THURSDAY, DECEMBER 25, 1913.

THE PEOPLING OF MELANESIA.

Wissenschaftliche Ergebnisse einer amtlichen Forschungsreise nach dem Bismarck-Archipel im Jahre 1908. *III. Untersuchungen über eine melanesische Wanderstrasse.* Von Dr. Georg Friederici. [Mitteilungen aus dem Deutschen Schutzgebieten. Ergänzungsheft Nr. 7.] Pp. iii + 182. (Berlin: E. S. Mittler und Sohn, 1913.) Price 3.60 marks.

IN this volume Dr. Friederici has used the results of his personal inquiries into the linguistics and ethnology of the Bismarck Archipelago in an endeavour to trace the path of the Melanesian people from Indonesia to their present settlements east and south of New Guinea.

In the second volume of the "Results" of the Hanseatic South Sea Expedition of 1908 Dr. Friederici gave a compendious account of the ethnography and languages of the archipelago, with special studies of certain implements and navigation. From these he concluded that there was evidence of a considerable connection between the people of the Bismarck Archipelago and those of the region roughly indicated by a line drawn from the Southern Philippines across north-east Celebes, to the Moluccas in the neighbourhood of Ceram and Buru. The present volume deals with the evidence in more detail. A comparison of the languages of the Barriai and related peoples of North New Pommern shows many agreements in grammar and vocabulary with the group of languages known as the Bahasa Tanah of the Alfurus (or inlanders) of Ceram and the adjacent Moluccan islands, and Dr. Friederici concludes that the Melanesians originally came from that region, though they were considerably modified by another stream of immigrants from the region included between the Southern Philippines, North Borneo, and the Minahasa peninsula of Celebes. On reaching the Bismarck Archipelago a portion of the Moluccan swarm passed through Vitiaz Strait and settled along the coast of south and south-eastern New Guinea. Another portion, after colonising the shores of New Pommern and New Mecklenburg, passed through Dampier Strait to the northern islands of the Louisiades, the Southern Solomons, and the New Hebrides. The immigrants from the sub-Philippine region took a more northerly route by the Admiralty group to New Hanover, East New Mecklenburg, and the Solomon Islands.

Although his argument is based mainly on the languages, Dr. Friederici recognises the difficulties in definitely fixing the position of the Melanesians, which arise from their great variation in physical appearance and culture. But he maintains that a close agreement in the fundamental structure of the languages and the presence in them of important and numerous common words is evidence of the presence of the carriers of the languages in the places where they are now found. He points out also a number of ethnological facts which support the conclusions based on linguistics.

Dr. Friederici's book will be found of much value to the student of oceanic ethnology. It increases very considerably our knowledge of the languages of the Bismarck Archipelago. It affords a satisfactory indication of at least one path by which the speakers of Melanesian languages entered the Pacific, though it leaves still unsolved the problems of the northern and eastern Pacific, and the details of the dispersal of the Melanesian swarm after its passage through the Vitiaz and Dampier channels.

The work would have been improved by an index, and in the absence of a purely linguistic map of the archipelago there is some difficulty in locating the languages. The names do not always agree with those appearing on maps in former volumes of the "Results." SIDNEY H. RAY.

REGIONAL AND GENERAL GEOGRAPHY.

(1) *Tirol, Vorarlberg und Liechtenstein.* By Prof. K. W. von Dalla Torre. Pp. xxiv + 486. (Berlin: W. Junk, 1913.) Price 6 marks.

(2) *Mittelmeerbilder.* Gesammelte Abhandlungen zur Kunde der Mittelmeerländer. By Dr. Theobald Fischer. Zweite Auflage, besorgt von Dr. A. Rühl. Pp. vi + 472. (Leipzig and Berlin: B. G. Teubner, 1913.) Price 7 marks.

(3) *La Région du Haut Tell en Tunisie.* (Le Kef, Téboursouk, Mactar, Thala) Essai de Monographie Géographique. By Dr. Ch. Monchicourt. Pp. xiv + 487 + plates. (Paris: Librairie Armand Colin, 1913.) Price 12 francs.

(4) *Animal Geography: The Faunas of the Natural Regions of the Globe.* By Dr. M. I. Newbigin. Pp. 238. (Oxford: Clarendon Press, 1913.) Price 4*s.* 6*d.*

(5) *A Commercial Geography of the World.* By O. J. R. Howarth. Pp. 236. (Oxford: Clarendon Press, 1913.) Price 2*s.* 6*d.*

(1) PROF. VON DALLA TORRE'S contribution to Junk's "Natur-Führer" is produced in the well-known style of "Baedeker's Guides," and is a scientific companion for the pedestrian or the cyclist. The commonplace details as to hotels and meals, railway-tickets, and gratuities to custodians, are omitted altogether; in their place we find a truly marvellous amount of information on natural phenomena, from scenic details to botanical species, arranged topographically, just as we come across them on the

routes. Human antiquities, from Roman times back to the cave-dwellers, are also noticed. It is impossible to give a fair idea of the personal observation and literary research that have resulted in these crowded pages. Two examples may be suggestive; but we must select from small places to keep the quotations within bounds. Here (p. 218) is Sillian, one of the delightful villages in the valley of the Drau :—

"1101 m. at the mouth of the *Villgratental*: quartz-phyllite and mica-schist. *Minerals:* Mispickel on the Davinealp. *Folklore:* Hard-hearted peasants: black biting dragons ate up everything, until in the end they were exorcised; still called "Bannhof" to this day. Gunshots from a ghost, who had sworn falsely. *Earthquakes:* 1827, 2, IV., 1 o'clock" (followed by a list of seven others).

Our second example has also some human interest (p. 191) :—

"*St. Valentin auf der Haid,* 1470 m., surrounded by dense woods; founded 1140 as a hospice. *Geology:* huge detrital cone of verrucano and gneissic phyllite from the Endkopf. *Fauna:* Osprey, 1896. *Anthropology:* 21·1 per cent. brachy-, 78·9 per cent. hyperbrachy-cephals."

The following "modern instance" does not seem strictly natural; but its anthropological bearing may excuse it (p. 161) :—

"In the Post Hotel stands the famous Schrofenstein vat; more than 400 years old, which held the wine, 400 years old, that once became renowned. The contents disappeared during the Bavarian occupation."

No intelligent visitor to Tyrol will grudge the moderate price of this new encyclopædic pocket-book.

(2) Dr. Rühl's edition of Fischer's "Mittelmeerbilder" renders this series of essays available for every traveller. We can imagine no more interesting companion during a sea-voyage in the Mediterranean. The original dates are assigned to the descriptions in all cases. In 1886, Fischer was somewhat doubtful about the power of the French to pacify Tunisia; but surely the indifference of the Mohammedans to the advantages of foreign rule lies in the simplicity of their aspirations in this world, and not in any special antipathy inspired by the French. The military domination to which Fischer refers is at the present time very gracefully concealed, and he gives every credit to the protectors in a later essay (p. 404). His ride through Feriana to the great oasis of Gafsa on the desert edge, undertaken in a critical year, must have helped to direct attention to a country of extraordinary interest. The return of Latin influences to North Africa is one of the most fascinating themes for a geographer, and Hilaire Belloc, in his "Esto perpetua," has gone shortly to the heart of it. Fischer, of course, gives us much more, and in so lucid and balanced a style that we read with equal pleasure of the olive trade and the folding of the Atlas. Curiously enough, it is Belloc that produces the most vivid impression of the structure of the country.

Fischer also penetrated Morocco; he supplies good general surveys of Palestine, Italy, Corsica, and of Spain, with its contrasts between life on the marginal lands and the interior; and he everywhere lays stress on human interests, to which his studies in natural history are subordinate.

(3) M. Monchicourt's monograph on a special district of Tunisia is an example of the thoroughness brought by French scientific men into the study of the protectorate. The Haut Tell is the region south-west of Tunis, which stretches from Testour to the Algerian frontier, including Teboursouk and El Kef as its important towns. The word *tell* is used in Tunisia, not for a geographical feature, but for a black or yellow clayland, which maintains a reserve of water for cereals, even in dry seasons. The author's Tell country is that in which *tell* is the common soil (p. 13), and it can be fairly limited as a northern region, while the Steppe, and finally the Sahara, succeed it as we travel south. The open and mostly lowland country that one finds so freely described as Sahel is attached partly to the Tell and partly to the Steppe.

The railway from Algeria enters the Haut Tell along the grand valley of the Medjerda, emerging on a rich alluvial plain. The beauty of the Roman remains at Dougga also attracts visitors from Tunis. But the southern area is far less known, though one sees brown mule-roads leading into it across the hills from Kairouan. The author indicates (p. 122) how it may be developed by using an old trade route. His photographic illustrations are excellent, and one feels that the surface-features which he so well describes are fundamentally connected with the structure and climate of the district. The ethnographic considerations bring us to the most important problem of ethnology, the maintenance of the population in harmony with the natural conditions of their fatherland.

(4) Dr. M. Newbigin has produced another book that can be read from cover to cover with grateful appreciation. The field is a very wide one; but the facts and observations are fitted into one another so as to produce a broad geographical impression. Even children will be attracted by the comparison between the jerboa and the horse, as animals requiring speed (p. 65), or between the birds and mammals of forest regions (p. 115), which select either an arboreal or a shelter-taking

policy. Marine life is treated with the advantage of very recent researches; but we doubt if irregular echinoderms are rightly styled "old-fashioned." Is not the author thinking of the extinct but regular Palæozoic forms? The illustrations of carnivores from paintings by W. Walls are the finest in a most interesting book. Teachers of geography and lovers of animal life will alike rejoice in it.

(5) Mr. Howarth has undertaken a hard task in giving a compressed picture of the commercial activity of the world. Such a work, however well done, cannot help reminding us of the lists of capes and rivers that once posed as lessons in geography. It is impossible to correlate all the details with the physical conditions of the country which they concern. The excellent description of the industries of Sheffield (p. 95) shows what the author would give us in a more limited field or in a series of such volumes. Even among the mere statements of facts, such as "*Zinc* is an important mineral product of Germany, Belgium, the United States, and elsewhere," he hits upon something that makes us think; why, for instance, are precious stones "in great part products of hot countries"? GRENVILLE A. J. COLE.

TEXT-BOOKS OF PHYSICS.

(1) *Mechanics and Heat: an Elementary Course of Applied Physics.* By J. Duncan. Pp. xiii + 381. (London: Macmillan and Co., Ltd., 1913.) Price 3*s.* 6*d.*

(2) *Experimental Science.* I., Physics. By S. E. Brown. Pp. viii + 272. (Cambridge: University Press, 1913.) Price 3*s.* 6*d.*

(3) *Practical Physics for Secondary Schools.* By N. H. Black and Dr. H. N. Davis. Pp. ix + 487. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd., 1913.) Price 5*s.* 6*d.* net.

(4) *A Text-book of Physics.* Edited by A. Wilmer Duff. Third edition revised. Pp. xvi + 686. (London: J. and A. Churchill, 1913.) Price 10*s.* 6*d.* net.

(5) *A Systematic Course of Practical Science for Secondary and other Schools.* Book II., Experimental Heat. By A. W. Mason. Pp. vii + 162. (London: Rivingtons, 1913.) Price 2*s.* 6*d.* net.

(6) *Paul Drudes Physik des Aethers auf Elektromagnetischer Grundlage.* Zweite Auflage. Neu bearbeitet von Dr. Walter König. Pp. xvi + 671. (Stuttgart: F. Enke, 1912.)

(1) THE object of Mr. Duncan's text-book, according to the preface, is to awaken interest in the applications of the principles of mechanics and heat to engineering and allied constructive arts. The author has compiled a well-arranged course of experimental work and descriptive matter in mechanics and heat, and, being an engineer, the applied side of the subject is kept well in the foreground. The first eleven chapters are devoted to mechanics, and contain, in addition to the more or less academic part of the subject, chapters on simple mechanism and hydraulic machines. The remaining ten chapters deal with heat, the action of the steam engine and the internal combustion engine being presented in a very simple and lucid manner, and well illustrated by clear diagrams. It may be regretted that Mr. Duncan could not have included some of the more modern methods of thermometry in the section on temperature, the principles and construction of many of the instruments employed being quite intelligible to elementary students. The subject of thermal conductivity, too, is barely touched upon, and as lagging is of extreme importance to the engineer, the value of the book would have been considerably increased by the inclusion of a few well-chosen experiments on this subject.

The book can be strongly recommended to first year students in technical institutes, and there is much in it that the average boy in the upper forms of a secondary school will appreciate. His interest in physics will certainly be stimulated by having the action of the cycle-motor and the motor-car engine so lucidly explained. Teachers of physics in schools may, however, object to the use of British units—lb., ft., ° F.—and the physicist does not usually determine the latent heat of water by plunging a piece of ice weighing ½ lb. in ½ gall. of water. Objection may also be made to this constant being termed the latent heat of ice. An excellent feature of the book is the questions and exercises appended to each chapter.

(2) The volume on physics by S. E. Brown is the first part of a course on experimental science for use in secondary schools; part ii. is to deal with chemistry. The present book is divided into four sections, viz., (1) measurement, (2) hydrostatics, (3) mechanics, (4) heat. The author supposes a boy to spend from two to three years in working through the book, and this, in conjunction with the chemistry course, should prepare him fully for such examinations as the experimental science of the Junior Locals or the Army Qualifying Examinations. As is now usual in books of this character, the manual may be used either in the laboratory or the class-room. The experiments are well selected, and great care has been taken in the preparation of the volume. We do not, however, like such statements as that on p. 3, where, in explaining how to use a scale for measuring lengths, we have the direction: "Put

one end of the object to be measured exactly opposite to the first unit mark"; the position of both ends of the object should be read off, the fraction of a division being estimated by the eye. We cannot agree with the author's claim on p. 194 that the apparatus described for measuring the expansion-coefficient of air at constant pressure gives better results than any form usually employed in schools. He has in the example cited a movement of the mercury column of 4·93 cm., and it would be very difficult to estimate this exactly to more than 1 mm. There is confusion in the definition of thermal conductivity, the expression "a centimetre cube" would have been better than "a cubic centimetre," and the coefficients of thermal conductivity in the table on p. 245 are not in calories. The large number of questions and numerical exercises should prove a great boon to many teachers.

(3) "Practical Physics for Secondary Schools," by Black and Davis, is not a laboratory manual, but what in England would probably be termed a "Text book of Elementary Physics." The authors, in the preface, state that in preparing the volume they have tried to select only those topics which are of vital interest to young people, whether or not they intend to continue the study of physics in a college course. They believe that everyone needs to know something of the working of electrical machinery, optical instruments, automobiles, vacuum cleaners, fireless cookers, &c. It must not be thought, however, that the fundamental principles of physics have been neglected; Messrs. Black and Davis have succeeded in producing a very clear and interesting text-book. In the chapters devoted to optics we have the proof of the mirror formula, $1/D_0+1/D_1=1/f$, but in the case of the lens the authors state the same formula holds. We should like to have seen it made more explicit as to the signs of the terms in the various cases which may arise. Fig. 444, combining spectral colours into white light by aid of a convex lens, is obviously wrong. The book contains a large number of questions and numerical exercises, and there is much useful information in it which should prove of extreme value to a teacher, but it is scarcely suitable for adoption in English schools owing to its American style.

(4) The first edition of Duff's "Text-book of Physics" appeared in 1908, and was compiled by the collaboration of seven teachers of physics in the universities and polytechnic institutes of the United States. In this third edition the sections on heat and electricity and magnetism have been re-written, and are greatly improved. Prof. Mendenhall is responsible for the section on heat, and Prof. Carman for that on electricity and magnetism. Prof. McClung contributes a section on the conduction of electricity through gases. The text-book forms an excellent college course on physics, and though, in a single volume, the treatment of some points must of necessity be meagre, there are references at the ends of each section to the various standard text-books dealing with special branches.

(5) "Experimental Heat," by A. W. Mason, is a laboratory course of experiments for secondary schools, and thoroughly covers the syllabus of the Matriculation and Senior Locals. The book is well arranged, and each exercise is furnished with questions bearing on it. The answering of these by the pupil will certainly necessitate intelligent thought about the experiment he has performed.

(6) It is more than eighteen years since Drude's "Physik des Aethers" was published, the book being the outcome of a course of lectures on Maxwell's Electromagnetic Theory delivered by the late Prof. Drude at the University of Göttingen. Although the book did not aim at being a complete treatise on electricity and magnetism, it formed an excellent introductory course to the standard work of Maxwell. The mathematical treatment was simple, no further knowledge than the elements of the calculus and differential equations being demanded of the reader. In the new edition by Prof. W. König, although the scope of the book remains the same, considerable modifications have been made which greatly enhance its value as a text-book of electricity. The first portion of this second edition is devoted to electrostatic theory, the treatment of which was exceedingly meagre in Drude's original work. The section dealing with Helmholtz's "Action at a distance" theory has been omitted, and also the chapters bearing on optical phenomena from the electromagnetic point of view. These latter have been treated by Drude at much greater length in his more recent "Lehrbuch der Optik." The chapters on electrical oscillations have been amplified, the theory of coupled circuits being included. The author has found it impossible to deal with the electron theory within the compass of the book. An excellent portrait of the late Prof. Drude forms the frontispiece of the work.

