NATURE

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*"To the solid ground
Of Nature trusts the mind which builds for aye."*—WORDSWORTH.

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NOTICE.

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All communications to be addressed to THE REGISTRAR, The Institute of Chemistry, 30 Russell Square, London, W.C. 1.

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UNIVERSITY OF BRISTOL. DEMOBILISATION.

SPECIAL REGULATIONS have been made to allow intending students who have served in the war or in the scientific service of the war to be admitted to matriculation by vote of Senate on their educational qualifications, without formal examination; and also to allow of such students entering the University in January if candidates in Arts; in January, or between January and May, if candidates in Science, Medicine, Dental Surgery, or Engineering; and if grounds be shown, counting their first year's attendance as though it had commenced in October. Engineering students in special cases may be allowed to count one whole year's attendance. Applications to the REGISTRAR.

APPOINTMENTS REGISTER.

A Register of Fellows and Associates of the Institute of Chemistry who are available for seeking appointments is kept at the Offices of the Institute. Applications for the services of chemists should be forwarded to the REGISTRAR, The Institute of Chemistry, 30 Russell Square, London, W.C. 1.

ROYAL SOCIETY. — Government Grant

for SCIENTIFIC INVESTIGATIONS.—APPLICATIONS for the year 1919 must be received at the Offices of the Royal Society not later than January 1 next, and must be made on printed forms to be obtained from the CLERK TO THE GOVERNMENT GRANT COMMITTEE, Royal Society, Burlington House, London, W.1.

COUNTY BOROUGH OF WEST HAM.

The Education Committee invite applications for the appointment of a PRINCIPAL of the MUNICIPAL TECHNICAL INSTITUTE, Romford Road, Stratford, E., at a salary of £600 per annum, rising by two annual increments of £50 to £700.

Particulars of duties and forms on which application must be made may be obtained at my office.

Canvassing members of the Education Committee is prohibited, but printed copies of application and testimonials may be sent to them.

Applications must reach me not later than 12 noon on Tuesday, January 21, 1919.

GEORGE E. HILLEARY,
Town Clerk.

Education Department,
95 The Grove, Stratford, E. 15,
November 28, 1918.

UNIVERSITY COLLEGE OF SOUTH WALES AND MONMOUTHSHIRE.

(COLEG PRIFATHROFAOL DEHEUDIR CYMRU A MYNWY.)

The Council of the College invites applications from both men and women for the post of TEMPORARY ASSISTANT LECTURER AND DEMONSTRATOR IN HISTOLOGY, who will also be required to assist in demonstrating to the first-year students in Zoology.

Further applications may be obtained from the undersigned, by whom applications, with testimonials (which need not be printed), must be received on or before Saturday, December 14, 1918.

D. J. A. BROWN,
Registrar.

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November 22, 1918.

ROYAL ALBERT MEMORIAL.

UNIVERSITY COLLEGE, EXETER.

The Governors invite applications for the post of LECTURER in PHYSICS, to begin work in January next. Salary from £250 to £300, according to qualification.

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Particulars may be ascertained from the REGISTRAR.

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UNIVERSITY READERSHIP in BOTANY tenable at King's College. Salary £300 a year. Applications (10 copies), in envelope marked "Readership in Botany," should reach the VICE-CHANCELLOR, University of London, South Kensington, S.W.7, not later than first post on December 21, 1918. Further particulars on application.

MERCHANT VENTURERS' TECHNICAL COLLEGE, BRISTOL.

TEACHER for WIRELESS TELEGRAPHY (Theory and Operating). £250-10-£300. For particulars and form of application send stamped, addressed foolscap envelope to the REGISTRAR.

THURSDAY, DECEMBER 5, 1918.

BRITISH SANDS.

(1) *A Memoir on British Resources of Sands and Rocks used in Glass-making, with Notes on certain Crushed Rocks and Refractory Materials.* By Prof. P. G. H. Boswell. With Chemical Analyses by Dr. H. F. Harwood and A. A. Eldridge. Second edition. Pp. xi+183. (London: Longmans, Green, and Co., 1918.) Price 7s. 6d. net.

(2) *A Memoir on British Resources of Refractory Sands for Furnace and Foundry Purposes.* Part i. By Prof. P. G. H. Boswell. With Chemical Analyses by Dr. H. F. Harwood and A. A. Eldridge. Pp. xii+246. (London: Taylor and Francis, 1918.) Price 8s. 6d. net.

