantalite	Ytterby, Sweden ...	0·437	5·56
Polycrase ...	?	0·334	0·36
Zircon	N. Carolina	0·307	0·34
,,	Virginia	0·217	0·52

[1] This consisted of pure grains of monazite, picked out from the commercial sand.

Mathematical Society, June 8.—Prof. A. R. Forsyth, president, and temporarily Prof. W. Burnside, vice-president, in the chair.—On the conditions of reducibility of any group of linear substitutions, and On criteria for the finiteness of the order of a group of linear substitutions: Prof. W. **Burnside.** In the first of these papers it is proved that a group of linear substitutions on a finite number of symbols is reducible if, and not unless, one or more linear equations holds between the coefficients of every substitution of the group. In the second paper it is shown that in order that a group of linear substitutions may be of finite order it is necessary that both the real part and the imaginary part of every coefficient should lie between two fixed assignable numbers, and this condition is sufficient.—On a class of many-valued functions defined by a definite integral: G. H. **Hardy.** The integral

$$\int_0^\infty \frac{e^{-u^\lambda}\, u^{a-1}}{u+x}\, du$$

is a many-valued function of x having no singularities save $x=0$, and the behaviour of the function depends on the character of a and λ as rational, algebraic or transcendental numbers. In a number of cases the function can be represented in the neighbourhood of the singular point by a convergent combination of two divergent power series.—Informal communications were made as follows:—The first principles of Cauchy's theory of functions: G. H. **Hardy.**—On differential equations whose integrals are expressible by partial quadratures: Prof. A. R. **Forsyth.**

Royal Astronomical Society, June 9.—Mr. W. H. Maw, president, in the chair.—The discordant values of the principal elliptic coefficients in the moon's longitude: P. H. **Cowell.**—Determination of heat radiation from the moon: the **Earl of Rosse.** The author had found that the lunar heat varied with the phase, that it was negligible at new moon, and attained its maximum at full moon. He considered it a surface heat, not regularly *reflected*, but absorbed and re-emitted. Suggestions were made for future observations during lunar eclipses. Prof. Turner stated that the maximum at full moon might indicate that some of the heat was reflected.—The diurnal variations of nadir and level of the Greenwich transit circle: **Astronomer Royal.** The variation of the level has a period of twenty-four hours, with a maximum about 6 a.m.

and a minimum about 6 p.m. The variations of nadir are much smaller, and do not show any conclusive result except a discordance near 6 p.m.—On the determination of stellar proper motions without reference to meridian places: A. R. **Hinks.**—The meteors from Biela's comet: W. F. **Denning** and Dr. **Downing.**—General scheme for determinations of stellar parallax from photographs taken at the Cambridge Observatory: A. R. **Hinks** and Dr. H. N. **Russell.** A brief account was also given of results already obtained for the parallax of Lalande 21185 and γ Virginis.