OUR BOOKSHELF.

Underground Waters for Commercial Purposes. By Dr. F. L. Rector. Pp. v+98. (New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Ltd., 1913.) Price 4*s.* 6*d.* net.

THE title of this book is rather misleading. Although the contents are interesting and useful so far as they go, the book cannot in any way be regarded as a text-book for those engaged in

advising as to water supply or in carrying out works for storage and distribution for domestic use or for power purposes. The subjects dealt with are the storage and flow of underground water in porous soils, and the chemical properties of this water, but nothing is said as to how this underground water can be made serviceable.

The chapters into which the book is divided relate to:—the source and flow of underground water; springs and wells; the chemical, bacteriological, and microscopical examination of underground water, together with rules and tables relating to water, and a bibliography of books bearing on the subjects dealt with.

The author does not attach much importance to the quality of water so far as what is generally termed "hardness" is concerned, due to the presence of lime, on the ground that the quantity contained in the water is so small "that it would be necessary to drink gallons of such water at a time in order to get enough to have any effect upon the system." Whatever may be the case in America, the country where the author's experience has been obtained, here it is generally recognised that water containing lime is very injurious to any constitutions subject to complaints such as gout or rheumatism. Such water when boiled leaves a solid deposit on the bottom of the vessel in which it is contained. The effect on domestic boilers is very deleterious, and necessitates frequent scaling to remove the encrustation that takes place on the surface in contact with the water. The encrustation also of boilers used for producing steam for power purposes is a very serious objection to the use of hard water when it can be avoided.

Outlines of Mineralogy for Geological Students. By Prof. G. A. J. Cole. Pp. viii+339. (London: Longmans, Green and Co., 1913.) Price 5*s.* net.

As its name implies, this book is "primarily intended for those who are interested in geology, and find themselves in need of an introduction to the classificatory details of the larger works of reference." Within the limits of 330 pages of fairly large type Prof. Cole has produced a textbook which, so far as it goes, is trustworthy, interestingly expressed, and based upon the now firmly consolidated modern ideas of crystal structure and symmetry. It has the further recommendation that it indicates, by footnote references, those larger works or original memoirs from which further detailed information may be obtained as regards both theoretical elaborations and experimental processes and measurements. Moreover, the greater number of these references are to works of very recent date, and it is obvious that the author has followed the rapid recent developments of the crystallographical part of his subject with care and keenness. Hence this book will form a safe and inspiring guide to students embarking on the study of mineralogy for the purpose of eventually utilising their knowledge in the field; and although such an object is not specifically indicated by the author, the use of the book can scarcely fail to produce the good effect of interesting the would-be mining engineer in the pure science of the subject, and possibly of inspiring some original work.

As regards the half of the book devoted to descriptive mineralogy, a point of special excellence is the manner in which the phenomena of isomorphism and of the periodicity and family resemblance in the relations of the chemical elements are maintained prominently in view throughout. Also the especially able treatment of the silicates, so important to the geologist, which one would naturally expect from Prof. Cole, is a commendable feature of the book. While the letterpress is thus of general excellence so far as its very limited outlook is concerned, it is to be regretted that such illustrations as are new (many of the figures being older ones borrowed from H. Bauerman's "Systematic Mineralogy" issued by the same publishers) could not have been of a higher character; while perhaps adequate for their purpose, they are by no means worthy of so well written a book.

The Elements of Descriptive Astronomy. By E. O. Tancock. Pp. 110+xv plates. (Oxford: Clarendon Press, 1913.) Price 2*s.* 6*d.* net.

THIS little book may profitably be placed in the hands of boys beginning to take an intelligent interest in the heavens. Facts are given mostly with accuracy, and stated clearly in simple phrasing. There are many half-tone reproductions of interesting celestial photographs, and the text is helped by numerous instructive line diagrams. We may mention No. 13, which excellently *explains* the different noonday altitudes of the sun at summer and winter solstices. Efforts are made throughout to lead the reader to observe and think. A feature of the book consists in a small collection of quotations of an astronomial character for the reader to explain. There are some blemishes which may perhaps be remedied in another edition. Thus the bulk of Saturn is incorrectly "deduced," and its aplatissement is much greater than that of Jupiter; also, eight significant figures are misleading when employed in expressing the distance from the earth to the nearest fixed star; and Praesepe might be mentioned as suitable for observation with a small telescope. H. E. G.

A National System of Education. By J. H. Whitehouse, M.P. Pp. 92. (Cambridge University Press, 1913.) Price 2*s.* 6*d.* net.

THIS book is welcome as an indication that our legislators are becoming not only more interested in national education, but also better informed as to English educational needs and shortcomings. These brief chapters on all grades of education, and on many problems which demand an early solution, will serve admirably to instruct ordinary citizens as to the duty of the State towards education.

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 Plumage Bill.

I HAVE read with much interest Sir Harry Johnston's article in NATURE of December 11 (p. 428) on the Plumage Bill proposed to be introduced next session into Parliament. I agree in the main with him that the Bill does not give as much satisfaction as was hoped for to "root and branch reformers," for it exempts from supervision personal clothing worn or imported by individuals entering this country from abroad. Consequently a woman resolved to have headdresses and robes of forbidden plumage has only to purchase such abroad and stick it into her apparel or her hat and she passes our Customs houses unchallenged.

This weakness in the Bill can surely be eliminated by making the *wearing* of wild birds' feathers in England by British subjects as illegal as the importation of the feathers. If no feathers can be introduced, it is obvious that anyone wearing them is act and part in their introduction, and the contraband is therefore subject to seizure. In any case, the Customs officers may examine any luggage suspect of concealing contraband plumes, and confiscate the feathers in the hat or dress of any subject when a law to the effect comes into force, just as they can now with any other species of contraband. It seems an absurdity to disallow the import of feathers, and yet allow them to be flaunted openly in the street. Of course, *foreign* visitors wearing feathers in England could not be legitimately interfered with; but it would be illegal for them to sell or dispose of the same in this country. Yet it would matter little if the *wearing* of plumes by British subjects were illegal. I think the American law, by which feathers worn by foreign visitors to the States, in whose country the custom is legitimate, are seized, is indefensible. It is all right when applied to its own subjects; but to foreigners it is nothing short of legalised assault and insult. How would a Maori chief, with the huia feathers distinctive of his rank in his hair, be dealt with?

Such a case as the Nipal trade could, as Sir Harry Johnston indicates, be easily blocked either at the frontier or at the Calcutta Customs House, and regulated in the same manner as the trade in opium or arms is.

As a British ornithologist, I hope Sir Harry will allow me to take exception, if I do not misunderstand him, to his charge of lukewarmness against our union in respect to this Bill. The union may contain a few opponents of the measure—they are chiefly egg-harriers—but the attitude of the great majority of its members most certainly is not that "so long as museum shelves are stuffed with specimens birds may be in the landscape or not." Only a few of the members have private collections or are museum conservators. At the last largely attended meeting of the club, a few days ago, approbation was universally extended to one of our members for having, by the expenditure of much time and with infinite patience, tried to identify by aid of his binocular a rare visitor to a certain part of England, instead of "collecting" it, which he could easily have done, and so spared himself, at the expense of a charming addition to the fortunate locality.

Is Sir Harry not rather inconsequent in asking why should there be any more killing of birds and beasts, and relegating their life-study to the camera, while reminding his fellow-ornithologists "that it is not only the skin of the bird for classification that is needed, but still more the bones, the muscles, and the viscera and the living creature itself"? I fear he cannot get these omelettes without breaking the eggs! A long series of skins is, moreover, now considered necessary for the real study of species. I may associate Sir Harry with myself as men who have collected largely, in affirming that the real scientific collector and lover of birds, who is also an exterminator of species, is a very rare person. Anyhow, over-destruction of animals for scientific purposes can be easily regulated by licence. Neither plume-hunters nor wardens can replace the scientific collector in obtaining materials for investigation.

The real object desired by the Royal Society for the Protection of Birds is the prevention of the great cruelty for which the plumage trade is responsible, of the extermination, and of the reduction towards that point of the beautiful and beneficent fauna of the world. America by her draconic law has the credit of beginning the war against extermination on effective principles. The evil must be scotched, both at the source and at the terminus of the trade. If England and her possessions prohibit the export, import, and wearing of plumes, assisted by Germany and Austria (and I understand they desire to cooperate with this country in the matter), the fashion for wearing feathers would die out notwithstanding the open market of Paris and Antwerp, and with it this nefarious trade. Where a species becomes so numerous as to cause loss to the agriculturist, it would be easy enough to give special licence for its destruction *without leave to export the skins,* for then there would be no inducement to kill more than might be necessary to "abate the nuisance." Against "discriminating reasonably" and allowing others so procured to be exported there could be no objection, if it were possible; but the Customs officers would then require to be trained ornithologists. The difficulty of determining a scheduled species is extremely difficult, and has been the cause principally of the failure of our Counties Bird Protection Bill.

All "root-and-branch reformers" in this matter are more than grateful to Sir Harry Johnston for his constant advocacy of a Bill that shall be effective to preserve the beautiful and useful animals of the world in face of the opposition of a "barbarous industry."

HENRY O. FORBES.

Redcliffe, Beaconsfield, December 14.

Intra-atomic Charge and the Structure of the Atom.

I AM very grateful to Mr. Soddy (NATURE, December 4, p. 399) that in accepting in principle the hypothesis that the intra-atomic charge of an element is determined by its place in the periodic table, he directed attention to the possible uncertainty of the absolute values of intra-atomic charge and of the number of intra-atomic electrons. Surely the absolute values depend on the number of rare-earth elements; but if to the twelve elements of this series, the international table contains between cerium and tantalum, the new elements (at least four) discovered by Auer von Welsbach in thulium (*Monatshefte für Chemie* 32, Mai, S. 373), further keltium, discovered by Urbain (*Comptes rendus d. l'Acad. des Sciences,* 152, 141–3), and an unknown one for the open place between praseodymium and samarium be added, this long period, too, becomes regular. Moreover, if only twelve instead of eighteen elements existed here, the ratio of the large-angle scattering per atom divided by M^2 is no longer constant, the values for copper,

silver, tin, platinum, and gold then being 1·16, 1·15, 1·19, **1·26**, and **1·24** respectively, instead of 1·16, 1·15, 1·19, **1·17**, and **1·15**; and the same holds for the following relation concerning the number of intra-atomic electrons.

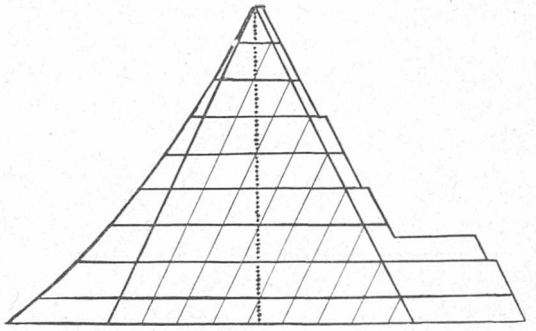
The irregularities in Mendeléeff's system—rare-earth series, complexity of group VIII., and this group, as well as group O being only half-groups—may be removed by putting hydrogen and helium (as components) outside the table, and condensing each triad of Group VIII. into one place alternating with the rare gases, and likewise all elements from cerium to tantalum into one place. For this "condensed" system, with a constant period of eight places and a constant long period of sixteen, the relation $(A-2M)/kP^2$=constant, holds as exactly, as for mean values of A, the possibility of different components taken into account, may be expected. (P is for the condensed system what M is for Mendeléeff's, and k is a constant.) If now M is the number of electrons of the negative intra-atomic charge, and A/2 (if the mass of the atom consists of α particles for by far the greater part) the total number of electrons per atom, then kP^2 must be the number of electrons, making up, together with the α particles, the positive intra-atomic charge (nuclear electrons).

	C	Mg	Ar	Cr	Zn	Kr	Mo	Cd	Xe	W	Hg	U
M... ...	6	12	18	24	30	36	42	48	54	78	84	96
P... ...	4	10	16	22	26	32	38	42	48	54	58	70
kP^2 ...	0	0	1	2	3	5	6	8	11	14	16	23
A (calc.)	12	24	38	52	66	82	98	112	130	184	200	238
A (exp.)	12	24	40	52	65	82	96	112	130	184	200	238

A (calc.)$=2(M+kP^2)$; $k=0{\cdot}00468$.

I agree with Mr. Soddy that the number of these electrons, or the components, or both, must be different for different members of the same element, and, as atomic weight, a mean value. But it seems doubtful whether other components than the α particles can be present in atoms in any appreciable amount, for of eighty-three elements no fewer than thirty-one have atomic weights of the type $4n$ (from $3{\cdot}51+4n$ to $4{\cdot}50+4n$), and twenty-nine of the type $3+4n$ (from $2{\cdot}51+4n$ to $3{\cdot}50+4n$, n being an integer), and if all radio-active substances be included (the atomic weights of the uranium family being calculated from those of uranium, radium, and lead, and actinium considered as a branch product of the uranium family), then from 114 atomic weights forty-one belong to the $4n$, fifty to the $3+4n$ series, and only twenty-three, instead of fifty-seven, to the two other types. Should particles of atomic weight one, two, three, or more, or other not being a multiple of H—for example, such as proposed by Nicholson (*Phil. Mag.*, vol. xxii., 1911, p. 871)—be mixed up with the α particles in comparable amount, then this distribution would be very improbable. Perhaps one particle of mass $\frac{3}{4}\alpha$ (J. J. Thomson's X_3?) only, is present in the $3+4n$ series, and none but α particles in the $4n$ series. Of course, other components are not impossible, but at least the members of each radio-active family must have the same components, and if actinium is a branch product of the uranium family, then here only members of the two series $3+4n$ and $4n$ are present. The periodic systems proposed previously (*Physik. Zeits.*, vol. xii., p. 490, and vol. xiv., p. 32) might then be systems not of elements, but of all possible atomic substances.

If then A/2 is the total number of electrons per atom, $kP^2=R$, that of the electrons of the intra-atomic positive charge, P that of the electrons arranged periodically, say in rings of eight electrons each, with a rest of electrons of valency, and $M-P=Q$ that of the electrons arranged aperiodically (as are the elements excluded from the "condensed" system), we get this scheme of electronic distribution, in which R is given on the left of P, and Q on the right, and the horizontal lines indicate the numbers of electrons in each and the atomic weight, while the dotted line gives the elements (each dot representing an element of the condensed system, and eight a period), and at the same time the scale for the numbers of electrons in the horizontal lines, each dot then representing one electron.



Distribution of intra-atomic electrons.

After the foregoing had been written, a letter appeared on the same subject from Prof. Rutherford (NATURE, December 11, p. 423). My letter was, indeed, not supposed by me to give any rectification of the theory of the positive nucleus as proposed by Prof. Rutherford. Nor did I suppose the idea that the nucleus might contain electrons to be new. Moreover, a cluster of α particles only may still be at the centre of the atom surrounded by some rings of electrons of a diameter smaller than $3{\cdot}10^{-12}$ cm. These rings may have no influence at all on the properties of the elements, and for an electron penetrating from without will belong to the nucleus, while for an electron ejected from the innermost ring they will not. So the characteristic radiation depends on M and not on A. This was proved by Moseley (*Phil. Mag.*, vol. xxvi., 1913, p. 1024; the first direct proof) to hold for the elements from calcium to zinc, but seems to hold for all. If the logarithm of μ/d(Al) be plotted against the logarithm of M, all the points lie on a straight line for the "K," and on another for the "L" radiation, the two lines being apparently parallel. The same holds for the values given by Laub (*Physik. Zeitschr.*, vol. xiv., 1913, p. 992) for the "I" radiation. The Al radiation, $\mu/d(\text{Al})=580$ cm.^{2}, g^{-1} seems to belong to still another series.

Likewise, Widdington's law holds better for $2M.10^8$ than for $A.10^8$ cm./sec., though, of course, for elements of low atomic weight the difference of M and A/2 is small; but for elements from Te upwards this difference is 20 per cent. and more.

Table II.

	Cr	Fe	Ni	Cu	Zn	Se
v min./0·995 A.10^8	0·98	**1·05**	1·05	0·99	0·98	**0·94**
M	24	26	28	29	30	34
v min./2·167 M.10^8	0·98	**1·03**	1·01	1·00	**0·98**	1·00

But the γ radiation for M=86 (lead, &c.) in the neighbourhood of the "L" values ranges from μ/d(Al)=11·4 to μ/d(Al)=85 (Rutherford and H. Richardson, *Phil. Mag.*, vol. xxvi., p. 946), and is different for "isotopes."