In pre-war days large quantities of Continental sands were used in both the metallurgical and glass industries, the low prices at which they were delivered at our seaboard being mainly due to their transport as ballast in returning coal-boats. Quite early in the war the stocks of these sands were exhausted, and it had become a matter of urgency to replace them by home supplies. Owing to the difficulties of transport, it was essential that, wherever possible, deposits of sand easily accessible to the industrial centres should be utilised. Much of the success which has attended the efforts to utilise our home resources of sand is unquestionably due to the survey made of them by Prof. Boswell at the instruction of the Ministry of Munitions, and in its earlier stages under the auspices of the Imperial College of Science and Technology. The author's contention that many sands were unnecessarily imported, and others equally unnecessarily moved about the country, cannot be gainsaid, and in view of the industrial importance of sands it is remarkable that hitherto there has been little or no systematic investigation of our native resources of them.

(1) The rapid exhaustion of the editions of the author's two earlier memoirs on our native resources of sands suitable for glass manufacture is an indication of the appreciation they received from the glass industry. Prof. Boswell has rendered further service by gathering into one volume the results of his investigation, and it is unquestionably the most important contribution which has been made to our knowledge of the sands of this country. The rapid and efficient manner in which the large amount of work entailed has been carried through and presented for use has been no inconsiderable factor in enabling glass manufacturers to replace by home supplies the imported sands previously used. It is not too much to say that one result of these investigations will be that imported sands will no longer be used except for the highest qualities of glass, and even for these there is a possibility of the sand from Muckish Mountain, Co. Donegal, proving suitable, although its inaccessibility may be a bar to its use.

In discussing in detail the methods for the mechanical analysis and grading of sands, the author points out the advantage of elutriation processes over sifting or screening, and describes a single-vessel elutriator of simple construction. The mechanical composition of a large number of sands is represented graphically, a method which brings out many useful points. Attention is directed to the value of aluminiferous sands, and it is unfortunate that the majority of our native sands carrying a high proportion of alumina are also high in iron, and therefore useless for all but the commonest varieties of bottle glass. A chapter is devoted to the methods in use for the improvement of sands by special treatment, and it is of considerable interest to note that sand-owners are now giving increased attention to this important matter. For purposes of comparison notes are given of a number of largely used Continental and American sands. Useful sketch-maps are appended showing the outcrops of the geological formations in which glass sands occur, and the location of the chief British resources in relation to the glass-making areas.

The author is to be unreservedly congratulated on a piece of work of the utmost value to our rapidly reviving glass industry.

(2) The memoir on British resources of sands suitable for furnace and foundry purposes will be invaluable to the iron and steel industries, as it for the first time places on record the information necessary to enable manufacturers to select sands for trial and subsequent utilisation. The purely scientific investigation of these materials must come first, but the ultimate tests must be in the works themselves, and investigations of the type of the present memoir will do much to link up the work of the man of science with that of the manufacturers.

The author's lines of laboratory work comprise chemical analysis of the bulk sand and its individual grades, mineral analysis, and mechanical analysis; and, again, many important points are brought out by the excellent graphical method of expressing the results of the mechanical analyses. In dealing with moulding sands the author adopts the plan of exhaustively examining a sand which works experience has shown to be highly suitable, and by deduction from the laboratory results noting what appear to be the desirable qualities. The special feature of a good moulding sand is its property of absorbing water without becoming really wet, and further investigation of this water-holding capacity is desirable because of its important bearing on the "bonding" qualities of the sand. It will be readily gathered from a perusal of this memoir that we have still much to learn respecting the properties of sands, and there is room for much interesting research work in connection with both naturally bonded sands and synthetic moulding sands made by admixing a high silica sand with clays and other bonding materials. There is much valuable empirical knowledge in the hands of foundry foremen which requires translating to a scientific basis.

To avoid delay in making the results of the survey available, the present part i. of the memoir deals mainly with the extent and character of our chief resources available. The author can be assured a particular welcome for part ii., dealing with further resources, and discussing the results of other important laboratory and works tests.

The sketch-maps are of interest, but in the chief of them, showing the location of the main British resources of refractory sands in relation to the metallurgical areas, it may be pointed out that such important iron-producing areas as the West Coast of Scotland, Frodingham, Workington, and Brymbo have been omitted. W. J. R.

GOADS FOR THE PHYSICS TEACHER.

A Calendar of Leading Experiments. By William S. Franklin and Barry Macnutt. Pp. viii + 210. (South Bethlehem, Pa.: Franklin, Macnutt, and Charles, 1918.) Price 2.50 dollars.