Zoological Society, June 6.—Dr. Henry Woodward, F.R.S., vice-president, in the chair.—Specimen of a new bushbuck, which it is proposed to call *Tragelaphus haywoodi,* sp. n.: O. **Thomas.** Mr. Thomas also exhibited some mammals and birds from Japan obtained by a collector sent out by the society's president, the Duke of Bedford, K.G., who proposed to further zoological science by having systematic collections made in that part of the world. Of the present series Mr. Thomas directed attention to a fine marten, different from the true *Mustela melampus,* and which he proposed to call *Mustela melampus bedfordi,* subsp. n.—On the intestinal tract of mammals: Dr. P. C. **Mitchell.** In the course of the last eight years, the author had taken every possible opportunity of studying the alimentary tract of mammals from specimens that had died in the society's gardens, and had obtained additional material elsewhere, with the result that his investigations covered more than two hundred individuals, and included the greater number of the mammalian orders.—The natural history of western Uganda, deduced from observations and collections made by the author while acting as British Boundary Commissioner on the Uganda frontiers: Lieut.-Colonel C. **Delmé-Radcliffe.**—Distribution of Mexican Amphibia and Reptilia: Dr. H. **Gadow.** After a critical revision of the species recorded from Mexico, the author stated that he grouped them according to the prevailing physical features of the country. It was found that Mexico had received its present fauna from both the northern and the southern continents. The northern immigrants had spread over high tablelands and mountains, whilst not a few species had descended into the hot lowlands, even into Central America and still further south. On the other hand, the southerners were divided by the plateau into an Atlantic and a Pacific mass, each having had time to modify many of its members according to the very different physical features. Scarcely any of these southerners had ascended the plateau, but they were not averse to ascending high outlying mountains. A comparative list of species confined to high altitudes was given, and the conclusion arrived at, with the help of geological data and the fauna of the Antilles, was that the exchange between the north and south took place during the Miocene epoch, at which period alone the Antilles were connected with Central America.—New species of reptiles discovered in Mexico by Dr. H. Gadow: G. A. **Boulenger.**—Batrachians and reptiles collected in South Africa by Mr. C. H. B. Grant and presented to the British Museum by Mr. C. D. Rudd: G. A. **Boulenger.**—Notes on the anatomy of the yellow-throated lizard, *Gerrhosaurus flavigularis*: F. E. **Beddard.**—Notes on the cerebellum in the exanthematic monitor, *Varanus exanthematicus,* and on the cerebral hemispheres in the Taraguira lizard, *Tropidurus hispidus*: F. E. **Beddard.**—The fœtus and placenta of the spiny mouse, *Acomys cahirinus*: R. **Assheton.**—Some new Coleoptera from South Africa: Rev. H. S. **Gorham.** The beetles referred to were of the families Malacodermata, Cleridæ, and Erotylidæ, and had been collected by Dr. H. Brauns, of Willowmore, in Cape Colony, either at Willowmore or at Delagoa Bay in 1900 or 1901, and indicated that the fauna of South Africa was rich in species of the two first families, and more so than had been supposed in members of the latter family. One new genus was described.—Remarks on the supposed clavicle of the sauropodous dinosaur Diplodocus: Baron Francis **Nopcsa.**

EDINBURGH.

Royal Society, June 5.—Prof. Geikie in the chair.—The distribution of the nerve cells in the intermedio-lateral tract of the dorso-lumbar region of the human spinal cord: Dr. A. **Bruce.** The region was found to extend from the end of the upper third of the eighth cervical to the lower extremity of the second or, perhaps, the upper part of the third lumbar segment, and to occur, not as a continuous tract, but as clusters or groups of cells, separated in some of the upper and lower segments by distinct intervals in which there were no cells, but in the greater part of the dorsal region by incomplete intervals in which there were present a small number of cells. The clusters appeared to be arranged in a manner characteristic more or less of each segment, attaining their maximum number in the third dorsal. The cells lay in the white matter behind the lateral portion of the anterior cornua in the eighth cervical and first dorsal segments; below that point they occupied the apex of the lateral horn, and from the lower part of the second dorsal region they occupied also the grey matter subjacent to the formatio reticularis, and occasionally extending into the formatio reticularis itself. The clusters of cells in this, the reticular group, were frequently continuous with those at the apex of the horn, and belonged undoubtedly to the same system. It was found that the symmetry between the two sides of the cord was not quite complete.—The Tardigrada of the Scottish lochs: J. **Murray.** Twenty-one species were identified, of which six were considered new. It has been usual to distinguish species of Echiniscus by the number and arrangement of the spines and other processes, but in some of the species it was found that spines continue to increase in size at the moult, and that new ones may appear. Also one or two species lay eggs when hardly larger than larvæ, and at successive moults thereafter lay more and larger eggs. In the study of the order there is, in fact, great need for careful tracing of life-histories.—Report on the Medusæ found in the Firth of Clyde (1901–2), and notes on the pelagic fauna: E. T. **Browne.** The report deals with thirty species of Hydromedusæ and five species of Scyphomedusæ, most of which had not previously been found in the Clyde. The fauna is distinctly littoral. Important information as to the seasonal changes in the fauna was obtained. Medusæ are very scarce in winter, and begin to appear about the middle of March. Most of the forms appear during summer, and begin to die off in September and October. The notes on the pelagic fauna contain an account of a number of miscellaneous animals found in the tow-net at different times of year.—Report on the free-swimming Crustacea found in the Firth of Clyde (1901–2): Dr. T. **Scott.** The summer months were the best and richest for plankton in the Clyde, a characteristic feature of the summer being the vast quantities of diatoms. During the winter months the plankton consists almost entirely of five species of copepods.—On a new method of preparing esters: Dr. W. W. **Taylor.** The water formed by the interaction of the acid and alcohol was removed by the addition of benzene, and distillation of the ternary mixture of alcohol, benzene, and water.—Vanishing aggregates of determinant minors: Prof. W. H. **Metzler.**