Hence an electron penetrating the atom must pass the region of the "M" electrons, to excite, if of the required velocity, the outer rings of what, from a chemical point of view, might be called the nucleus,

and, the radiation depending on the charge within the ring, and this charge being equal approximately to the number of electrons surrounding the ring, both will depend on M (see Bohr, *Phil. Mag.*, vol. xxvi., 1913, p. 476, and Moseley, *loc. cit.*). But a β particle ejected from the innermost ring must pass all other rings, and excite radiation different for each ring and for each "isotope," as dependent on the charge within, *i.e.* on nearly A/2, on M, on P, and so on, and lose quanta of energy proportional to the square of M, P, &c. Indeed, for Ra C ("K" radiation)

$$2m.M^2.10^{16}=0{\cdot}8\times10^{13}e(M.=88), \text{ and}$$
$$2m.P^2 10^{16}=0{\cdot}4\times10^{13}e(P=62),$$

in agreement with the quanta, calculated by Rutherford. (For these velocities $m/2V^2$ will nearly give the energy of the β particle.) Besides, the "L" radiation of Bi being about equal to the "K" radiation of As (P=29), another quantum

$$m/2(58.10^8)^2=0{\cdot}09\times10^{13}e,$$

may be expected, and can indeed be calculated from Rutherford's tables (*Phil. Mag.*, vol. xxvi., 1913, p. 725).

But even then the nucleus might contain electrons. If the particle should, as probable, consist of 4(H+) and 2 electrons, and the particle X_3+ of 3 (H+) and 2 electrons, the number of electrons and of H+ particles should both be equal to the atomic weight. But then the diameter of the positive unit could certainly not be greater than the diameter of the electron (10^{-13} cm.), and it might, indeed, be an electron too, but in a different state, and be a particle with a net positive charge.

A. VAN DEN BROEK.

Gorssel, Holland, December 12.

Wind Provinces.

SEVERAL meteorologists have shown recently that the wind directions in the neighbourhood of cyclones and anticyclones are not of the simple nature that is sometimes supposed. Indeed it would seem that at any moment, if we consider an area large enough, the winds may be separated into distinct provinces over which they blow with great steadiness as regards direction.

Fig. 1 shows these *wind provinces* for the North Atlantic and the European and East Asiatic areas for October 25. No doubt near the surface of the earth the winds are more complex in their distribution than they are in the free air. The wind directions and isobars are taken from the Weekly Weather Report, and the long and short dotted lines separate one wind province from another. The greatest irregularities in the direction of the wind occur near mountain chains, and where rain is falling and producing local currents in the lower atmosphere.

Fig. 2 shows the wind provinces over western Europe at 8 a.m. on November 13, 1901. The wind directions shown by the arrows are from plate vii. of "The Life History of Surface Air Currents," by Shaw and Lempfert. Here we have the winds of three provinces flowing towards or influenced by the cyclonic centre. At 6 p.m. the centre had moved about one mile to the east, heavy rain fell over Europe, and the wind in the rainy area became more variable in direction. The rain of this cyclone appears to have been largely due to the wind of the south-south-westerly province bunching up against and mounting over the wind of the east-north-easterly current. Cave is of opinion that rain is very frequently the result of one wind rising over another in this manner. Thus a north-easterly wind may have an upper south-westerly rain-bearing wind blowing over it, adiabatic expansion and condensation being due to the rise of the air and only slightly to the lower pressure of the cyclonic centre.

From Fig. 1 it would appear that winds which are at the earth's surface at one place must often be upper winds at other places. Occasionally no doubt the line separating two provinces is where the wind undergoes a rather sudden change of direction under the influence of an advancing depression; for the

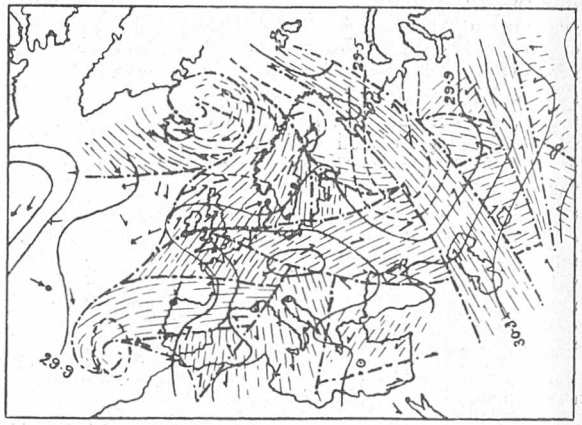


FIG. 1.—Wind Provinces, Oct. 25, 1913.

cyclone as it advances, although it changes the direction of the wind, does not carry any particular mass of air very far from the position in which it found it. An interval of twenty-four hours is generally sufficient to alter very greatly the distribution of pressure, and, therefore, also of the wind provinces.

Shaw and Lempfert, in their "Life History of Surface Air Currents," have shown that the actual path

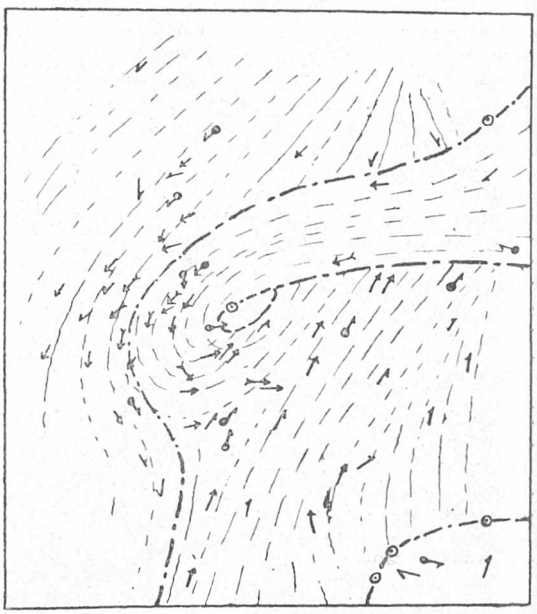


FIG. 2.—Wind Provinces, Nov. 13, 1901.

of the air is not that which might be gathered from the wind charts; for the distribution of pressure and the arrangement of the wind provinces, change entirely in many cases, long before a mass of air could pass from an area of high pressure to one of low pressure. However, they prove that there is an actual rise of the air near a cyclonic centre capable of producing adiabatic expansion and the fall of rain.

It may be that if each day, or, better still, twice each day, a more detailed map of the wind provinces were drawn, and as much information of the upper currents obtained as possible, it would assist to elucidate many obscure questions relating to rainfall.

Of late years the steady improvement of the charts given in the Weekly Weather Reports of the Meteorological Office has been very noticeable. If the charts were twice the size and the evening observations dealt with as fully as the morning, a great step in advance would be made. R. M. DEELEY.

Abbeyfield, Salisbury Avenue, Harpenden, November 13.

Amœbocytes in Calcareous Sponges.

WHEN Prof. Dendy, in NATURE of December 4, writes that "the Amœbæ referred to by Mr. Orton . . . possibly . were . . . metamorphosed collared cells," he must have failed to notice the dimensions given by Mr. Orton.

A cell "with slightly rounded ends" "80 μ long and 40 μ broad," and (say) only 10 μ thick, would contain some sixty of even the large collar-cells of *Grantia compressa*. GEO. P. BIDDER.

Cavendish Corner, Cambridge, December 14.

MR. BIDDER is perfectly right. The Amœbæ described by Mr. Orton are far too large to be metamorphosed collared cells or even young amœboid germ cells. The only cells in the sponge (*Grantia compressa*) which compare with them in size are the full-grown oocytes, and although these are amœboid and put out long pseudopodia, it is scarcely likely that they would find their way into the gastral cavity, as I have never seen them except in the mesoglœa between the chambers. My data, from which the actual size of the amœbocytes could be calculated, were not at hand when I wrote my letter, and as I had been working with a magnification of 1650 diameters, my ideas of a "rather small" Amœba had come to differ considerably from Mr. Orton's. Knowing how abundant amœbocytes frequently are in the flagellated chambers of the sponge it seemed almost certain at first sight that any obtained from the gastral cavity would be of the same nature, but evidently I was mistaken, and I am much obliged to Mr. Bidder for directing my attention to the fact. ARTHUR DENDY.

University of London, King's College, December 16.

Reversibility of Ferment Action.

IN NATURE of December 4 last there is a letter from Sir Lauder Brunton, correcting a misstatement in a former issue in connection with a paper by Prof. Bourquelot on the reversible nature of ferment action.

Sir Lauder Brunton's letter points out a mistake that might have been prejudicial to me; but your original article was not quite fair also to Prof. Bourquelot, for he, so far from claiming priority for himself, gave me in his paper full recognition.

Since I first showed that the action of a ferment was a reversible one, many observers have done confirmatory work. The earliest to do so were Profs. Kastle and Löwenhart, of the United States, and among the more recent, Prof. Bayliss in this country has done valuable work.

I am glad that Prof. Bourquelot by his own good work has become convinced.

ARTHUR CROFT HILL.

169 Cromwell Road, S.W., December 19.

THE ORIGIN OF CLIMATIC CHANGES.

THE discussion of meteorological observations shows clearly that climates undergo variations of short duration, but such records as the presence of old lake beaches and the existence of well-marked glacial moraines, and other geological evidence distinctly point to climate changes covering long intervals of time. The evidence is not sufficient to characterise the variations as periodic, but the ice ages are sufficient to point to times when the conditions reached were extreme.

What may reasonably be assumed to be the chief established facts about such extensive changes may be summed up briefly as follows:—Climatic changes were several, and probably many. Similar simultaneous changes occurred over the whole earth, or, in other words, it was warmer or colder over the whole earth simultaneously. These times of warmth or coldness were unequal in intensity and duration, and of irregular occurrence, and, lastly, they have taken place from very early, if not from the earliest geological age down to the present. Numerous theories, both probable and improbable, have been suggested from time to time to account for the origin of such world-wide changes, and while each has its advocates, perhaps only three may be said to claim attention to-day. These may be briefly stated as the Eccentricity Theory (Croll), depending on the eccentricity of the earth's orbit; the Carbon Dioxide Theory (Tyndall), based on the selective absorption and variation in amount of carbon dioxide; and thirdly, the Solar Variation Theory, on the assumption of solar changes of long duration. A new theory, which may be called "The Volcanic Dust and Solar Variation Theory," has recently been put forward by Prof. W. J. Humphreys,[1] under the guarded heading, "Volcanic dust and other factors in the production of climatic changes, and their possible relation to ice ages."

The author carefully points out that the idea that volcanic dust may be an important factor in the production of climatic changes is not new, but "though just how it can be so apparently has not been explained, nor has the idea been specifically supported by direct observation." He remarks also that while the pioneers regarded the presence of volcanic dust in the atmosphere as an absorbent of radiation, and so lowered the earth's temperature, modern observation suggests the opposite effect, namely, the warming of the earth's surface.

In putting forward his views of the action of dust, Prof. Humphreys proceeds first to indicate that the dust that is effective is that which is situated in the atmosphere in the isothermal region or stratosphere. He then enters into the question of the size of the particles and probable time of fall, and concludes that particles of the size 1·85 microns in diameter would take from one to three years to get back to the earth if

[1] Journal of the Franklin Institute. August, 1913, vol. clxxvi., No. 2, p. 131; also Bulletin of the Mount Weather Observatory, August, 1913, vol. vi., part 1, p. 1.

they originally had been thrown up by a volcanic eruption.

Considering next the action of the finest and therefore most persistent dust on solar radiation, he finds that the "interception of outgoing radiation is wholly negligible in comparison with the interception of incoming solar radiation."

Prof. Humphreys now turns his attention to the observational evidence of pyrheliometric records, such readings being functions of, among other things, both the solar atmosphere and the terrestrial atmosphere. He thus introduces a curve showing smoothed values of the annual average pyrheliometric values, and compares this with sun-spot frequency values (representing solar atmospheric changes) and number of volcanic eruptions (representing terrestrial atmospheric changes). The similarity of the last-mentioned with the pyrheliometric curve leads him to write as follows: "Hence it appears that the dust in our own atmosphere, and not the condition of the sun, is the controlling factor in determining the magnitudes and times of occurrence of great and abrupt changes of insolation intensity at the surface of the earth."

The action of the dust intercepting at times as much as one-fifth of the direct solar radiation leads him to inspect earth surface temperature values to inquire whether they are below normal on such occasions. The pyrheliometric and temperature curves suggest a relationship, but, as he states, "the agreement is so far from perfect as to force the conclusion that the pyrheliograph values constitute only one factor in the determination of world temperatures." A better agreement is secured when the combined effect of insolation intensity and sun-spot influence is considered.

The author then discusses the temperature variations since 1750 as influenced by sun-spots and volcanic eruptions, and indicates that the disagreement in the curves of temperatures and sun-spots is in every important instance simultaneous with violent volcanic eruptions.

Limitations of space will not permit us to remark on his references to the action of carbon dioxide in slightly decreasing the temperature or to probable great changes in level. Enough perhaps has been said to show that Prof. Humphreys, in his interesting attempt to show "that volcanic dust must have been a factor, possibly a very important one, in the production of many, perhaps all, past climatic changes . . .", has restarted a topic which will no doubt call for criticisms and discussions from many quarters.

BIOLOGY OF THE LAKE OF TIBERIAS.[1]

THAT natural history had its students among the ancient inhabitants of Palestine is clear from the book of the Levitical law and from the biography of King Solomon. But during the first century of our era there is nothing to show that the study excited the slightest interest in that locality. Fishes are mentioned for their economic use; mint, anise, and cummin as objects of taxation; the stars in the sky and the flowers of the field for their superficial beauty; crops are supposed to spring from dead seeds; pearls of impossible size are made the symbols of celestial splendour. It is only in modern times, and even now by strangers rather than natives, that a striking contrast to this apathy has been brought about. If the water of the Jordan is still carried westward for religious rites, samples from the Sea of Galilee are now collected with equal care for chemical analysis; Syrian Entomostraca are reared in England from mud out of the pool of Gihon at Jerusalem; from the Galilean lake, by the use of tow-nets, hand-nets, and special dredges, a varied fauna is obtained, such as might have excited the interested surprise of Solomon, but would probably have been viewed with disgust by the Sanhedrim of a later epoch.

Prof. Théodore Barrois, in his own interesting study of the Syrian lakes (1894), explains that the scientific exploration of them was begun in August, 1847, by Lieutenant Molyneux, R.N. By great efforts this officer succeeded in obtaining valuable hydrographical details, both in the lake of Tiberias and in the Dead Sea, only to succumb almost immediately afterwards to the exhausting effects of the climate, torrid and unwholesome at that season in the valley of the Jordan. In some future Dictionary of National Biography his name ought surely to find a place. His initial enterprise has been followed by the labours of many eminent naturalists. Dr. Annandale's present contribution to the subject was instigated by his desire to trace the genera of sponges and some other invertebrates "characteristic of the fresh waters of India and tropical Africa northwards up the Jordan valley, should they prove to have a distribution in any way similar to that of the Jordan fishes, whose African affinities have long been known." He concludes that "There is no reason to think that the sponge-fauna of the Lake of Tiberias is closely related to that of any other lake, but its affinities lie rather with that of Eastern tropical Asia, and possibly with that of the Caspian Sea, than with any in Europe and Africa."

His investigation of the Galilean fresh-water sponges leads Dr. Annandale to divide the Spongillidæ into two subfamilies, the Spongillinæ, in which microscleres are present, and the Potamolepidinæ, in which microscleres apparently are not produced. Of the former subfamily the lake of Tiberias provides only one species, the widely distributed *Ephydatia fluviatilis*, var. *syriaca*, Topsent. Of the latter it furnishes four species, allotted to two new genera, *Cortispongilla barroisi* (Topsent), only known from this lake, and *Nudospongilla reversa*, *N. mappa*, and *N. aster*, all new. These are described and figured, together with other species introduced for the sake of comparison.

Useful keys are provided for distinguishing the Galilean sponges one from the other, and for recognising various genera of the Spongillidæ.

[1] A Report on the Biology of the Lake of Tiberias. Series I. Journal and Proceedings, Asiatic Society of Bengal (New Series), vol. ix., No. 1, 1913.

The subject is rather intricate, as may be judged from the history of the genera Uruguaya, Carter, 1881, and Potamolepis, Marshall, 1883. In describing the latter, Marshall, it appears, confessed that its separation from Uruguaya depended only on a geographical consideration, one group being found in Africa, the other in South America. Yet now they are assigned to separate subfamilies. Dr. Annandale, however, admits that the recognition of his sub-family Potamolepidinæ "depends to some extent on the fact that no gemmules have been found in any species that can be definitely assigned to the genus Potamolepis," and that if in the future "gemmules be found in an undoubted Potamolepis with specialised gemmule-spicules that can be called microscleres, the genus would have to be transferred to the Spongillinæ." It is evidently a case in dealing with which the student must be specialised as well as the spicules. It will not interest the water board at Cardiff, which is reported to have cleared its pipes of a blockading sponge-growth simply by using a solution of common salt, without reference to systematic nomenclature.

As it is sometimes supposed that the influence of environment is all-sufficing for the origin of species and makes natural selection a needless hypothesis, it is worth while to quote Dr. Annandale's remark that "it is not unusual for two species that live together to adopt diametrically opposite means to attain the same end." This he illustrates by the case of *Cortispongilla barroisi*, notable for the possession of a well-defined and almost symmetrical central cavity, while *Nudospongilla aster*, which inhabits the same environment, is a peculiarly compact sponge without any trace of a central cavity. The explanation offered is, that "if the particularly well-developed exhalent system implied in the production of a central cavity opening by a large osculum is advantageous in getting rid of silt that has entered the sponge, a compact structure may be equally efficient in preventing the silt from entering at all."