READERS of Prof. Franklin's book, "Bill's School and Mine," will open the present volume with zest, and their anticipation of enjoyment will be increased by the remark on the title-page: "The authors are teachers, and they consider teaching to be the greatest of fun; but they never yet have been helped in their work by anything they have ever read concerning their profession." Bacon mentioned a "calendar of leading experiments for the better interpretation of Nature" as one of the things most needful for the advancement of learning, and it would seem that the authors, having failed to find assistance with regard to physical lecture demonstrations, have boldly set about filling the gap. Perhaps this method of statement is a little unfair to the excellent volume published under the auspices of the French Physical Society! The authors state that their book has to do primarily with class-room experiments in physics; secondarily it is intended to set forth the possibilities of an extended course in elementary dynamics, including the dynamics of wave motion. The writer is of opinion that most teachers will find the most stimulating part of the volume to be the humorous interludes, criticisms, and questions with which the book is filled from beginning to end. "So many things in teaching *are* funny, from our point of view." "Precision of thought is not dependent upon precision of measurement." "Science, even in its elements, presents serious difficulties." The following problem was given to a group of engineering students:—"A cart moves due northwards at a velocity of $5\frac{1}{2}$ ft. per sec. A man pushes vertically downwards on the cart with a force of 200 lb., and a mule pulls due northwards on the cart with a force of 50 lb. Find the rate at which the man does work, and the rate at which the mule does work." In answer to the question 44 per cent. of the young men found that the man developed 2 h.p. and the mule developed $\frac{1}{2}$ h.p. "Truly, mule-driving would be strenuous labour for our pampered college students!"

Prof. Franklin is a formidable controversialist, but one statement by the authors is certainly open to question. "It is conceivable that the atomic conceptions of electrical phenomena may some time come to be important in everyday life and in everyday engineering, but that time is certainly not yet" (p. 117). Putting aside Faraday's laws of electrolysis, the Coolidge tube and the thermionic appliances used in wireless telegraphy can scarcely be ignored at the present time.

To the experiments described it is impossible to refer at length; some are old, many are new. "The best experiments are those that are homely and simple, and suggestive rather than informing. The physics lecturer should pull ideas out of things like a prestidigitateur." The authors suggest that colleges and technical schools should have fully equipped "Visitors' Laboratories of Physics," and every member of the department, including Clarence and Pete, may take a share of the fun of edifying visitors. "The entire equipment need cost no more than four or five thousand dollars." Let our millionaires please note!

A book for physics teachers to read and ponder over. H. S. ALLEN.

APPLIED ANALYTICAL CHEMISTRY.

Treatise on Applied Analytical Chemistry. By Prof. V. Villavecchia and others. Translated by T. H. Pope. Vol. ii. Pp. xv + 536. (London: J. and A. Churchill, 1918.) Price 25*s.* net.

IT is pleasant to have in English a work like the present, emanating from Italian chemists. Such a book would be welcome at any time, but is especially so just now, when Italy is allied with us against a foe who has grossly misused his knowledge of chemical science.

Prof. Villavecchia's treatise deals with the analysis of foodstuffs and the principal industrial products, including, therefore, both organic and inorganic substances. As regards general scope and design, the book is of an intermediate character: it is not a mere summary, but neither is it so comprehensive as works like those of Allen or Post and Neumann. It does not, for example, treat of alkaloids, drugs, or pharmaceutical chemicals.

The present volume (ii.) is chiefly concerned with organic products. About one-half of the matter is devoted to foodstuffs, and the remainder to various industrial commodities, including essential oils, varnishes, rubber, tanning materials, inks, leather, colouring matters, and textile articles.

A very good selection of modern analytical methods has been made. The directions for carrying them out are clear and concise. Difficulties are pointed out, and the limitations of particular processes indicated. Methods are not merely outlined, but reasonably full descriptions are given, allowing of determinations being made with the requisite certainty and precision by any competent operator.

On looking through the various sections one finds little to criticise, and much that leaves a favourable impression. Sugar analysis, for example, which is often treated much too scantily in general treatises, receives adequate attention in the work under review. This chapter, in fact, is excellent, and one of the best in the book. The section on milk is quite good generally, but for use in this country it would have been improved by including the standard requirements and adapting it to English practice, much in the same way as the chapter on beer has been treated. Of the other sections, those on spirituous liquors, colouring matters, and textile articles may be singled out for commendation. The Allen-Marquardt method of determining higher alcohols, however, is not included in the first-mentioned group; presumably it is not in favour with Italian chemists.

Occasional references are given, but more might well be included, for the benefit of readers who may wish to consult the original descriptions. For example, both the Denigès colorimetric and Thorpe and Holmes's gravimetric method of estimating methyl alcohol are described, but without reference either to the authors or to the original papers.