PARIS.

Academy of Sciences, June 13.—M. Troost in the chair.—The action of fluorine on the oxygen compounds of nitrogen: Henri **Moissan** and Paul **Lebeau** (see p. 183).—The moving shadows of the total eclipse of the sun of May 12, 1706: G. **Rayet.** Reference to some remarks of De Joly concerning the phenomena of moving shadows observed by him during the total eclipse of the sun, May, 1706.—On a solution of Monge's problem relating to the equation $f(dx_1, dx_2, \ldots dx_n)=0$ with variable coefficients: M. **Bottasso.**—The measurement of the capacity of long submarine cables: M. **Devaux-Charbonnel.** The principle of the method consists of charging the cable and a condenser of known capacity placed in cascade, the capacity of the cable being deduced from the charge taken up by the condenser. The method has several advantages over those in current use, and has been applied with success to the cable recently laid between Brest and Dakar.—Thermoelectric power and the Thomson effect: M. **Ponsot.**—Pyrrhotine, ferromagnetic in the magnetic plane and paramagnetic perpendicularly to that plane: Pierre **Weiss.** The atomic susceptibility of iron in pyrrhotine, measured perpendicularly to the magnetic plane, is very near the atomic susceptibility of iron in paramagnetic bodies.—On the true atomic weight of

nitrogen: G. D. **Hinrichs.** The author gives his reasons for supposing that the atomic weights of the elements can be more accurately determined by calculation than by experiment.—On a mode of formation of acetol by the direct oxidation of acetone: M. **Pastureau.** By the oxidation of acetone in acid solution by hydrogen peroxide, the author shows that in addition to the peroxide already described by Baeyer and Villiger, acetol and pyruvic acid are always formed, the yield of the latter amounting to 75 per cent. of the weight of acetone taken. The application of the reaction to higher ketones would appear to show that in addition to the ketone peroxide, the keto-alcohols and ketonic acids are always formed.—The action of sodium on the esters of the fatty acids: M. **Bouveault** and R. **Locquin.** By the action of sodium on a cooled ethereal solution of ethyl butyrate, the principal product is the keto-alcohol $C_3H_7—CO—CH(OH)—C_3H_7$, a small quantity of dibutyryl also being obtained.—On some aromatic substitution derivatives of ethylene oxide: MM. **Fourneau** and **Tiffeneau.** The substituted ethylene $R—CH=CH_2$ is treated with iodine and yellow mercuric oxide, and the iodohydrin thus obtained digested with powdered caustic potash. Details are given of the preparation and properties of phenyl, benzyl, methoxyphenyl, and methylphenyl ethylene oxide.—The action of chloroacetic esters on the halogen magnesium derivatives of aniline: F. **Bodroux.**—On some compounds of azelaic acid: A. **Bouchonnet.** The preparation of the phenyl ester and of thioazelaic acid is described.—On sparteine and its reaction with methyl iodide: Charles **Moureu** and Amand **Valeur.** The authors have isolated from this reaction, besides the iodomethylate already known, an isomer, probably a stereoisomer, distinguished by its higher rotatory power and its solubility in water.—On the pyrolysis of gum lac: A. **Etard** and E. **Wallée.**—On the affinity of artificial colouring matters for conjunctive tissue: M. **Curtis** and P. **Lemoult.** A study of the various stains in use in histological work from the point of view of their permanence.—On the reserve carbohydrates in evergreens: Leclerc **du Sablon.**—On a new banana tree of Madagascar: Pascal **Claverie.** The species described appears to be new, and is named by the author *Musa Perrieri.*—On *Oidium lactis* and the ripening of cream and cheese: P. **Mazé.** Remarks on a paper on the same subject by M. Arthaud-Berthet.—The ancient coastal lines of the Sahel d'Alger: General **de Lamothe.**—On gladkaïte, a new rock in dunite: L. **Duparc** and F. **Pearce.** Veins of the new mineral are found in the dunite mass on the river Wagran in the N. Ural. It is a silicate of iron, alumina, lime, magnesia, soda, and potash.—On the probable yield of the springs in the basin of the Seine during the second quarter of 1905: F. **Launay** and E. **Maillet.**