In separate sections of the report several subjects besides sponges are discussed by Dr. Annandale and his collaborators, but to these justice cannot be done within the limits of this notice.

T. R. R. STEBBING.

PROF. P. V. BEVAN.

THE younger generation of Cambridge physicists and many others will have noticed with regret the announcement in last week's NATURE of the death of Prof. P. V. Bevan at the early age of thirty-eight. He had a distinguished scientific record, and his friends confidently expected for him a useful and fruitful career. Entering Cambridge University in 1896 he took up the study of mathematics, and in 1899 was fourth Wrangler. The following year he was placed in the first division of the first class in part ii. of the mathematical tripos. With this equipment he turned his attention to experimental physics, and commenced research in the Cavendish Laboratory under Sir J. J. Thomson. In 1901 he was appointed to a demonstratorship, to which lecturing duties were added in 1904, and in 1908 he became Professor of Physics at the Royal Holloway College, a post which he held till his death.

Prof. Bevan's earliest important research was a very complete investigation of the action of light on the rate of combination of hydrogen and chlorine, but after his removal to London he devoted himself to optics. Starting from the work of Prof. R. W. Wood on anomalous dispersion in sodium vapour, he extended it to the vapours of other alkali metals. He made a detailed study of the absorption spectra of the vapours of lithium and cæsium, mapping their principal lines, and testing the applicability of the various formulæ suggested by Kayser and Runge, Rydberg, and Hicks to the series of lines in these spectra. Both at Cambridge and in London Bevan was keenly interested in the religious life of the students. He was president of the Cambridge Nonconformist Union, and later took an active part in the student Christian movement, to the publications of which he was a contributor. His was a strong, vigorous, and genial personality, which won the affection of all the students with whom he came into personal contact.

A. W.

NOTES.

FOR several days Sir David Gill has been suffering from double pneumonia at his residence in Kensington. As we go to press we learn that though his lungs are improving and he maintains his strength, his condition is still critical.

DR. TEMPEST ANDERSON, whose death was announced in NATURE of September 4, has left 50,000*l.* to the Yorkshire Philosophical Society, of which he was formerly president, and 20,000*l.* to the Percy Sladen Memorial Fund, established by his sister, Mrs. Sladen, in 1904.

IT is proposed to present to the Royal Society a portrait of the retiring president, Sir Archibald Geikie. A small executive committee, with Sir William Ramsay as chairman, has been formed to carry out the preliminary arrangements and collect subscriptions, which it is agreed should range between one and three guineas. Promises amounting to about one hundred guineas have been received already from fifty fellows of the society. Subscriptions may be sent to the treasurers of the Geikie Portrait Fund, at the Royal Society, or paid direct to Messrs. Coutts and Co., 440 Strand, W.C., for the fund. The subscribers will constitute a general committee, and they will be called together at a later date to consider the choice of an artist and other matters.

THE valuable services rendered to public departments by the Royal Society were referred to by Sir Archibald Geikie in his recent presidential address (see NATURE, December 4, p. 405); but it was pointed out that though the society has acquired the character of a kind of central bureau of science, there has been no corresponding increase of financial support. Sir Joseph Larmor, in *The Times* of December 20, refers

to two recent matters of national importance in which scientific advice was apparently not invited from the Royal Society or any other expert body. One case is that of the rearrangement of the lightning conductors on St. Paul's Cathedral. During the structural examination made in the past summer the iron bars, inserted at the instance of Benjamin Franklin, the originator of lightning-rods, were found; and it was recalled also that the protection of the cathedral had then (about 1780) been under the consideration of a special committee of the Royal Society. Sir Joseph Larmor asks, therefore, whether in the recent rearrangement the Royal Society, or the Institution of Electrical Engineers, or other expert public body conversant with electrical matters, was approached, or consulted, upon the matter. The other instance mentioned by him relates to the problem of the decaying stone in public buildings. It was recently reported that funds have been obtained from the Treasury, at the instance of the Office of Works, to institute a scientific inquiry on this subject, and it was proposed to move "the Foreign Office to inquire of the Governments of France, Germany, Italy, Greece, and America whether any man of science in those countries had evolved any treatment to combat this very serious evil." Here again it does not appear that the Royal Society, the Chemical Society, or the Society of Chemical Industry have been asked for advice on a national matter especially within their domain, or to provide the information which the Foreign Office proposes to collect from various Governments, though in these days of intimate international cooperation and rapid spread of information in science they could no doubt do so.

At the meeting of the Society of Antiquaries of Scotland on December 8, Mr. A. Henderson Bishop read a paper on his recent excavations in the Island of Oransay. The excavation of the MacArthur Cave at Oban in 1895 had revealed certain indications which seemed to point to the possibility of there having been a human occupation on or about the line of the 30-ft. beach at a time when the sea had not permanently retired from this level. The evidence, however, was much too meagre and insecure to admit of such a revolutionary theory being founded upon it, but that theory has now for the first time been demonstrated from the shell mounds of Oransay. The line of the beach was found on a contour of approximately 30 ft. round the hill, and the disposition of its constituents was exactly what might have been looked for as the result of powerful seas washing against the talus of food refuse. Very interesting was the attempted reconstruction of the configuration of the site at the time of occupation. What is now a turf-covered sandy hill, some 54 ft. in height, standing about 650 ft. from the present high-water mark, was then an elliptical peninsula washed round nearly the whole of its circumference by the sea and connected by the stone ridge of the beach with the rest of the island. Further, the excavation supplied exhaustive material for a picture of the culture-stage of the inhabitants, and the result is a demonstration of the existence in Scotland of a culture presenting an extremely close affinity to that discovered in the Pyrenees grottos by the late M. Piette, to which he has given the name Azilian. The characteristic implements of both sites are the same—flat harpoons of bone and horn, sometimes with one, sometimes with two, rows of barbs, and generally perforated near the base; shoe-horn-like chisels of deer horn, and bone pins, along with pieces of pumice-stone on which they were fashioned. Very striking was the large number of convex faceted chisels—about 1000 were found—hitherto unexplained, which are regarded as implements worn by gouging the mollusc of the limpet from the shell.

The death is announced, in his eighty-seventh year, of Mr. J. W. Wilkins, one of the pioneers of the telegraph system in this country.

We regret to see the announcement of the death on December 18, at seventy-two years of age, of the Rev. Edmund Ledger, professor of astronomy at Gresham College, London, from 1875 to 1908, and the author of several popular works and articles on astronomical subjects.

It is proposed to place a tablet suitably inscribed to commemorate Benjamin Franklin in the Church of St. Bartholomew the Great, West Smithfield—the parish in which he worked as a printer. Subscriptions for this memorial may be sent to Mr. E. A. Webb, rector's warden, 60 Bartholomew Close, London, E.C.

By the will of Mr. Arnold Friedlander the sum of 5000*l.* is bequeathed for a Cancer Research Fund, to be applied as his executors may direct towards increasing the knowledge of the cause, characteristics, and effects of cancer and allied diseases, and the best means of the prevention, alleviation, and cure thereof.

Prof. E. L. Trouessart, of Paris, and Prof. W. B. Scott, New Jersey, U.S.A., corresponding members of the Zoological Society of London, have been elected foreign members of the society. Prof. E. Ehlers, Göttingen, Mr. J. H. Fleming, of Toronto, and Dr. C. Gordon Hewitt, Ottawa, have been elected corresponding members of the society.

A leading article in *The Northern Whig* of December 19 reminds us that the day of publication was the centenary of the birtn of Prof. Thomas Andrews, one of the most notable men whom Belfast can claim. The article gives an interesting and instructive summary of Andrews's career, and of the scientific work which won for him a place among the foremost discoverers of the Victorian era.

The twelfth general meeting of the Association of Economic Biologists will be held at Liverpool on December 30–31. Among the papers to be presented are:—"Some Observations on the Bionomics of *Glossina morsitans* in Nyasaland," Prof. R. Newstead, F.R.S.; "The First-stage Larva of *Hypoderma bovis*," Prof. G. H. Carpenter; "The Food and Feeding Habits of Some Game Birds," W. E. Collinge; "Pollination in Orchards," F. J. Chittenden.

In *Man* for December Mr. T. C. Hodson records a curious account of silent bargaining from India. When the person making an offer for a horse at a fair suggests a hundred rupees, he takes one finger of the person to whom the proposal is made under a sheet spread over both their hands, and whispers

the work *pakka*, adding another finger for every additional hundred. Similarly, the word *dâna* denotes five rupees, and *sute* a single rupee. It is a gross breach of etiquette to disclose the price fixed while the fair lasts, and it is a question of honour that offers made in this way should be held final and binding.

MR. J. REID MOIR has reprinted from *The Field Club Journal* a paper on a flint workshop floor recently discovered at Ipswich. In it were found hammer-stones, cores, worked flints, flakes, and "pot-boilers," in great abundance and close association. Comparing these "finds" with specimens of the Aurignac type, now in the British Museum, it is clear that the Ipswich flints belong to the Palæolithic cave period, in the Lower-Middle Aurignacean age. Two important results follow from this discovery. In the first place, it disposes of the theory that all the people of this age were cave-dwellers. Here there is no cave, and the settlement was formed in the open. In the second place, the abundance of "pot-boilers" indicates that these people split their flints in the fire, and, when possible, used the fragments as implements. This is an easy process, as experiments show that when a flint is placed in the fire for about five minutes, cracks appear in different places, and then a sharp blow will shatter the stone into several pieces. Mr. Reid Moir infers from this discovery that there is no hiatus between the industries of the River-Drift and those of Neolithic man, a result of the first importance, if it is found to be verified by further excavation in eastern England.

IN a paper on fishes from the Madeira River, Brazil, published in the October issue of the Proceedings of the Philadelphia Academy, Dr. H. W. Fowler describes fifteen species, one of which is made the type of a new genus—as new to science.

AN obituary notice, accompanied by a portrait, of Dr. J. W. B. Gunning, late director of the Transvaal Museum, Pretoria, appears in vol. iv., part 2, of the Annals of the Museum. Dr. Gunning, who was born at Hilversum, Holland, on September 3, 1860, went to South Africa in 1884, where he at first practised medicine. Appointed director of the museum in 1898, he raised the Zoological Gardens, which form a part of that institution, to their present high status.

THE British Ornithologists' Club has issued a "Guide to Selborne" and "A Synopsis of the Life of Gilbert White," by Major W. H. Mullens, and published by Messrs. Witherby as No. cxc of the club's Bulletin. Both were prepared in anticipation of a visit to Selborne in connection with the twenty-first anniversary of the club; but the visit did not take place, owing to the death of Dr. P. S. Sclater. In the "guide" it is pointed out that on the monument to White in Selborne Church it is stated that his remains are interred in a grave adjacent to the wall to which the monument is affixed. As a matter of fact, it lies outside the north-east corner of the church, the discrepancy being due to the transference of the tablet from the exterior to the interior of the building.

AT a particularly opportune moment, when, as has been well said, "a wave of vitalism has passed over society owing to the pervasive eloquence of Bergson and other writers," appears a reprint of an address delivered by the late Prof. Emil du Bois-Reymond on neo-vitalism ("Ueber Neo-Vitalismus," pp. 60; Verlag von W. Breitenbach, Brackwede, price 1 mark), before the Prussian Academy of Sciences, on the occasion of the Leibnitz anniversary in 1894. This is a strong criticism of the vitalistic theories which du Bois-Reymond himself did so much to undermine in Germany, and more particularly of the views of Virchow, Bunge, and of Driesch himself, whose theories have recently found favour in certain circles in this country as a new philosophy, although they are but a recrudescence of those which he formulated in 1893. The strong condemnation by du Bois-Reymond of such views may be summarised in Schleiden's phrase, which is made the text of his address:—"The savage who calls a locomotive a living thing is not more unscientific than the investigator of nature who speaks of vital force in the organism." The new edition is edited, with the addition of useful notes, by Erich Metze.

AN account, by Mr. S. W. Kemp, of the Crustacea Stomatopoda (Squillidæ) of the Indo-Pacific region constitutes part i. of vol. iv. of the Memoirs of the Indian Museum. It is really, so far as the structure and relations of the adults are concerned, a monograph of the entire group, since in addition to a review of all the local forms it includes a list, with references and synonymy, of all the species described from other regions. Altogether, according to the author, 139 species and varieties of adult Stomatopoda are known, of which ninety-seven have their being in the Indo-Pacific. All these are critically compared and succinctly described, the author having investigated not merely the extensive collection in his own charge, but also select loan collections from the British Museum and other institutions. No new methods of classification are proposed, though emphasis is laid upon the value of the ischio-meral articulation of the raptorial maxilliped for a primary subdivision of recent Squillidæ; the characters employed in grouping the species are those furnished by the raptorial apparatus, the sculpture of the carapace terga and telson, the form of the abdomen, the size, form, and inclination of the eye, and to a certain extent the presence or absence of a mandibular palp. Masterly as is the "systematic" touch, equal skill and judgment are shown in the treatment of those larger biological problems that always confront the open-eyed systematist, and the style throughout is a model of lucidity. The ten fine plates by S. C. Mondul that illustrate the memoir are part of the Illustrations of the R.I.M. Survey Ship, *Investigator*.

THE final part of the "Lepidoptera Indica (Rhopalocera)" has now been published by Messrs. L. Reeve and Co., Ltd., completing the tenth volume of this important work. The task of describing the whole of the butterfly fauna of India was planned and begun by the late Dr. F. Moore in 1890, and since his death in 1907 it has been carried on by Colonel C. Swinhoe,

in accordance with the lines originally laid down. The families, genera, and species of the Indian region are all fully dealt with, and more than sixteen hundred species are illustrated by life-sized coloured figures. The Indian region, as recognised by Dr. Moore for the purposes of this work, is bounded by the Himalayas on the north, the Suleiman and Hala mountains on the north-west, and Burma on the east. It includes Ceylon and the Andaman and Nicobar islands. Within these limits is found a butterfly fauna of great and varied interest, less noteworthy indeed than that of Indo- and Austro-Malaya, and far less rich than that of South America, but well deserving of the exhaustive treatment which it receives in the present work.

MR. IMMANUEL FRIEDLÄNDER, of Villa Hertha, Vomero, Naples, has published, with Dietrich Reimer, Berlin, a small quarto work of 110 pages, with nineteen plates and eleven maps, entitled "Beiträge zur Kenntnis der Kapverdischen Inseln." This gives the results of a journey made by him in the summer of 1912. After briefly summarising the literature and the maps of the Cape Verde Islands, giving some details of their history, of the climate, inhabitants, health relations, fauna, and vegetation, the author gives an account of his geological observations on the various islands. A valuable synopsis of the rocks collected on the islands by Stübel, Bergt, and Friedländer is contributed by Prof. W. Bergt, of Leipzig. The work should be particularly useful to anyone proposing to visit these islands, which, obviously, are worthy of further study. Mr. Friedländer has long been attempting to establish in Naples a Vulcanological Institute under international auspices, but since his plans have not met with all the support he hoped, he has determined to begin at once with a small private institute established by himself, but open to students of all nationalities. It is hoped to lend out instruments from the institute, and to publish as its organ a *Vulcanologische Zeitschrift*.

THE July number of the Journal of the College of Agriculture, Tokyo, contains an interesting paper by Osawa on the sterility in *Daphne odora*, Thunb. This species is a native of China, commonly cultivated in Japan, where it is completely sterile. The pollen and embryo sac development in two related wild Japanese species, *D. pseudo-mesereum* and *D. kiusiana*, were studied for comparison. The latter are fertile, even under cultivation, in Japan. In the microspore mother-cells of *D. odora* extra nuclei are frequently formed, and various other irregularities occur. Even mature pollen grains which reach the stigma fail to germinate. Megaspores are also formed, but the embryo sacs usually degenerate before completing their development. This species is thus sterile in both sexes. In the two fertile species the sporophyte number of chromosomes is eighteen, while in *D. odora* it is about twenty-eight. Osawa refers to the conclusion of Darwin that sterility may result from change of climate or from the effects of cultivation, as well as from crossing, and he also cites a number of sterile plants which are known or believed to have originated through mutation, as in the well-known case of *Œnothera lata*. The author concludes that the sterility of *D. odora* has been caused either by cultivation or by mutation. The change in chromosome number in this species, together with the absence of sterility in the other two species in cultivation, favours the latter hypothesis, which could be verified by determining whether *D. odora* is sterile in its original habitat.