These omissions, however, are minor matters. The work, as a whole, will be found useful and practical; it well deserves a place in the analyst's library. A meed of praise is certainly due to the translator, who has done his work very well indeed.

C. SIMMONDS.

OUR BOOKSHELF.

Contouring and Map-reading. By B. C. Wallis. Pp. 48. Price 2*s*.

Macmillan's Geographical Exercise Books: VII.—Physical Geography. With Questions. By B. C. Wallis. Pp. 48. (London: Macmillan and Co., Ltd., n.d.) Price 1*s*. 6*d*.

THESE books, which form parts of a series by the same author, have the advantage of being compiled by a teacher of wide experience who has given much thought to the presentment and mapping of geographical data. Mr. Wallis has shown considerable ingenuity in devising some of his exercises, and to a great degree has managed to avoid the trivial and merely mechanical tasks which often make such work irksome and of little value. In the volume on contouring and map-reading, which is specially to be recommended, advantage has been taken of the interest the war has given to geographical study in making use of many excellent war-maps in setting questions. Attention should also be directed to the exercises in making sketches from contour maps, though perhaps the method requires rather more explanation than is offered. In the glossary in the volume on physical geography the definition of barometric gradient requires revision. But the feature that gives the books great value is that every exercise has to be done on an accompanying map or diagram. The maps are clear and well printed, even to the smallest details. These books should give pupils an excellent grounding in the use and construction of maps.

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 Perception of Sound.

I WOULD first thank those correspondents who have replied to my difficulties with respect to certain theories of the function of the cochlea. Unfortunately, the fundamental physical difficulty has not received the consideration that I hoped for, probably because it was not made sufficiently clear. Sir Thomas Wrightson (NATURE, November 7) gives a quotation from Helmholtz which does not seem to me to meet the case, but perhaps it was written in connection with a different aspect of the problem. It is not obvious how the dimensions of the space filled with liquid in relation to the wave-length of the vibrations affect the nature of the process. If it were the case, the conduction of sound in liquids should be of a different nature according to the dimensions of the vessel and the pitch of the note. May I, therefore, put the question in another way?

When sound-waves impinge on water and are conducted through it, there could not be the necessary condensations and rarefactions unless the mass of water in front of the advancing wave offered sufficient resistance by its inertia to enable the local compression to take place. If the column of water moved as a whole in the way assumed by Sir Thomas Wrightson's theory, it could not conduct sound-waves as such, since there would be no possibility for the formation of any local differences of density. Now the impulses impressed by the stapes on the liquid of the cochlea are identical in time-course with sound-waves, and the nature of the disturbances in this liquid must be the same as if it were conducting sound. Of course, the column of liquid moves as a whole to relatively slow rates of incidence of energy. If a short, sharp tap be made on a membrane at one end of a column of water, the ear at the other end does not perceive the sound at the moment at which the blow is given; the transmission is by a wave. If it were necessary that the whole column of water should be moved, a large expenditure of energy would be required. It seems to be assumed that the force available is too small to do anything but move the liquid column in the cochlea as a whole, unequal to effect anything in the nature of a compression. But is this so? The force is concentrated into a very minute space. On the whole, I can see no alternative but the conclusion that the waves to which the organ of Corti responds are the same as sound-waves. I regret that Lord Rayleigh in his letter (NATURE, November 21) has overlooked this point, about which his statement would have carried so much weight. It is important, however, that he does not see so many difficulties in the resonance theory as others do.

I cannot quite follow Sir Thomas Wrightson's explanation how there is produced a difference of pressure between the two sides of the basilar membrane. It seems to assume that there is a wave of pressure—that is, a sound-wave. Although the helicotrema is small, the volume of liquid moved through it is very minute (0·075 cub. mm. as a maximum, p. 96 of Sir Thomas Wrightson's book), and the existence of a difference of mechanical pressure is difficult to believe. The hairlets would not be bent unless there were such a difference.

When Sir Thomas Wrightson states that the strongest argument against the "string instrument theory" is that the basilar membrane does not consist of separate strings, he forgets that this is not an essential part of the resonance theory. Helmholtz made his calculations on the assumption that the membrane is homogeneous, but has a greater tension laterally than longitudinally.

Prof. Keith (NATURE, October 31) has pointed out that the work of Keith Lucas and Adrian on the "all-or-nothing" character of the nerve impulse was done on motor nerves only. I am obliged to him for doing so, and apologise for omitting to mention the fact. At the same time, we know of no such differences in the properties of motor and sensory nerves as to suggest a fundamental contrast of the kind required. There seems no inherent difficulty in the performance of similar experiments on sensory fibres, using the reflex as an indicator. Perhaps Dr. Adrian, when freed from his military duties, may find it possible to undertake the work. The results would be of great value.