NEW SOUTH WALES.

Linnean Society, April 26.—Mr. T. Steel, president, in the chair.—Revisional notes on Australian Carabidæ, part ii., tribe vi., Scaritini: T. G. **Sloane.** Critical observations and tabular lists are offered, and six species are described as new.—The possible relationship between bacteria and the gum of *Hakea saligna*: Dr. R. Greig **Smith.** The conclusions to which this research has led are as follow:—(1) The gum of *Hakea saligna* is neither arabin, metarabin, nor pararabin. The hydrolytic products consist of reducing bodies that yield indefinite osazones, and are probably akin to the furfuroïds of Cross, Bevan, and Smith. It is not pectin, although it approaches this substance in some respects. (2) Of the bacteria occurring in the tissues of the plant, the most probable producer of the gum is one intermediate between *Bact. acaciae* and its variety *Bact. metarabinum,* but as we do not yet know that the host plant can alter a gum once formed by a bacterium, it cannot be said that the gum is produced by this micro-organism.—The origin of natural immunity towards the putrefactive bacteria: Dr. R. Greig **Smith.** The author shows:—(1) That there is a close analogy or identity between the production of bacteriolytic bodies and the digestion of food. (2) That bacteria do traverse the intestinal wall, and that negative experimental results regarding the same are untrustworthy. (3) That natural immunity, especially towards the bacteria that normally inhabit the intestinal tract, is occasioned and maintained by the comparatively few bacteria which, in crossing the intestinal wall and possibly gaining access to the body fluids and organs, stimulate the cells to produce immune bodies. (4) That the agglutination of bacteria may claim a much more active part in the production of immunity than is generally supposed.—The probable bacterial origin of the gum of linseed mucilage: Dr. R. Greig **Smith.** Following is a summary of the research:—(1) The gums of linseed mucilages vary in their chemical reactions, and, therefore, probably vary in their chemical constitution. (2) The products of hydrolysis consist of galactose and reducing substances which yield indefinite osazones that are possibly akin to the furfuroïds of Cross, Bevan, and Smith. (3) The gum bacteria in the tissues of Linum are relatively very numerous, and consist chiefly of races of two species. (4) The chemical reactions of the gums from these are practically identical with the reactions of average linseed gum. (5) The gum of one of the bacteria is hydrolysed to galactose, and of the other to galactose and a reducing substance that yields an indefinite osazone. Both gums contain a large proportion of the furfuroïd substances. (6) The gum formed by bacteria is probably altered by the plant into mucilage and other substances required in the plant economy. (7) A number of so-called species of gum bacteria have probably one common origin; the host plant can alter the nature of the gum product which influences the growth characters.

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