THE monthly parts of *The Geophysical Journal* issued by the Meteorological Office for 1912 contain daily meteorological, magnetic, electrical, solar and seismic data for Kew and Eskdalemuir, meteorological and magnetic data for Valencia, and values of the wind components for certain hours for four stations. They also include the results of the investigations of the upper air, and other useful data. The units are based on the C.G.S. system; the reasons for adopting the centibar or millibar instead of the inch for barometric measurements are given in the preface to the 1913 edition of "The Observer's Handbook" published by the office. As all attempts at popularising these units will be welcome to most meteorolgists, we may take this opportunity of referring to a useful article by Mr. Bonacina in the September number of *Symons's Meteorological Magazine*, relating to the valuable work by Prof. Bjerknes on dynamic meteorology and hydrography (Publication No. 88 of the Carnegie Institution of Washington). Among Mr. Bonacina's interesting remarks it is pointed out that barometric readings in inches "no longer avail when meteorological data are employed *quantitatively, i.e.* to serve for the precalculation of ensuing atmospheric changes, in accordance with the avowed aim of the new method."

THE director of the Meteorological Service, Survey Department, Egypt (Mr. J. I. Craig), has recently published his report on the rains of the Nile Basin and the Nile flood of 1911, in the usual form, with tables and plates. For the whole year there was a general deficiency of rain, except in Kordofan, and on the White Nile. In a chapter dealing with the normal rainfall it is stated that the time of its distribution is more complex than has been supposed; the regional curves show that they include three separate distributions, instead of two, as usually supposed, and an attempt is made to give a simple explanation of the facts. As a whole, the flood of 1911 started early, but afterwards was late and poor; it improved in September, and "matters were not so bad as at one time they promised to be." The report includes some interesting notes on the regimen of Lake Victoria; the mean annual variation of its levels at various seasons is said to be only 28 centimetres (11 in.), but the surface rises and falls by much greater amounts, consequent on variations in the intensity of rain and evaporation from one year to another.

AN interesting notice of the late Prof. Milne appears in the last number (vol. xvii., part 3–4) of the *Bollettino* of the Italian Seismological Society. Dr. Martinelli refers to his ability as an organiser, to his two textbooks on "Earthquakes" and "Seismology," to the seismographs with which his name is connected, and to the fact that he was a pioneer in almost every

department of his science. The only noticeable omission is that of all reference to his useful work on the construction of buildings in earthquake countries.

IN a circular just issued by the Bureau of Standards of Washington giving the fees charged for tests of apparatus intended for temperature and heat measurements, a considerable number of hints as to the best methods of use of such apparatus are given. These hints cover thermo-electric pyrometers, both with elements of platinum, platinum-rhodium, and of iron, nickel, chromium, and their alloys, platinum resistance thermometers, and radiation pyrometers of both the single colour type, and those using the whole radiation. The provisional temperature scale now in use at the bureau is indicated by the following melting points:—Tin, 232°; cadmium, 321°; lead, 327°; zinc, 419°; antimony, 630°; aluminium, 658°; a silver-copper alloy of composition Ag_3Cu_2, 779°; silver, 961°; gold, 1063°; copper, 1083°; nickel, 1450°; palladium, 1550°; platinum, 1755°; alumina, 2050°; tungsten, 3000° C.; and the following boiling points at atmospheric pressure:—Naphthaline, 217·9°, benzophenone, 305·9°; sulphur, 444·6° C.

WHEN light is transmitted through a liquid in which a fine precipitate has just been formed, it is well known that the absorption due to the liquid increases with the time, while the proportion of polarised light in the scattered light at right angles to the incident beam decreases, both changes being due to the increase in size of the precipitated particles. A similar relation has long been suspected between the absorption of the atmosphere for the sun's rays and the degree of polarisation of the light of the sky. The question has been tested experimentally by M. A. Boutaric, of the University of Montpellier, and his results appear in Bulletin No. 7 of the Classe des Sciences of the Belgian Royal Academy for 1913. The intensity of solar radiation was measured by an Ångström pyrheliometer, and the proportion of polarised light in the light of the sky by a Cornu photopolarimeter. The measurements show conclusively that for the greater part of the radiation received from the sun the absorption due to the atmosphere is closely connected with the proportion of polarised light in the general light from the sky. When one of the two increases the other decreases. Selective absorption plays a relatively unimportant part except in certain well-marked regions of the spectrum.

IN the Records of the Geological Survey of India (vol. xliii., part 1, 1913) Dr. L. L. Fermor contributes a preliminary note on garnet as a geological barometer, and on an infra-plutonic zone in the earth's crust. Observations on the Kodurite series of rocks in the Vizagapatam district led him to inquire why these garnetiferous rocks had been caused to crystallise as such rather than according to the norm, or standard, mineral composition of Cross and Iddings. He concludes that since the garnet rocks have a higher specific gravity than their norm calculated from the chemical analyses, they must have crystallised under greater pressure. "Therefore it seems legitimate to postulate the existence below the plutonic rocks (which are typically non-garnetiferous) of a shell characterised by garnets wherever a sesquioxide radicle exists." For this shell he suggests the term *infra-plutonic*. He considers that carbon existing as graphite in the higher zones of the earth's crust will probably be represented by diamond in the infra-plutonic zone on account of the high density of the latter mineral. It is thus deduced that garnet and diamond will be two of the characteristic minerals of the zone. A release of pressure over any portion of the infra-plutonic shell would allow the liquefaction of that part of the shell under the high temperature prevalent; such liquid rock, on being intruded into the higher zones of the crust, would then solidify under lower pressure as a plutonic rock.

IN "A Theory of Time and Space" (Cambridge: Heffer and Sons, 1913, pp. 16) Dr. Alfred A. Robb gives a brief account of his investigation of the relations of time and space in connection with optics, which he hopes to publish before long in book form. His problem consists in reconstructing from the bottom the theory of relativity which, though much discussed, is "still in a condition of considerable obscurity." The chief part in Dr. Robb's mainly logical investigation is played by the idea of what he calls *conical order*. This means that there are pairs of instants, A, B, such that, though A is neither before nor after B, the instants A, B are not identical. According to the author's view, the only events which are "really simultaneous" are those which occur at the same place. Of events occurring at different places one is, generally speaking, neither before nor after the other. Only if it be abstractly possible for a person, at the instant A, to produce an effect at the instant B, is the instant B said to be after A. This is one of the fundamental definitions given along with a set of postulates. By means of these and certain additional postulates, Dr. Robb promises to develop a system of geometry based on the conceptions of "after" and "before," and thus to include the theory of space in the theory of time. If A is an instant of which I am directly conscious and B is distinct from, but neither before nor after A, then B, of which I can be aware only indirectly, assumes an external character. In short, it is an instant "elsewhere." All who are interested in the subject will desire to see these remarkable and radical ideas developed fully in the promised book.

QUICK and at the same time trustworthy methods of quantitative analysis are amongst the most important desiderata of biological chemistry, and any additions to their number are to be welcomed. Dr. P. A. Kober's application of the nephelometer, an instrument first introduced into analytical chemistry by Richards, to the study of enzyme chemistry is a case in point. In recent papers from the Harriman Research Laboratory, New York, he describes the conversion of the Duboscq colorimeter into a nephelometer, which he uses to determine the amount of dissolved protein present in a solution by precipitating it as a suspensoid by a suitable reagent. Comparison with a standard containing a known amount of the precipitated protein enables the accurate estimation of very small amounts of protein. Having found suitable precipitants for various proteins—for example, sodium

chloride for edestin, sulphosalicylic acid for casein—he is able to measure the amount of peptic, tryptic, and ereptic digestion with accuracy and speed. In a second paper (Journal Amer. Chem. Soc., 1913, vol. xxxv., 1546) the same author describes improvements in the micro-chemical method of forming copper complexes of amino-acids, peptides, and peptones in neutral or slightly alkaline solution, so that quantitative results can be obtained in dilutions of one part in 500,000. It is shown that very few other substances react with the reagent, and these can be easily removed by means of ammoniacal lead acetate. The method has been studied carefully in its application to blood, urine, and the measurement of proteolysis, and it appears to give results accurately and quickly with small amounts of material. Seeing that the Sörensen, van Slyke, and Abderhalden methods for determining amino-acids have each in their turn been most fruitful in advancing the knowledge of the proteins much is to be hoped from the application of the new method.

MR. FRANCIS EDWARDS, bookseller, 83 High Street, Marylebone, W., has issued a catalogue of books, pamphlets, engravings, maps, and manuscripts relating to the whole American continent. The catalogue contains some 1662 entries, many of them referring to works of unique interest.

OUR ASTRONOMICAL COLUMN.

ASTRONOMICAL OCCURRENCES FOR JANUARY, 1914:—

Jan. 3. 9h. om. Earth nearest the Sun.
5. 6h. om. Mars at opposition to the Sun.
8. 21h. 41m. Saturn in conjunction with the Moon (Saturn 6° 47′ S.).
11. 1h. 49m. Mars in conjunction with the Moon (Mars 0° 34′ S.).
12. 1h. 39m. Neptune in conjunction with the Moon (Neptune 4° 26′ S.).
17. 7h. om. Neptune at opposition to the Sun.
20. 4h. om. Jupiter in conjunction with the Sun.
24. 21h. om. Mercury in superior conjunction with the Sun.
25. 6h. 32m. Venus in conjunction with Jupiter (Venus 0° 33′ S.).
,, 8h. 43m. Jupiter in conjunction with the Moon (Jupiter 3° 22′ N.).
,, 8h. 54m. Venus in conjunction with the Moon (Venus 2° 48′ N.).
27. 20h. om Uranus in conjunction with the Sun.
30. 15h. 36m. Venus in conjunction with Uranus (Venus 0° 30′ S.).

A FAINT NEW COMET.—A Kiel telegram dated December 18 reports the discovery by Delavan of a comet of magnitude 11·0 on December 17 at 10h. 34·8m. La Plata mean time. Its position is given as R.A. 3h. 3m. 19·2s., declination 7° 25′ 24″ south.

A further telegram from Kiel, dated December 19, reports the observation of this comet at Bergedorf on December 18, at 8h. 5·3m. Bergedorf mean time. It is stated to be of magnitude 11·0, and its position is given as R.A. 3h. 2m. 41s., and declination 7° 21′ 29″ south.

THE EARTH'S ALBEDO.—*Astronomische Nachrichten*, No. 4696, is occupied for the main part with a contribution by Mr. Frank W. Very on the earth's albedo. The research consists of determining the albedo from visual observations on the earth shine on the moon in comparison with light from similar sun-illuminated areas on the moon's surface. The contribution describes in the first instance the photometer employed, the methods of procedure, and the necessary constants of the instrument. Then follow the records of the observations made during the years 1911 and 1912. Mr. Very finally concludes that in round numbers the earth shine at new moon has an intrinsic brightness of about 1/1600 of moonlight of average quality, such as is received shortly before first quarter. He eventually states, as a final result, that the albedo of the earth may be taken as Ae=0·89. This value he finds favours the higher of the two values of the solar constant, namely 3·6 cal./sq. cm. min., which he published at the beginning of this year.

ANNUAIRE DE L'OBSERVATOIRE ROYAL DE BELGIQUE.—The Royal Belgium Observatory's Annual, published under the direction of M. G. Lécointe, the director of the observatory, is well known to amateur and professional astronomers on this side of the channel, and the issue for the year 1914 will be found as useful as ever. The aim of the publication is to present the indispensable elements to those who interest themselves in astronomical observations and to help render the science more popular by means of numerous clearly written articles on various astronomical topics. The list of the contents is a very full one, but attention can only be directed to one or two of the items inserted. The recent progress of astronomy, *i.e.* the progress up to the end of the year 1911, is well summarised by M. P. Stroobant, and is very well illustrated. Under "Periodic Comets" an interesting table is given showing, among other facts, the epochs of the first and next appearances. The scheme for the distribution of international time by wireless is thoroughly described, and such sections as those devoted to different tables, their cost, elementary notions on the measurement of time, &c., will be found useful.

DISTRIBUTION OF ELEMENTS IN THE SOLAR ATMOSPHERE.—In this column for September 11 very brief reference was made to an important paper by Mr. Charles E. St. John on radial motion in sun-spots, the contribution in question dealing with the distribution of *velocities* in the solar vortex. The November number of *The Astrophysical Journal* (vol. xxxviii., No. 4, p. 341) is devoted to a second portion of the investigation, and deals with the distribution of the *elements* in the solar atmosphere. This paper forms No. 74 of the contributions from the Mount Wilson Solar Observatory. Mr. St. John finds that radial displacements are intimately associated with depth, and, assuming as a standard a series of displacements shown by the iron lines, he deduces the relative level of twenty-six other elements of the reversing layer and chromosphere. The distribution shows that the form of calcium that produces the H and K lines is at the highest level, followed by the Hα line of hydrogen. Then successively come the vapours of magnesium, sodium, iron, aluminium, &c., each increasing in absolute density with the depth until in the lowest portion of the reversing layer occur also the vapour of all the elements the lines of which appear in the solar spectrum. It is interesting to note that enhanced lines show smaller radial displacements than unenhanced lines of the same solar intensities, and thus originate at higher levels in and near sun-spots. A differentiation is also made between the levels of different groups of iron lines. A comparison of the radial displacements with the weakening and strengthening of spot lines shows that the latter is associated with increase of depth and the former with high elevations. Numerous other important conclusions are included in this investigation.

SCIENCE IN AGRICULTURE.[1]

IT might truly be said that only within the last two decades has the importance of the scientific investigation of the infinite number of problems arising from agricultural practice received, in some measure, general recognition. During this period it has become more and more evident to those engaged in the production of plant and animal commodities that it is sometimes merely foolish, and at others almost dangerous, from an economic point of view not to accept the help freely proffered by agricultural educational authorities. The aid given by these bodies may be embodied in one or several schemes, such as the institution of demonstration experiments to illustrate certain manurial and cultural measures, the value of which is indisputable, facilities for consultation with experts in cases of special fungoid and insect pests, educational measures by means of in-college lectures and peripatetic work, and, lastly, the creation of a close connection between the farmer and the research worker.

The white woolly currant scale. From "The Journal of the South-Eastern Agricultural College."

The report before us provides an inspiriting example of such agricultural activity and indicates to the general reader how much may be accomplished by efficient organisation and sound work; to the agriculturist of the south-eastern counties it would constitute what might almost be regarded as a book of reference on many matters agricultural.

The work is compiled in the form of reports from the departments of agriculture and dairying, horticulture, economic zoology, chemistry, botany, mycology, veterinary science, and concludes with general notes. Although much of the subject-matter must pass unnoticed here owing to lack of space, reference may be made to experiments on pig-feeding and the winter feeding of dairy cows, the effect of ferrous sulphate on the quality and quantity of potatoes, the valuation of basic slag, and weeds in seed samples, the latter article being illustrated by many admirable plates. Some valuable experiments have been made on celery blight (*Septoria petroseline*, var. Apii) and its prevention, the results obtained showing that a vast improvement may be induced both in size and value of produce by means of spraying with Bordeaux mixture.

In his report, the economic mycologist directs attention to the disquieting fact that the compulsory measures of the "American Gooseberry Mildew Orders," as at present carried out, do not in any way check the spread of the disease to fresh plantations. At the beginning of the season there were in Kent alone about 3300 acres of mildewed plantations, and it is evident that the measures with respect to the autumn pruning of diseased bushes will have to be uniformly enforced in order to keep down further spread and to prevent the measures taken by conscientious growers being largely nullified by laxity in others.

The report on economic zoology maintains its usual high standard and outlines the various insect pests which have come under observation during the year. Of these, a bad attack by the white woolly currant scale (*Pulvinaria vitis v. ribesiae*) is reported, a portion of an affected plant being shown in the accompanying illustration.

A vaccine has been prepared by the veterinary department, and is being used in the "struck sheep" experiments, and we look forward with interest to the publication of the results of this work.

[1] The Journal of the South-Eastern Agricultural College, Wye, Kent. No. 28. Pp. 476. (London and Ashford: Headley Bros., 1912.) Price 7*s*. 6*d*.; Residents in Kent and Surrey, 3*s*. 6*d*.

THE CHANK BANGLE INDUSTRY IN INDIA.

FROM a commercial as well as an artistic point of view the chank or conch shell industry is so important that in 1910 the Government of Madras deputed Mr. J. Hornell, superintendent of the Pearl and Chank Fisheries' Department, to visit northern India and report upon the subject. The result of his inquiries is described in an interesting monograph published in vol. iii., No. 7, of the Memoirs of the Asiatic Society of Bengal.

He begins by discussing the literary evidence of the position of the industry in early times, and reviews the evidence from the large collection of prehistoric remains collected by Mr. Bruce Foote, now deposited in the Madras Museum. Mr. Foote was inclined to assign many of these chank or conch shell ornaments to the Neolithic period. But this identification is, in many cases, not supported by the investigations of Mr. Hornell, who points out that many of the speci-

mens bear marks of the use of iron saws or other metal implements.

The shells of the sacred Indian chank or conch (*Turbinella pyrum*, Linn.) are principally found in the Gulf of Manaar, whence, to the number of about two millions, they are annually exported to Calcutta. At present the industry of bangle-cutting is confined almost entirely to Bengal, but Mr. Hornell shows that in former times it was widely spread over the greater part of India, relics of bangle-workshops being discovered from Tinnevelly in the extreme south to Kathiawar, and Gujarat in the north-west, through a long chain of factories located in the Deccan. The causes of this transfer of the manufacture are somewhat obscure, but Mr. Hornell largely attributes it to the upheaval resulting from the Mahomedan conquest of southern India.