I admit that the title of Sir Thomas Wrightson's book implies that the internal ear has analytical functions, but it is not easy to see what these are on his theory. In fact, Prof. Keith states on p. 159 of the book that the relegation of the powers of analysis to the cerebral cortex is the hypothesis advanced by Sir Thomas Wrightson.

With regard to the necessary function of all structures found in an organism, I think Prof. Keith must have misunderstood my words; for he would scarcely claim a functional importance for the details of such structures as the splint-bones of the modern horse. It is to be remembered that Helmholtz did not profess to account for the whole of the mechanism of the internal ear. He would no doubt have been the first to recognise the necessity for modifications and additions to his theory. When we find a particular mode of effecting a given object in living organisms, it by no means follows that this is the simplest or best conceivable. Structures already present, of ancestral origin, are taken into use.

As Lord Rayleigh points out, the crux of the matter is the applicability of Müller's law. The parallel between sound and light is not so much that between the perception of pitch and colour as the perception of the elements of an image on the retina, each of which must be transmitted by its own special nerve-fibre. This circumstance, together with Lord Rayleigh's difficulty of admitting the capacity of nerves to transmit 10,000 vibrations per second and that of the "all-or-nothing" property of motor nerves, shows that physical and anatomical considerations alone cannot decide the question, which is, in the end, one of physiology.

It does not seem impossible that investigations with the Einthoven galvanometer might throw light on the form of the impulses in the auditory nerve. Even if the wave-form were beyond the capacity of the instrument, the number of impulses per second in relation to those of the pitch of the note and the refractory period of the nerve might be determined.

Dr. Perrett's difficulties (NATURE, November 7) relate to the extent of spread of a resonant vibration and to the perfection of damping. It seems to me to be unreasonable to bind Helmholtz to exact numerical data, considering the enormous difficulties involved in the determination of the physical constants of the auditory apparatus. Nor are the numerical values used by Helmholtz for approximate calculations to be regarded as the "keystone of his theory." At any rate, the amplitude of a resonant vibration in a membrane decreases very steeply as the maximal point is departed from, and the fact that below a certain intensity of stimulus a nerve-fibre is not excited at all suggests the possibility that the amplitude of vibration may be sufficiently great to be effective only in immediate proximity to the maximum.

The sudden cessation of the perception of a sound when its source ceases, as required by phonetics, is, as Dr. Perrett is aware, a question of the perfection of damping. I fail to see why we are necessarily limited to any particular value of the reduction in a given time by the cochlear apparatus, be this value one-tenth or otherwise. The fact that a resonant vibration may be practically "dead-beat" was made clear to me in a recent experience at an orchestral concert. The floor-board on which one of my feet rested resounded by vibration to a particular note, especially to the powerful one of the trombone or drum. But the interest lay in the fact that this vibration ceased instantaneously as soon as the exciting note ceased, doubtless owing to the effective damping by the benches and the feet of the audience.

There is one phenomenon which has not been referred to hitherto in the present discussion: the disputed question as to whether the different compound wave-forms produced by different phase relations of the same component tones affect the quality of the sound heard. Helmholtz stated that they did not, but other observers have stated the contrary. Sir Thomas Wrightson's theory would be able to account for a difference, but the resonance theory would not. Unfortunately, the statements are very contradictory, and it does not appear that the experiments made by those who found phase relation to be effective were such as to exclude differences other than those of phase in the complex tones produced.

The desirability of a decision of the question at issue, if possible, may serve as excuse for a further letter on my part, for the length of which I beg to apologise.

W. M. BAYLISS.

University College, London.

International Prize for Scientific Work.

I HAVE recently received from one of the secretaries of the Royal Academy of Turin a printed Latin notice of the conditions prescribed for the next award of an international prize of the net value of 9000 Italian lire founded by Cesare Alessandro Brussa, M.D. The prize is to be awarded to the *vir doctus* who has produced that which, in the judgment of the academy, is the most important and most useful invention or the most important work during the four years between January 1, 1915, and January 1, 1919, in any of the following departments of study:—Physics, or other branches of experimental science; natural history; mathematics (pure or applied); chemistry; physiology; pathology; geology; history; geography, or statistics.

Those who are proposing to compete for the prize are requested to send their inventions or their works to one of the secretaries of the academy (Prof. C. F. Parona, secretary for physical, mathematical, or natural sciences, or Prof. E. Stampini, secretary for moral, historical, or philological sciences) before January 1, 1919. Any works sent must be printed, but will not be returned (works in manuscript or type-written are inadmissible). The academy may also award the prize to one who has not submitted any work. The prize is open *docto viro cujuslibet nationis*, but Italian members of the academy are not eligible.

Cambridge. J. E. SANDYS.

SCIENTIFIC GLASSWARE.

THE manufacture of scientific glassware must be regarded as a single industry rather from the point of view of its markets than from that of the processes employed. It includes, in the first place, several branches of the glass trade. Light hollow ware, such as beakers and flasks, are blown in the glasshouse, the mass of glass on the blowing iron being rotated during the process of blowing in the mould, so that no mould marks appear on the finished article. In this respect the processes are identical with those employed in the manufacture of lighting ware, and differ essentially from those of common bottle-blowing. Mechanical methods are largely employed in the finishing processes. The manufacture of heavy goods, such as desiccators, which may be pressed, blown in moulds, or partly or entirely made by hand, belongs to other branches of the trade. Tube drawing is an entirely different branch of the industry, important in itself and furnishing the raw material for the manufacture of light and delicate pieces of apparatus at the hands of the lamp-worker. Finally, we have the accessory trades of grinding, polishing, and graduating, and others of minor importance.

Prior to the outbreak of the war the blowing of light hollow ware in this country was practically confined to the manufacture of electric-lighting bulbs and gas globes, of which vast quantities, including the whole of the resistance lighting ware, were also imported. Beakers, flasks, and similar articles were entirely imported. Though the British glass-worker is probably the most highly skilled handicraftsman in the world, the whole of our heavy chemical hollow ware came from Germany and Austria, an occasional piece only, to a special pattern, being made in an English glasshouse. Tube drawing, principally for gauge glasses, was practised to a certain extent; but the whole of the high-grade glass for the lamp-worker came from Germany. Finally, our means of production of glass instruments, graduated or otherwise, stop-cocks, etc., were insignificant compared with our requirements, even in peace-time.

It is probable that in the month of August, 1914, and for many months later, no Government Department appreciated the fact that the successful carrying on of the war depended in a large measure on the maintenance of the supply of scientific glassware. In this case, as in the case of other essential goods or materials which had previously been imported from enemy countries, no attempt was made to organise production, which was left to private enterprise.

The manufacture of such goods as beakers and flasks was not an attractive enterprise, particularly as a four-year war appeared to be outside the bounds of possibility, and there seemed little prospect of retaining the industry after the conclusion of peace. However, not many weeks had elapsed before Messrs. Baird and Tatlock (London), Ltd., Messrs. Moncrieff, of Perth, and Messrs. Wood Bros., of Barnsley, decided independently to venture in the national interest, the first-named by building a new glassworks (Duroglass, Ltd.), the others by extending their existing glassworks. Within a year of the declaration of war British flasks and beakers were on the market.

Those of us who are interested in chemical hollow ware must have a painful recollection of the exhibition held in the rooms of the Chemical Society in November, 1915. It showed that beakers, flasks, etc., were being made in this country, and from resistance glasses, and gave hope for the future; but the goods exhibited can scarcely have been said to show either the regularity in thickness or the finish to which chemists had been accustomed. The exhibit of the British Chemical Ware Manufacturers' Association at the British Science Guild's Exhibition at King's College in August last will, we hope, wipe out the memory of the earlier days.

While scientific literature contains scant information on the subject of glass, a good deal of information was available to those who knew where to look for it. The dealers in glassware possessed extensive information as to the varieties of German and Austrian glass which had been imported. Samples of the glasses were easily acquired, and when these were analysed information was obtained which, combined with a working knowledge of commercial materials, was sufficient to enable a chemist to work out formulæ for the glasses. The formulæ might be slightly modified after trial in the glasshouse, but the actual production of glasses identical with, or even superior to, those which had previously been imported presented no particular difficulties.

At every stage in the manufacture of light hollow ware new processes and methods of working had to be devised, and old prejudices of the British glass trade fought down. The design of moulds, the working of the glass on the iron, and the blowing in the mould had to be studied carefully so as to ensure uniformity of production. The annealing of the glass, which differed in its behaviour from the usual British glasses, required particular attention. The finishing of the goods was at first carried out by skilled men in the glass-house, but it soon became necessary to replace the man by the girl and the machine.