Mr. Hornell describes the condition of the industry as flourishing. While there is an increasing demand for gold ornaments, the Swadeshi movement in favour of Indian-made goods has greatly stimulated the trade. He gives full details, with photographs, of the methods employed in the manufacture, and his discussion of the religious and social influences which encourage the use of this form of ornament not only in Bengal, but as far north as Tibet, from Ladakh in the west to the Kham country on the east, make this excellent account of a curious industry more than ordinarily instructive.

BOTANY AT THE BRITISH ASSOCIATION.

THE Birmingham meeting of the British Association was, from the point of view of the Botanical Section, as from others, highly successful. There was a very large attendance of botanists, particularly of the younger ones. The meeting of the section this year was noteworthy in being presided over by Miss Ethel Sargant, the first woman president of any section of the association. It is scarcely necessary to state that the section suffered in no way as a result of the innovation. The president's address having been previously reported in full in these columns, it is unnecessary here to attempt to summarise it. It dealt with the progress of vegetable embryology in recent years, the subject being treated from the morphological side. The great difficulty in all such work, as the president herself pointed out, is to distinguish between adaptive characters of comparatively recent origin and the characters inherited from remote ancestors. However, the study has already thrown much light on embryological problems, and is likely to throw more as time goes on. .

Fossil Botany.

Dr. D. H. Scott contributed an important paper on some fossil plants from Devonian strata. The specimens described were collected by Prof. C. R. Eastman near Junction City, Boyle County, Kentucky, from the nodule-bearing layer at the base of the Waverley shale, in the lower part of Upper Devonian strata. They are thus (at present), among the oldest known land-plants showing internal structure. The communication was made in the joint names of Prof. E. C. Jeffrey, of Harvard, and Dr. Scott. The following fossil-plants were described:—(1) *Calamopitys americana* (sp. nov.), Jeffrey and Scott. This has mixed pith, containing tracheides, and paired leaf-trace bundles in the wood. (2) *Kalymma* petioles. This no doubt belongs to a species of Calamopitys. (3) *Calamopteris Hippocrepis* (sp. nov.), Jeffrey and Scott. This is a petiole of the Kalymma group, but with the bundles arranged in a horse-shoe form, and largely fused. These three fossils are members of the group Pteridospermeæ. (4) *Archaeopitys Eastmanii* (gen. et sp. nov.), Jeffrey and Scott. This is a stem with dense secondary wood and numerous small mesarch strands of xylem scattered in the pith. It is probably a member of the group Cordaitales. (5) *Periastron perforatum* (sp. nov.), Jeffrey and Scott. This is a curious petiole with a median row of separate vascular bundles and large lacunæ in the ground tissue. It is allied to *P. reticulatum*, Unger; but it is not known whether it is a pteridosperm or a fern. (6) *Stereopteris annularis* (gen. et sp. nov.), Jeffrey and Scott. This is probably a fern, with a petiole possessing a single large vascular bundle, with solid wood, external protoxylem, and cortex differentiated into several distinct zones. (7) *Lepidostrobus devonicus* (sp. nov.), Jeffrey and Scott. This has an axis of an ordinary Lepidostrobus type. The sporangia have the usual columnar wall, and the spores are in tetrads. It is the oldest known fructification with structure of any plant. The most remarkable matter concerning these very ancient land-plants is their high structural organisation.

Mr. H. H. Thomas followed with an account of a new type of Ginkgoalian leaf, found in the Jurassic plant-bed at Cayton Bay, near Scarborough. The leaves are beautifully preserved, linear or oblanceolate in outline, with rounded or slightly bifurcated apices, short petioles, and dichotomising venation. The form of the stomata and subsidiary cells is very like that of other Ginkgoalian leaves, while they possess the secretory tracts between the veins as seen in the modern form. The epidermal cells possess very characteristic papillæ. The leaves form the type of a new genus, Eretmophyllum, with two species, the second one occurring at Whitby. The specimens provide a further illustration of the importance of the Ginkgoales in the Mesozoic vegetation.

Dr. Ethel de Fraine described a new species of Medullosa from the Lower Coal Measures.

Anatomy.

Dr. M. J. le Goc gave an account of the transition of centrifugal xylem to centripetal xylem at the base of the petiole of Cycads. The centrifugal system at the base is in great part a secondary growth, and the centripetal system a primary structure; both are consequently independent morphologically. The two kinds of xylem overlap at their ends, and are connected for a physiological function. Their reduced extremities point to a time when possibly they ran parallel throughout their entire length.

Mr. R. C. Davie spoke on the pinna-trace in the Filicales. The "marginal" type of vascular supply in the Filicales occurs generally in leaf-traces which have no hooks at their ends; the "extramarginal" type appears regularly in connection with leaf-traces possessing incurved hooks. Variations from these types were described.

Histology.

Miss M. Hume gave the results of her researches on the histology of the leptoids in the moss Polytrichum. These leptoids do not deserve the name of sieve-tubes. Their contents differ from those of the other lining cells in never including starch-grains or large drops of oil; but each leptoid has a nucleus. They are rich in connecting protoplasmic threads. The conducting function of the leptoids seems to be confined to albuminous materials, and not to be concerned with carbohydrates.

Physiology.

Last year, at Dundee, Prof. W. B. Bottomley directed attention to the effect of soluble humates on plant growth. This year he further maintained that

ammonium humate can supply the nitrogen need of plants if soluble phosphates and potassium salts are present in the culture solution.

Mr. W. N. Jones gave an account of his investigations on anthocyan formation. Coloured petals of stocks, &c., soaked in 95 per cent. alcohol became colourless, but regained their colour when transferred to water. It is believed that a pigment-producing mechanism, and also a reducing body are present in the petals. The amount of water in the cells determines which way the pigment reaction shall go. It also appears that considerable quantities of reserve "raw material" occur in petals from which pigment can be produced. The darkening of many flowers on fading is explicable on the assumption that this raw material comes into action.

Dr. E. M. Delf read a paper on the transpiration of sclerophytes.

The Nature of Life.

Prof. J. Reinke, of Kiel, dealt with the subject of the nature of life. In the period preceding the present the dogma prevailed that the phenomena of life ought to be interpreted merely mechanically. In still older times, people believed a *vis vitalis* to be active in the organism. Now the doctrine has arisen that life is only a complicated example of the processes predominant in lifeless nature; and physiology then becomes the chemistry and physics of organisms. Prof. Reinke, for his part, refused to adopt either the exclusively vital or the exclusively mechanical dogma. Life has its own laws, though this view does not exclude the fact that physico-chemical laws reign in the elementary processes of a living body.

Fungi.

Dr. O. V. Darbishire described the development of the apothecium in the lichen Peltigera. The early stage of the "fruit" is found amongst the young marginal hyphæ. Certain cells arise, which at first are uninuclear, but which become multinuclear. Fusions with neighbouring cells are common; but no transference of nuclei has been observed. No coiled carpogonia can be distinguished. The multinuclear condition seems to be due to simultaneous nuclear divisions in the cells, and not to any passage of nuclei. Long, unbranched, multicellular hyphæ grow towards the cortex, whilst nuclear division is still active. These appear to be functionless trichogynes, and gradually disappear. Certain of the large cells—the "ascogonia"—now grow out, and the nuclei formed by simultaneous division—female nuclei—pass into the ascogenous hyphæ in pairs. From these the asci appear to derive their first nucleus in the usual way.

Mr. S. P. Wiltshire spoke on the biology of the apple-canker fungus (*Nectria ditissima*), a genuine wound parasite. The chief means of inoculation in nature are injuries made by frost and by the woolly aphis (*Schizoneura lanigera*). The relatively immune varieties of apple may be readily infected through suitable injuries.

Miss M. L. Baden described the conditions necessary for the germination of the spores of *Coprinus sterquilinus*. She arrived at the conclusion that in some way bacteria are necessary for the germination of the spores of this fungus; and suggestions were made as to the way the bacteria are of benefit from this point of view.

Miss E. M. Poulton gave an account of the structure and life-history of Verrucaria, an aquatic lichen. She showed how the structure of the thallus changed with advancing age, and how the ascospores underwent simultaneous germination within the perithecium, the tufted mass of mycelium thus produced being expelled into the water, and forming an efficient trap for the capture of the floating green unicellular Algæ.

Prof. A. H. R. Buller, of Winnipeg, read a paper on the organisation of the hymenium in the genus Coprinus.

Algae.

Prof. G. S. West gave an account of the structure, life-history, and systematic position of the genus Microspora. After pointing out that species of this genus were amongst the most abundant and widely distributed of fresh-water Algæ, and that the controversy concerning its systematic position was mainly due to defective knowledge, an account was given of its cytology and reproduction. The zoogonidia invariably possess two cilia, and there appear to be two distinct methods by which they may be liberated, with various intermediate conditions. The aplanospores and akinetes were fully discussed, and the conclusion arrived at that Microspora would be best placed in the family Microsporaceæ of the Ulotrichales.

Prof. G. S. West and Miss C. B. Starkey had a paper on *Zygnema ericetorum* and its position in the Zygnemaceæ. It was shown that published accounts of the cytology of this common Alga are all erroneous; also that its conjugation, as observed in West Indian examples, is quite normal. The genus Zygogonium of Kützing (1843) cannot be accepted as of any value, and the Zygogonium of De Bary (1858) and Wille (1897, 1909), is based upon De Bary's figures of two apparently monstrous conjugating examples.

Dr. E. M. Delf gave an account of an attached Spirogyra.

Ecology.

Prof. F. W. Oliver discoursed on the distribution of *Suaeda fruticosa* and its rôle in the stabilising of active shingle. Shingle beaches exposed to the sea are liable to travel landward during times of high tides when these are accompanied by onshore gales. *S. fruticosa* is the most effective plant in retarding this process, and is the most effective stabiliser of all British shingle plants. Valuable agricultural alluvial pasture is sometimes greatly endangered by the movements of shingle beaches, and the suggestion was made that the "afforestation" of certain shingle beaches by *S. fruticosa* was a matter of practical importance.

Mr. P. H. Allen outlined a botanical survey, which some botanical students at Cambridge have undertaken, of the maritime plant formations at Holme, Norfolk. The area is characterised by (1) a salt marsh, with *Armeria maritima, Statice Limonium, S. binervosum, S. vellidifolium, Cochlearia anglica, Salicornia perennis, S. disarticulata, Atriplex portulacoides,* and other halophytes; (2) a shingle bank, with *Suaeda fruticosa* and *Frankenia laevis*; and (3) sand-dunes, with *Ammophila arenaria, Elymus arenarius,* and *Hippophaë rhamnoides*. The mapping out of the area was begun by chaining out a base line seven furlongs (ca. 1·4 km.) in length. At each furlong offsets were chained out to the cultivated land on the one side and low-water mark on the other. The mapping in of the plants in the smaller areas thus obtained was done with the plane table on a scale of 80 in. to the mile (1 : 792). Work on the analysis of the soil and the soil-water is being carried on. It is hoped that light will be shed on some of the problems of plant-distribution, and that a detailed record of the succession of changes occurring over the area will also be obtained.

Mr. A. R. Horwood presented his ideas with regard to the influence of river-development on plant-distribution.

Miss W. H. Wortham described some features of the sand-dunes in the south-west of Anglesey. The fixed dune association is a *Caricetum arenarieae,* which forms a close sward. The shifting dunes, with *Ammophila arenaria* and *Euphorbia paralias,* alternate with embryonic stages of dune-marsh, with *Salix*

repens. Dunes of *S. repens* occur, and have a two-fold origin: (1) the inundation of a dune-marsh with sand, and (2) invasion of Salix seedlings. The ultimate association of the marsh of *S. repens* is a *Callunetum vulgaris*, and of the dunes an *Agrostidetum vulgaris*.

Genetics.

Dr. R. R. Gates brought forward some evidence to show that mutation and Mendelian splitting are different processes. He maintained that definite evidence has been obtained to show that some of the mutations in Œnothera are not due to recombinations of Mendelian characters, as some biologists have assumed, but to irregularities in meiosis, which lead to changes in nuclear structure.

In connection with the visit of Sections D, K, and M to the Burbage Experimental Station for Applied Genetics, Major C. C. Hurst read a paper on the inheritance of minute variations in garden races of Antirrhinum. The garden variety, "Aurora," breeds true to its bushy habit of growth, its scarlet lips, and its ivory throat; but individual plants show slight differences in habit, precosity, and in size and colour of flowers. Experiments on these, in conjunction with others on sweet peas and culinary peas, show that many presumed unit-factors can be analysed into several subfactors which themselves behave as units. It is also evident that these minutely continuous variations are strictly discontinuous in their inheritance.

Miscellaneous.

Prof. F. E. Weiss recorded and described a case of juvenile flowering in *Eucalyptus globulus*.

Dr. A. S. Horne described the variations in the flower of *Stellaria graminea*.

The semi-popular lecture was this year delivered by Prof. W. H. Lang. The subject, "Epiphyllous Vegetation," dealt with the different forms of plant-life which pass their lives on the surface of the leaves of tropical plants, and attracted a large and interested audience.

Colonel H. E. Rawson described his experiments and observations on the variation of the structure and colour of flowers under insolation. The paper was a continuation of one communicated to the section in 1908. His method was to shade off with a perfectly opaque screen all direct rays of the sun for certain selected intervals of daylight, while admitting all the diffuse light possible. By this means, it is claimed, many colour and other forms were produced. Colonel Rawson maintained that his experiments, which have now extended over eight years, definitely point to a connection between the variations of colour and structure and the sun's altitude, both seasonal and diurnal: and he suggested that solar rays of different refrangibility are transmitted through the atmosphere at different altitudes.

Preservation of the British Flora.

Mr. A. R. Horwood introduced the subject of the preservation of the British flora, which has come into some prominence again during the past year or two. He pointed out that there are some factors which tend to the extirpation of certain British plants, and are difficult to control except in special ways. He asked for information as to the extent of the effect of these factors, and for suggestions for combating their effects. Factors mentioned were drought, drainage, cultivation, building operations, and the spread of golf courses. He added his opinion that an Act of Parliament was required to deal effectively with some aspects of the general problem. There was some disagreement among the speakers who followed as to the best means of attaining the desired end.

The committee of the section passed a resolution expressing sympathy with the general object, but withholding their support from any proposal which might tend to affect the present law of trespass.

Joint Meetings.

Two meetings were held jointly with other sections. The first was held in conjunction with the newly formed Agricultural Section, when some problems in barley production were discussed. The second was held in conjunction with the Zoological and Physiological Sections, when Prof. B. Moore introduced a discussion on the synthesis of organic matter by inorganic colloids in the presence of sunlight, this subject being considered in relation to the origin of life. Fuller accounts of these joint meetings are given in the reports of these sections.

Exhibits.

A series of exhibits of Algæ and fungi were arranged by Prof. West in the Botanical Laboratory. Among the Algæ were twenty selected Caulerpas, to show how the different species simulate the various types of habit found in higher plants; some beautiful examples of Lithothamnion, Lithophyllum, and other stone Algæ; microscopical preparations of various Algæ, including conjugated Desmids, showing all types of Zygospores, *Euastropsis Richteri*, akinetes of *Microspora floccosa*, the largest known Desmid (*Closterium turgidum* subsp. *giganteum*), *Tetraspora gelatinosa*, showing the pseudocilia, and the following Volvocaceæ—*Platyodorina caudata, Pleodorina illinoisensis, Pleod. californica, Volvox africanus*, and *V. Rousseletii*.

The fungi included numerous Deuteromycetes, Pyrenomycetes, Discomycetes, Uredineæ, Ustilagineæ, and Hymenomycetes, mounted for class purposes; a series of dried specimens of the Polyporeæ; specimens of *Batarrea phalloides, Rhoma pigmentivora*; and cultures of *Sigmoideomyces clathroides*, and of a species of Sepidonium.

Living and fixed specimens of the giant sulphur bacterium, *Hillhousia mirabilis*, were also on view, and a series of about fifty species of Mycetozoa (Myxomycetes) from the midland counties.

Excursions, &c.

More or less informal excursions were held, the following places being visited by some members of the section:—(1) Hartlebury Common, a sandy heath with *Calluna vulgaris, Ulex Gallii, and Drosera rotundifolia* in the bogs. At this late stage of the summer, the spring ephemerals (including some submaritime species) were invisible. (2) Sutton Park, a great stretch of semi-natural vegetation of heaths alternating with oak woods and marshes, the whole on sandy and gravelly soils. The heaths showed wide expanses of *Aira flexuosa, Molinia caerulea, Ulex Gallii, U. europaeus, Calluna vulgaris*, and a little *Empetnem nigrum*. The woods were dominated by *Quercus Robur*, associated with *Betula pubescens* and *Ilex aquifolium*. Some societies of the last-named species were unusually fine. (3) Wyre Forest, an extensive natural forest of *Quercus sessiliflora*, associated with *Betula alba*. Locally, *Carex montana* was an abundant member of the ground vegetation of the forest.

The excursion to the Burbage Experimental Station for Applied Genetics, held jointly with the Agricultural and Zoological Sections, is referred to in the report of the latter section in NATURE of November 27 (p. 389).