Success in every trade depends largely upon organisation. In the English glass trade the furnace has been used as a means of melting glass during the week-end, and of keeping it hot during the week while the goods are being made. In modern glassworks practice a furnace is looked upon as a machine for melting glass, the pots being worked out as fast as possible, any reheating of articles during working being performed in subsidiary furnaces, called glory holes. In the most modern type of furnace the glass is melted by night, and the pots are worked out every day and filled again, so as to be ready for the next day. This is probably the best kind of furnace for working light scientific and lighting hollow ware, and in working other classes of goods the furnace must be suited to the work, so as to reduce the furnace charges, one of the heaviest costs, to a minimum. Next, it is important that the lehrs, or annealing ovens, should be suitably designed and placed near the furnaces, for on the efficiency of the annealing much depends. The annealing loss carries with it the whole of the corresponding labour and furnace charges, and it may make the difference between success and failure. On the efficiency of the annealing will depend the loss in the processes of "cutting off" and finishing. To the second annealing, during which the strains introduced in the finishing processes are removed, close attention must be paid, for if the flanges crack off flasks while in use, chemists are inclined to show irritation. Finally, the organisation of the handling of such fragile goods is of the first importance, for casual breakage may easily run away with the whole of the profits.

The exhibits of the British Chemical Ware Manufacturers' Association and of the Flint Glass Makers' Association show what progress has been made during the war in the manufacture of heavy hollow ware, but the processes employed can scarcely be said to be new to this country. These associations, and the British Lamp-blown Scientific Glassware Manufacturers' Association, have also turned their attention to the manufacture of lamp-blown goods and graduated glass instruments, the supply of which has risen in both quality and quantity to meet the national needs. In these branches of the industry some progress has been made in introducing new and improved machinery; but as for some time past it has been very difficult to get machinery constructed, even the most progressive firms have been considerably hampered.

In spite of all the difficulties which he has had to face, the British manufacturer may claim that he has gone a long way towards solving the new problems of glass manufacture, and making the country self-supporting in the matter of scientific glassware. It is true that prices are high. But the cost of manufacture is practically three times as high as it was before the war, and all branches of the industry are burdened by heavy capital charges on account of new works erected or old works modified and improved. Heavy taxation has not tended to cheapen production.

This is a heavy handicap at the outset, and it must not be forgotten that the majority of works in which the goods are being made were not designed for the purpose to which they have been applied during the war, and much new construction has been carried out with a view rather to rapidity of execution than to ultimate efficiency. Also, though much has been learned, there remains much for the British glass manufacturer to learn if he is to compete on equal terms with his foreign rival. Finally, wages and expenses in Great Britain are likely to remain at a higher level than on the Continent and elsewhere.

No one supposes that the cost of manufacture on the Continent will fall to anywhere near pre-war rates, but, all other things being equal, the Continental manufacturer will still have the advantage of having his furnaces and plant in good repair, while those in British works will have been worked for five years up to the limit. He will also be burdened by smaller capital charges, and will be in a very advantageous position from the point of view of cheap production. It is clear, therefore, that this industry, *which is the key to every other industry*, cannot be maintained in the country without adequate protection and effective assistance from Government.

The establishment of the Department of Optical Munitions and Glassware Supply, Ministry of Munitions, not only for the purpose of organising the manufacture of munitions of war, but also with a view to the future development of the industry, may be taken as indicating the policy which the Government proposes to adopt. Assured of the support of the State, the manufacturers are prepared to do their utmost to hold on to what they have won; and through their trade associations, as well as the newly formed Society of Glass Technology, with its headquarters in Sheffield University, they are doing their best to organise for the future. MORRIS W. TRAVERS.

A "MINISTRY OF WATER."

A DEPUTATION representative of the National Sea Fisheries Protection Association and of other fishery interests waited on Mr. Prothero, President of the Board of Agriculture and Fisheries, on Wednesday, November 27, and made proposals for the establishment of a British Ministry of Fisheries, marine and freshwater. A memorandum published by the Fishmongers' Company was submitted. The proceedings of the conference are fully reported in the *Fish Trades Gazette* of November 30.

The memorandum is a careful, and even scholarly, piece of work. Beginning with a concise account of the development of the modern fishing industry, it proceeds to summarise the conditions that existed on the outbreak of war, and then traces the effects that may be expected when demobilisation is complete. In 1913 there were about 3700 steam- and motor-driven vessels, besides a larger number of smaller boats. About a million and a quarter tons of fish were landed in that year, and rather more than half was exported, about 600,000 tons being consumed in this country. Of this quantity about 18 per cent. was distributed by the fried-fish shops (the "National Kitchens"). During the progress of the war about 3000 of the steam vessels, with 40,000 to 50,000 men, joined the Royal Naval Reserve. They "saved the Navy and the Navy saved Britain," while those who were left continued to feed the people. Exports largely ceased, and the smaller vessels increased their production, with the result that, in 1917, about 400,000 tons of fresh fish were still available as human food. "The public," says the memorandum, "are voluble in their expressions of gratitude to the fishermen," and it then proceeds to set out the ways in which this gratitude can best be expressed—and future favours ensured.