The sectional dinner was held on the Saturday evening, when nearly eighty members of the section were present.

Reports of Research Committees.

Mr. R. S. Adamson presented a report on the vegetation of Ditcham Park, Hampshire, Miss M. C. Rayner one on the flora of the peat of the Kennet Valley, Mr. H. H. Thomas one on the Jurassic flora of Yorkshire, and Prof. F. E. Weiss on botanical photographs. The last-mentioned report recommends that all prints of ecological interest should be handed to the newly founded Ecological Society, and that all other prints should be housed in the botanical department of the University of Manchester.

C. E. M.

EDUCATION AT THE BRITISH ASSOCIATION.

THE meetings of the section of Educational Science were in many respects the most successful of recent years. Attendance was uniformly good; both papers and discussions reached a high level of interest. The presidential address has already received a great deal of attention, and as copies will probably be still more widely circulated, we may expect it to stimulate a national educational stocktaking such as cannot fail to be fruitful.

Perhaps the most generally attractive morning concerned itself with the modern university. Sir Alfred Hopkinson, who opened the discussion, made a sympathetic reference to the time when Oxford and Cambridge were in effect the sole training ground for clergymen, public officials, members of Parliament, and Cabinet Ministers. The value of this State service could hardly be exaggerated. The modern universities, in receipt of direct grants from central and local exchequers, must also concern themselves with the old ideal of raising up men and women fitted to serve in Church and State, but they must also contribute directly to the intellectual life of the people about them, as centres from which ideals may radiate amongst the general public and as sources of inspiration wherein the merchant and manufacturer may learn to care for things outside their business. He warmly protested against the heresy which regarded the university as existing to give degrees, whimsically suggesting that the latter must have been invented as a substitute for corporal punishment, and he dwelt upon the importance of research and of the communion between students and men who were engaged in advancing knowledge. Finally, he pleaded for freedom. Poverty would be better than wealth from State support if it meant State interference and control, though the right of the State to lay down conditions in respect of grants for special purposes, like the training of teachers, could hardly be questioned.

Sir Philip Magnus dealt with the professional outlook of the university, and in that connection welcomed the tendency to reduce the age of entrance. Dr. Maclean, formerly president of the Iowa State University, spoke eloquently of the work of universities in the United States and of their development since Harvard received its first State grant of 400*l.* a year in 1636. Mr. Mosely pointed to the danger attached to low emoluments. Business offered such attractive prizes to first-rate men that the universities were in danger of having to recruit their staffs from the second best. Dr. Hadow pointed out the variety and contradictory nature of the current views concerning universities and their function. "He who steers simultaneously for Scylla and Charybdis is in danger of missing both." He showed the greatly widened area of service which State and Church now offered, and emphasised the need of special regard to particular districts, though in that connection he reminded his audience of the definition of utilitarianism in education—the application to useful purposes of knowledge that had ceased to grow. Sir James Yoxall doubted whether the path was as open as it should be to youths of ability; and Dr. H. A. L. Fisher reminded the section of the claims of women, especially in those centres where the district was inclined to regard the university purely from the point of view of industry and commerce.

From the point of view of educational science, the most important meetings were held in conjunction with the psychological subsection. Dr. Kimmins made a strong plea for the endowment of research in education, in which he was supported by Prof. Findlay, Dr. C. S. Myers, Prof. Green, and Mr. C. L. Burt. We have learned not to trust the superficially empirical viewpoint in medicine, and why do we cling to it in pedagogy? Nor is the old *a priori* road satisfactory in a study which is concerned with actuality. Experiment and research are essential to progress. The subsequent discussions on the psychology of reading and spelling brought out the need for a combination of the psychological and the pedagogical point of view in researches that concern class-room problems.

Sir William Ramsay and Sir Oliver Lodge spoke in favour of spelling reform. Sir Oliver Lodge thought we should not trouble very much about spelling, and Sir William Ramsay seemed to think in a phonetically written language there is no bad spelling. As to the former view, teachers would reply that they are concerned with people who cannot afford to spell badly. The president of the British Association may misspell words to his heart's content, but humbler people dare not; a spelling reform will not do away with error in spelling, nor will it prevent the necessity of learning to spell. In any case, there will always be a psychology of spelling and a right and wrong way of acquiring orthographic efficiency.

Mrs. Meredith presented an interesting paper on suggestion as an educative instrument. It was a plea for the rational treatment of the young in the interest of later years when the march of events either leads to the challenge of fundamental conceptions and much painful uprooting, or to intolerance born of prejudice derived from the suggestive influences of early life.

Mr. Burt's paper on mental differences in the sexes aroused a good deal of attention. He pointed out the need for, and difficulty of, distinguishing inborn from acquired character. His researches showed that the differences were less (but were by no means eliminated) when children from mixed schools were compared than when children from girls' and boys' schools were examined. Inborn differences seem to be largest in the simplest psychical processes. Emotional differences seem smaller, though of far-reaching consequence; on higher levels differences between boys and girls become progressively smaller.

A discussion on the educational use of museums was attended by representative anthropologists and museum officials. There was general agreement that, whilst much had been done since the subject was discussed at the last Birmingham meeting of the Association, there was room for inquiry and further development in the direction of making museums more effective educational institutions. The discussion was opened by papers from Dr. Clubb, who described the ideal organisation of a museum as he conceived it, and Mr. Horwood, who confined his attention to the needs of the elementary school engaged in fostering the study of nature. Sir Richard Temple urged the importance of good housing and of educational arrangement. Donors, as well as visitors, were attracted in this way. Dr. Hoyle dis-

cussed the needs of the student and the layman. The latter needs good labels and effective guidance; the former wants access and privacy. The first duty of the curator was, however, concerned with neither. His primary business was to preserve.

Dr. Browne told what the Classical Association of Ireland were doing to encourage the use of *Realien* in the teaching of Latin and Greek. Dr. Bather would have special provision for children, and suggested the provision of fellowships and research scholarships in connection with museums. Dr. Haddon spoke of the courage needed to refuse irrelevant objects offered by distinguished donors. A clear idea of the object of the museum and unswerving adherence to that function was, in his view, essential to successful educational work.

Mr. Bolton, Dr. Harrison, and Mr. H. R. Rathbone supported a suggestion to form a committee to consider and report upon the whole subject of museum organisation from the viewpoint of their educational functions. Prof. Newberry described the work already done in Liverpool, and suggested that the label should be written first and the illustrative objects gathered about it. The general feeling that museums might be made to render better educational service was a particularly pleasing feature of the debate. A committee with representatives from Sections C, D, H, K, and L was subsequently formed, with the object of reporting to the Manchester meeting in 1915.

On Tuesday morning the section was busied with the subjects of compulsory school registration and manual work in education. Bishop Welldon, Dr. Sophie Bryant, and Mrs. Shaw spoke strongly in favour of State action in the matter. Bishop McIntyre, as representing Catholic feeling, supported the idea, with the proviso that schools were left free to determine the form and spirit of the education they provide. Mr. Ernest Gray thought action would be easier if provision were made for compensation in case a man's livelihood were taken away. Mr. A. Mosely opposed any such idea as compensation in such cases. The State cannot compensate for inefficiency.

The papers on manual work in education were read by Mr. P. B. Ballard, Mr. T. S. Usherwood, and Mr. W. F. Fowler. Mr. Ballard offered interesting evidence of the stimulating effect of handwork in school; Mr. Usherwood and Mr. Fowler, from the secondary school and primary school point of view respectively, argued in favour of freedom and initiative as opposed to series of graduated exercises based upon an adult view of the elementary processes involved in manipulation. A short discussion followed, in which the old battle between freedom and technique was fought, though the feeling of the meeting was clearly in favour of the newer view.

The last meeting of the section was given to a discussion on the subject of the working of the Education Act of 1902. Sir George Fordham opened in an interesting review of the problems which the Act presented to a county area like that of Cambridge, and of the way his authority had met them. Mr. W. A. Brockington joined issue with those who regarded the act as a failure and who called for a reversion to *ad hoc* authorities. The birth of an interest in secondary education was directly due to the Act. At the same time, some amendments in detail were called for, amongst others those sections dealing with differential rating and with foundation managers of non-provided schools. Alderman Pritchett, Mr. Ernest Gray, and others also spoke warmly of the working of the Act and of the importance of coopted membership to education authorities. Mr. Norman Chamberlain took up the cause of the primary school, and expressed his profound dissent from the pessimism of the presidential address. The section closed with a vote of thanks to the president, moved by Sir George Fordham and seconded by Mr. Ernest Gray.

BEIT MEMORIAL FELLOWSHIPS.

A MEETING of the trustees of the Beit Memorial Fellowships for Medical Research was held on December 17. Dr. F. Gowland Hopkins, F.R.S., was appointed a member of the advisory board in succession to Sir William Osler, Bart., F.R.S., resigned. The Francis Galton Eugenics Laboratory was recognised as a place of research. The annual election to Beit Fellowships was made. The following persons were chosen this year, and we give in each case the character of the proposed research and the institution at which the work is to be carried out.

Dr. John O. W. Barratt, study of nature and mode of action of substances contained in or derived from blood plasma and taking part in plasma or serum reactions; also cytological studies—the Lister Institute; Dr. Myer Coplans, study of immunity with special reference to the action of silicates (including the asbestos minerals, slag, wool, and the zoolites) on bacterial and allied substances—Lister Institute; Mr. Egerton C. Grey, bacteriological chemistry, with special reference to the relation between bacterial enzymes and chemical configuration—the Lister Institute; Mr. John R. Marrack, the chemical pathology of arthritic diseases—(1) the estimation of the uric acid in the blood of patients suffering from certain types of arthritic disease; (2) continuation of the work on calcium metabolism and organic acid excretion—Cambridge Research Hospital; Mr. Victor H. K. Moorhouse, the investigation of the metabolism of animals as indexed by the respiratory quotient under various conditions, with special reference to the question of diabetes—the Institute of Physiology, University College, London; Dr. G. E. Nicholls, to continue research on "the investigation of the structure and function of the subcommissural organ and Reissner's fibre," which up to the present time has been principally concerned with the lower vertebrates; the study of the "pineal region of the brain"—the Biological and Physiological Laboratories at King's College, London; Dr. Annie Porter, on the parasitic Entozoa, more especially Protozoa and Helminthes, infecting vertebrates and certain invertebrates—The Quick Laboratory, Medical Schools, Cambridge; the Liverpool School of Tropical Medicine; and, if possible, the King Institute of Preventive Medicine, Madras, or the Wellcome Research Laboratories, Khartum; Mr. J. G. Priestley, investigation into the factors concerned in the regulation of the excretion of urine—Physiological Department, Oxford; Miss J. I. Robertson, the comparative anatomy and physiology of the heart in the first instance; also the study of the vertebrate nervous system—the Victoria Infirmary, Glasgow; Miss M. Stephenson, the metabolism of fats and its relation to that of carbohydrates in the animal body, having special regard to the light afforded by the study of the fat metabolism of diabetic animals—Institute of Physiology, University College, London; Mr. J. G. Thomson, the cultivation of Protozoa (the intention is to obtain knowledge of the toxins elaborated by these and the antibodies formed); the cultivation of tumour tissues—the Lister Institute.

Each fellowship is of the annual value of 250*l.* payable quarterly in advance. The usual tenure is for three years, but the trustees have power in exceptional cases to grant an extension for one year. All correspondence should be addressed to the honorary secretary, Beit Memorial Fellowships for Medical Research, 35 Clarges Street, W.

SCIENTIFIC PAPERS IN THE SMITHSONIAN REPORT FOR 1912.

THE annual report of the Board of Regents of the Smithsonian Institution for the year 1912 has now been issued by the Government Printing Office in Washington. It provides full particulars of the varied activities, the expenditure, and the general condition of the Institution for the year ending June 30, 1912. But, as usual, the most attractive part of the volume, which runs to 780 pages, is the general appendix of 650 pages of contributions by scientific workers of many nationalities. These papers are sometimes translations of important contributions to scientific periodicals in different parts of the world, sometimes lectures or addresses of note, and in other cases original articles.

Among the numerous translations may be mentioned those of Prof. P. Puiseux's article in the *Revue générale des Sciences* of June 30, 1912, on the year's progress in astronomy, and that in the *Revue Scientifique* for April 6, 1912, on spiral nebulæ. Another translation is of an article by Mr. C. V. Boys on experiments with soap bubbles. The original was published in the *Journal de Physique*, August, 1912, and was a lecture delivered before the French Physical Society in April of that year. From the *Revue générale des Sciences*, November 30, 1912, is taken also Prof. Emile Borel's address on molecular theories and mathematics, which was delivered on the occasion of the inauguration of the Rice Institute at Houston, Texas. This is followed by an essay by the late Henri Poincaré on the connection between æther and matter, an address delivered before the French Physical Society on April 11, 1912, and printed in the *Journal de Physique*, May, 1912. It may be remarked here that at the end of the volume there is an interesting biography of Henri Poincaré, his scientific work, and his philosophy, written by Dr. Charles Nordmann. From the *Journal de Physique*, June, 1911, is taken also Sir William Ramsay's address to the French Physical Society on the measurement of infinitesimal quantities of substances, in which he details some of the recent efforts of men of science "to see the invisible, to touch the intangible, and to weigh the imponderable." Prof. L. Lecornu's "Review of Applied Mechanics" is taken from the *Revue générale des Sciences* of July 30, 1912; M. A. Lacroix's essay on "A Trip to Madagascar, the Country of Beryls," is from *La Géographie*, November 15, 1912; and that by M. R. Legendre on the survival of organs and the "culture" of living tissues is from *La Nature*, November 2, 1912, where he cites remarkable experiments the results of which have proved that organs and living tissues may be preserved for some time "in cold storage," and then transplanted or grafted to the living bodies of other individuals of the same species. An essay on adaptation and inheritance in the light of modern experimental investigation, by Herr Paul Kammerer, is from *Himmel und Erde*, June, 1911. Dr. L. Gain's account of the penguins of the Antarctic regions is from *La Nature*, July 6, 1912.

Prof. Zaborowski's paper on ancient Greece and its slave population is translated from the *Revue Anthropologique*. From it one is enabled to obtain a good idea of the social and economic conditions which prevailed in ancient Greece during the height of the slave traffic, which was instrumental in effecting a decline in the efficiency and productiveness of her citizens. Slaves were employed at such low rates and were secured in so many ways, that everyone owned at least one or two, who were made to perform all the household and industrial work, leaving the citizen owners to spend their time in idleness and luxury. The prevailing economic conditions and customs tended to lower the *moral* of families, and reduce their numbers. Enriched by slave labour, and entertained by the doings of men and women purchased from abroad, the Greeks became spectators of life and practically renounced the raising of children.

Among notable addresses included in the appendix Prof. Schäfer's presidential address to the Dundee meeting of the British Association takes a prominent place. Prof. G. Elliot Smith's presidential address to the Anthropological Section at Dundee on the evolution of man appropriately follows Dr. Schäfer's. Dr. Edward Sapir's lecture at the University of Pennsylvania on the history and varieties of human speech is reprinted from the *Popular Science Monthly*, July, 1911. Prof. H. T. Barnes's Royal Institution lecture on icebergs and their location in navigation is given in full.

Many original contributions are also included. Prof. W. J. Humphreys, professor of meteorological physics in the United States Weather Bureau, contributes an article which will be of interest and of practical value to aviators and students of mechanical flight. It is entitled "Holes in the Air," which means the various places in the atmosphere where the conditions, so far as flying is concerned, very much resemble actual vacuities. The author explains the nature of the nine known types of atmospheric conditions, which he groups under two heads: the vertical group and the horizontal group. After carefully covering the dangers resulting from such atmospheric conditions, Prof. Humphreys concludes his article with the following note:—

"All the above sources of danger, whether near the surface, like the breakers, the torrents, and the eddies, or well up, like the billows and the wind sheets, are less and less effective as the speed of the aëroplane is increased. But this does not mean that the swiftest machine necessarily is the safest; there are numerous other factors to be considered, and the problem of minimum danger or maximum safety, if the aëronaut insists, can only be solved by a proper combination of theory and practice, of sound reasoning and intelligent experimentation."

Mr. F. B. Taylor, of the U.S. Geological Survey, contributes an essay on the glacial and post-glacial lakes of the Great Lake Region, and Mr. A. H. Brooks, of the same service, one on applied geology.

Mention must be made of the articles reprinted from English periodicals, among which we notice Prof. Armstrong's "Origin of Life: A Chemist's Fantasy," which appeared in *Science Progress*, October, 1912.

As usual, the illustrations are numerous and excellent.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

LORD RAYLEIGH will unveil a tablet to the memory of Lord Lister at King's College, London, on Wednesday, January 14, at 4.30. The ceremony will be followed by the inaugural lecture of the newly appointed professor of physics, Prof. O. W. Richardson, F.R.S., who will take as his subject, "The Discharge of Electricity from Hot Bodies."

DR. GEORGE SENTER, reader in chemistry in the University of London, and lecturer in chemistry at St. Mary's Medical School, has been appointed to the position of head of the department of chemistry at Birkbeck College, in succession to Dr. Alexander McKenzie, who was appointed recently to the chair of chemistry at University College, Dundee (University of St. Andrews).

A FUND of 100,000*l.*, which the Knights of Columbus of the United States have been collecting for more than two years for the Catholic University at Washington, has been completed. The gift, says *Science*, will be presented to the institution some time during the Christmas holidays. From the same source we learn that the board of regents of the University of California has announced the completion of the additional fund of 120,000*l.* for the erection of the hospital building which is to be a part of the college of medicine of the University.

THE late Right Hon. G. W. Palmer bequeathed 10,000*l.* to University College, Reading. We learn from the *Reading University College Review* for December that Mr. Alfred Palmer has suggested that this legacy should be devoted to building a university library, and on behalf of Mrs. G. W. Palmer, his sisters, and himself, has offered to supplement it to such extent as will be necessary to enable a suitable library to be built on the site reserved for the purpose, and also to provide an endowment fund for maintenance. The library would thus become a memorial to Mr. G. W. Palmer. The council of the college has approved the proposal gratefully.

THE Eugenics Education Society is organising a course of instruction on the groundwork of eugenics which will be given during the spring and summer of 1914. Dr. L. Doncaster will deliver eight lectures on evolution and heredity at the Imperial College of Science, South Kensington, on Fridays, at 5.30 p.m., beginning January 23, and Dr. M. Greenwood, Jun., will give instruction in statistical methods as applied to problems in eugenics, at the Lister Institute, Chelsea Bridge Road, S.W., on Fridays at 5.30 p.m., beginning May 1. Dr. Doncaster will discuss the general evidence for evolution and the more important theories of evolution, variation, and mutation, theories of heredity, old and new, the relation between heredity and sex, and the facts of heredity in man, together with the bearing of all these things on human improvement. Dr. Greenwood will give an outline of statistical work and theories bearing on heredity, and will explain the principal statistical constants, such as means, standard deviations, and coefficients of correlation. Their calculation will be illustrated on suitable data. The fee for the combined courses will be one guinea, to be paid in advance to the hon. secretary, Eugenics Education Society, Kingsway House, Kingsway, W.C., to whom all inquiries should be addressed.

THE report of the work of the department of technology of the City and Guilds of London Institute for the session 1912–13 has now been published by Mr. John Murray. At the recent examinations 21,878 candidates were presented in technology from 448 centres in the United Kingdom, and of these 13,618 passed. By including 812 candidates from India, from the overseas Dominions, and from other parts of the British Empire, and all candidates for special examinations, the total number examined was 25,339. During the session ninety-one centres were visited by the institute's inspectors, several centres receiving two or three visits in order to complete the inspection. It is satisfactory to find the report stating that there can be no doubt that the teaching of technology has greatly improved during the past few years; but it is noted that the examiners have still to direct attention to the insufficient knowledge that some candidates possess of the principles of their subjects, and to the lack of practical knowledge shown by others. The inability of candidates to express themselves clearly is, the report says, perhaps not so noticeable as in past years, but in no fewer than ten subjects the examiners have to direct attention to the difficulty that simple arithmetical calculations present to many candidates—a defect which can only be attributed to insufficient preliminary training.

THE December number of *The Popular Science Monthly* contains an article on the place of study in the college curriculum, by Dr. P. H. Churchman, of Clark University. In it he points out that a renaissance of the old belief in the value of strenuous intellectual work for the young man of eighteen to twenty-two seems to be coming, and that the older universities of the United States are beginning to weed out the incompetents who for several generations have used them as social clubs. For a time this step will mean a decrease in numbers, and to those who only look at the surface of things numbers mean success. The idea that it is not necessary to insist that all those in residence at a college should be real students is called "Oxonian" by the author, and he admits that it has the advantage over the Continental idea of much learning and nothing else. He values highly all those college institutions of a non-intellectual type which contribute to the production of the "college-bred man," but he points out that the college loafer who is up for social reasons avoids strenuous effort even of the non-intellectual kind. He has no confidence in the annual or semi-annual college examinations as a means of discrimination between the idler and the earnest student, and reminds his readers of well-known candidates at Princeton who, after idling away the session, obtained respectively a first class in psychology after two hours' grind at some printed notes and a second class in zoology after five hours' coaching. No examination of the usual type has ever been invented which cannot be circumvented by the aid of an intelligent crammer. He advocates the less formal monthly examination or the better plan of imposing examination tests at any moment without warning and frequently. Such examinations afford the best test of that gradual growth of intellectual power which comes from steady and sustained effort over a long period, and from intercourse and discussion with superiors and colleagues developing along the same or similar lines.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, December 11.—Sir William Crookes, O.M., president, in the chair.—A. **Mallock**: Intermittent vision. When a wheel turns so rapidly that the separate spokes cannot be seen or easily followed by the eye, and if at the same time the observer receives a small mechanical shock of almost any kind, the spokes appear almost stationary for a fraction of a second. The appearances depend on the speed of rotation, on the brightness of the illumination, and, to a lesser degree, on the nature of the shock. Suitable shocks are given by the contact of the feet with the ground, as in walking, by tapping the head or body, and in many other ways. Experiments are described bearing on the relation between the appearances and the speed of rotation, and an explanation is suggested depending on an assumed variation of sensibility produced by a slight shock. This variation, which it appears is rapidly extinguished, has a periodic time of about 1/18 second, but this differs slightly for different individuals.—Prof. R. J. **Strutt**: Attempts to observe the production of neon or helium by electric discharge. The present experiments were begun in the hope of confirming the work of Collie and Patterson (Trans. Chem. Soc., 1913, vol. ciii., p. 419, and Proc. Chem. Soc., 1913, vol. xxix., p. 217). The results have been negative, whether from a failure to

appreciate the proper conditions for the production of neon by electric discharge through hydrogen or from some other cause.—Walter **Wahl**: The relations between the crystal-symmetry of the simpler organic compounds and their molecular constitution. Part iii. —Prof. G. G. **Henderson** and I. M. **Heilbron**: The selective absorption of ketones. The authors have found that the selective absorption of a large number of simple ketones is of the same type, since the absorption bands of all are practically identical. They suggest that the absorption of these compounds may be due to electronic disturbances accompanying oscillations which arise from the alternate formation and breaking down of unstable ring systems within the molecule.—F. E. **Smith**: Absolute measurements of a resistance by a method based on that of Lorenz. The instrument employed differs from all other forms of apparatus based on the method of Lorenz, inasmuch as two discs are employed instead of one. The disturbing effect of the earth's magnetic field is thus practically eliminated. The result of the experiments is that a resistance of one international ohm is equal to $1{\cdot}00052 \pm 0{\cdot}00004$ ohms (10^9cm./sec.).—A. N. **Shaw**: A determination of the electromotive force of the Weston normal cell in semi-absolute volts. With a preface by Prof. H. L. **Callendar**. This paper represents the completion of work commenced by Prof. H. L. Callendar and Mr. R. O. King in the years 1894 to 1898. The final result for the E.M.F. of the Weston cell in semi-absolute volts comes out 1·01827 at 20° C., which agrees closely with the mean of the best recent determinations, namely 1·01824.—F. E. **Rowett**: Elastic hysteresis in steel. A thin-walled steel tube was coupled to a coaxial tube of greater section and length. The compound tube was twisted, and the twist in each component measured by spirit levels. The twist of the large tube, in which the stress and therefore also the hysteresis was small, measured the torque applied to the small tube. The elastic hysteresis in hard-drawn tubes was about one-eighth of that in the same tube after annealing.—F. W. **Aston**: A simple form of micro-balance for determining the densities of small quantities of gases. (1) A simple micro-balance is described, by which the densities of gases may be determined relative to some standard gas, using a null method; (2) about half a cubic centimetre only of the gas is required; (3) the determination can be performed in a few minutes, with an accuracy of 0·1 per cent; (4) possibilities of its use in other fields of research are indicated.—T. R. **Merton**: A second spectrum of neon. The spectrum of neon has been investigated under different conditions of electrical excitation. It has been found that with a condensed discharge a second spectrum is developed, as in the case of argon, krypton, and xenon. The strongest lines of the ordinary spectrum are also feebly visible when a condensed discharge is used.

DUBLIN.

Royal Dublin Society, November 25.—Prof. James Wilson in the chair.—Prof. T. **Johnson**: *Ginkgophyllum kiltorkense*, sp. nov. The author described a stalked leaf of a Ginkgophyllum from the Yellow Sandstone beds of Kiltorcan, county Kilkenny. The bilobed leaf is 5×7 cm., and shows forking venation clearly in its dichotomising segments. It suggests comparison and affinity with *G. Grasseti*, Saporta, from the Permian of Lodève. The specimen indicates that the Ginkgoaceæ occurred in the Devonian epoch. Impressions of the stem, showing distant leaf-scars arranged spirally, and intervening Lyginodendron-like cortical fibres, were also described, as well as certain seed-like impressions.—W. R. G. **Atkins**: Oxydases and their inhibitors in plant tissues. Part ii., The leaves and flowers of Iris. These gave the indirect oxydase reaction throughout, though not in many instances until after the removal of inhibitors by hydrogen cyanide. Prolonged darkness has no decided effect upon the distribution of enzyme or inhibitor. The occurrence of the natural sap pigments in the flowers of about thirty varieties of Iris has been correlated with the presence of oxydase and inhibitor.

PARIS.

Academy of Sciences, December 8.—M. F. Guyon in the chair.—H. **Deslandres** and V. **Burson**: The action of the magnetic field on the lines of the arithmetical series in a band of lighting gas. Variation of the number of the lines with the intensity of the field. A study of the violet band λ 3889 in the spectrum of coal gas. The lines of a given arithmetical series are all either divided or displaced in the same manner, the magnitude only of the divisions or displacements being variable from one line to another.—G. **Gouy**: The absence of sensible refraction in the sun's atmosphere. A discussion of the possible effects of abnormal dispersion in lines of emission or absorption from the sun, with especial reference to the views of W. H. Julius.—Ph. **Barbier** and R. **Locquin**; The transformation of citronellol into rhodinol. It is shown that pure rhodinol, the main constituent of essence of roses, can be obtained from citronellol.—M. **Duhem** was elected a non-resident member.—J. **Guillaume**: Observations of the sun made at the Observatory of Lyons during the third quarter of 1913. The results are given in three tables showing the number of spots, their distribution in latitude, and the distribution of the faculæ in latitude.—Maurice **Gevrey**: Indefinitely derivable functions of given class and their rôle in the theory of partial equations.—G. **Bouligand**: The problem of Dirichlet in an indefinite cylinder.—MM. **Maurian** and de **Moismont**: Comparative measurements of the friction of air on surfaces of different natures. —P. **Idrac**: Observations on the flight of gulls behind ships. In the hovering flight of birds in the neighbourhood of moving ships, the birds are sustained by ascending air currents due to the motion of the vessel. —Victor **Valcovici**: The hydrodynamical resistance of an obstacle in a movement with surfaces of slipping. —A. **Bilimovitch**: Special canonical transformations.— Marcel **Brillouin**: The propagation of sound in a non-absorbent heterogeneous fluid.—Edouard **Guillaume**: The velocity of light and Carnot's principle.—P. **Vaillant**: The polarisation capacity of an electrode submitted to an alternating electromotive force and a method for its determination. The polarisation capacity appears to start from a very high value for zero polarisation, decreases rapidly to a minimum, and again increases continuously. Its order of magnitude is 10 microfarads per sq. mm. for a difference of potential of 0·5 volt between the electrode and the electrolyte.—Marius **Hartog** and Philip E. **Belas**: The trajectory of a permeable particle moving without inertia in a bipolar Newtonian field of force.—G. **Foex**: Molecular fields in crystals and energy at the absolute zero.—E. **Tassilly**: Determination of the velocity of formation of the diazo-compounds. Since a colouring matter was the product of the reaction studied, the reaction velocity was followed with the Féry spectrophotometer. The reaction is shown to be bimolecular.—René **Dubrisay**: The neutralisation of periodic acid. Periodic acid in solution behaves as a tribasic acid.—J. **Barlot** and Ed. **Chauvenet**: The action of carbonyl chloride upon phosphates and the natural silicates.—P. **Brenans**: The nitration of paraiodoacetanilide.—L. **Moreau** and E. **Vinet**: Remarks on the use of wine traps for capturing the moths of Cochylis. These traps, although useful as supplementary means of destruction, cannot be relied upon

as the sole protection against Cochylis.—Mme. Marie **Phisalix**: The independence of the toxic and vaccine properties in the cutaneous mucous secretion of Batrachians and some fishes.—L. **Lapicque** and R. **Legendre**: Relation between the diameter of nerve fibres and their functional rapidity.—Jacques **Pellegrin**: The presence of deep-sea fishes on the Paris market. Owing to the increasing depths, up to 200 metres, at which trawling operations are now carried out, numerous specimens of fish considered as very rare are occasionally sold for food in the Paris markets. A list of the rarer forms is given, including *Pterycombus brama*, an archaic fish not represented in the Paris Museum.—J. **Athanasiu** and J. **Dragoiu**: The aërial capillaries of the muscular fibres in insects.—H. **Dominici** and M. **Ostrovsky**: The action of the diffusible poisons of the Koch bacillus upon normal tissues. The results of these experiments invalidate the commonly accepted theory with regard to the pathogeny of the lesions caused by the Koch bacillus.—M. **Javillier** and Mme. H. **Tchernoroutsky**: The comparative influence of zinc, cadmium, and glucinum on the growth of some Hyphomycetes. Three moulds were examined —*Poecilomyces varioti*, *Penicillium caseicolum*, and *Penicillium glaucum*—and in each case there was marked catalytic action of zinc salts in stimulating growth. Cadmium showed a similar but much smaller activity, whilst glucinum salts are inert.—Ph. **Glangeaud**: The dislocations and the amethyst-quartz lodes of Livradois. The old extension of the coal basin of Brassac.—G. **Vasseur**: New palæontological discoveries in the upper Aquitanian in the neighbourhood of Laugnac (Lot-et-Garonne). This region is remarkably rich in fossil vertebrates.—Ph. **Flajolet**: Perturbations of the magnetic declination at Lyons (Saint Genis Laval) during the third quarter of 1913.

BOOKS RECEIVED.

Die Vitamine: ihre Bedeutung für die Physiologie und Pathologie. By C. Funk. Pp. viii+193+ii. plates. (Wiesbaden: J. F. Bergmann.) 8.60 marks.

Scientific Memoirs by Officers of the Medical and Sanitary Departments of the Government of India. (New Series.) No. 60. Studies on the Mouth Parts and Sucking Apparatus of the Blood Sucking Diptera. No. 4. The Comparative Anatomy of the Proboscis in the Blood-Sucking Muscidæ. By Capt. F. W. Cragg. Pp. 56+v plates. (Calcutta: Superintendent Government Printing, India.) 1*s*. 9*d*.

Recueil de l'Institut Botanique Léo Errera. By J. Massart. Tome ix. Pp. viii + 408 + iv plates. (Bruxelles: H. Lamertin.)

The Freedom of the Press in Egypt. By K. Mikhail. Pp. xii+37. (London: Smith, Elder and Co.) 1*s*. net.

The Purpose of Education. By St. G. Lane Fox Pit. Pp. ix+83. (Cambridge University Press.) 2*s*. 6*d*. net.

Genera of British Plants. By H. G. Carter. Pp. xviii+121. (Cambridge University Press.) 4*s*. net.

A Practical Manual of Autogenous Welding (Oxy-Acetylene). With a Chapter on the Cutting of Metals with the Blowpipe. By R. Granjon and P. Rosemberg. Translated by D. Richardson. Pp. xxii+234. (London: C. Griffin and Co., Ltd.) 5*s*. net.

Elementary Graphic Statics. By J. T. Wright. Pp. xii+227. (London: Whittaker and Co.) 4*s*. net.

Artificial Parthenogenesis and Fertilisation. By J. Loeb. Originally translated from the German by W. O. R. King. Supplemented and revised by the author. Pp. x+312. (Chicago: University of Chicago Press; London: Cambridge University Press.) 10*s*. net.

Proceedings of the London Mathematical Society. Second Series. Vol. xii. Pp. lix+488. (London: F. Hodgson.)

Elementary Practical Chemistry. Part i., General Chemistry. By Prof. F. Clowes and J. B. Coleman. Sixth edition. Pp. xvi+241. (London: J. and A. Churchill.) 3*s*. 6*d*. net.

The Foundations of Science. By H. Poincaré. Translated by G. B. Halsted. Pp. xi+553. (New York and Garrison, N.Y.: The Science Press.)

Social Insurance, with Special Reference to American Conditions. By I. M. Rubinow. Pp. vii+525. (New York: H. Holt and Co.) 3 dollars net.

Handbuch der vergleichenden Physiologie. Edited by H. Winterstein. 39 Lief. (Jena: G. Fischer.) 5 marks.

Handwörterbuch der Naturwissenschaften. Edited by E. Korschelt. Lief. 69 and 70. (Jena: G. Fischer.) 2.50 marks each Lief.

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