The beginning of demobilisation sees the almost complete breakdown of the pre-war conditions of production and distribution. The fish docks and harbours were inadequate in 1913, and they are still more inadequate to-day; there are unfair railway rates, and delays and inconveniences in transport and handling (there are not enough fish-boxes in the country at present to contain the catch to be expected in a few months); while the machinery for retail distribution has broken down as the result of the Military Service Acts. Already there are powerful competition from Norway and an almost unbelievable reorganisation and extension of the German sea fisheries (see appendix v. of the memorandum). Obviously there must be increased production here; new means of capture; discovery of new grounds and regeneration of old ones; policing and regulation, both international and national; industrial experiment, training, education, and research. There must be an end of the "Victorian fallacy that science can be hired for the wages of unskilled labour"; reliance by the trade on the results of investigation; co-ordination of commercial and consular activities; search for new markets; and salvation "from the inanities of doctrinaire politicians."

All these objects are clearly unattainable as things are. Why? A glance at appendices i. and ii. of the memorandum will show. There are a multitude of authorities, national, central, and local, each of them "doing its bit"—or not; each more or less unco-ordinated with the rest. To secure effective joint action by this complex is obviously impossible. So there must be a Ministry of Fisheries with an Imperial General Staff, and strengthened and simplified English and Scottish authorities. (The inclusion of Ireland is, apparently, hopeless as yet.) The memorandum outlines a scheme for a Ministry, adopting, to a large extent, that of the United States Bureau of Fisheries.

Disregarding sectional jealousies, the scheme cannot fail to obtain approval by anyone who knows the conditions. Now for Mr. Prothero's reception of it. The Minister was, doubtless, disappointed by the presentation of the case by the deputation. About an hour was set aside for speeches, and most of this time was taken up by the chairman and vice-chairman, by Sir J. Crichton-Browne, who spoke about rearing pedigree cod, and by Mr. J. Arthur Hutton, who dealt with river pollution and the national importance of the salmon fisheries (which yielded 0·2 per cent. of the 1913 total catch). That was about all. The fishermen themselves were unrepresented, and (judging from the speeches reported) so were the fish-friers, the retail trade, and the preservation and canning industries.

Mr. Prothero's reply must have been equally disappointing. The Board of Agriculture and Fisheries was, he indicated, almost powerless with regard to many important matters, and a united Ministry of Fisheries for the United Kingdom would probably be the best authority. But it would be expensive; it would add to the number of officials and to bureaucracy generally—and we had had too much of that. He could not speak for Scotland or Ireland. He could not see that a Ministry of Fisheries could free itself from the Board of Trade or Admiralty, nor would it be of "sufficient calibre" to carry weight. So as an alternative he suggested the formation of a "Ministry of Water." "Why not sever land from water?" Then, after some wholesome platitudes as to the national services of the fisher-folk, the Minister pleaded other engagements.

So the matter remains, awaiting the attention of some statesman who can put aside other engagements—or that of some wholly independent organisation which can influence the public and so supply the driving force without which politicians seem unable to move.

THE PROMOTION OF SCIENTIFIC AGRICULTURE.

WHEN, in his recent speech at Wolverhampton, the Prime Minister spoke of the need for promoting scientific agriculture, he touched upon a subject of great national importance, and it may be profitable to attempt to give significance to his words. As was pointed out in the last issue of NATURE, it may be that what Mr. Lloyd George had in mind was merely the extended use of artificial manures, the discovery and methods of use of which were undoubtedly scientific discoveries of the first magnitude, with which the name of Lawes and his experimental station at Rothamsted will ever be honourably associated. But we should like to think that the passages in the speech to which attention was directed are evidence that the Prime Minister has advanced to a position which few of his political forbears ever reached, namely, that progress in the arts and industries is indissolubly bound up with the progress of science; and science in this connection should not be limited to the "natural" sciences. The application of the scientific method to technical problems may well be as potent an element in progress as the adoption of the results of scientific research properly so-called. The field experiment in agriculture may not be research, but it is futile as an *experiment* unless it is conducted under the conditions and interpreted with the precautions which science dictates.

If, then, the Prime Minister has resolved that agriculture shall benefit from science, his first task is to take such measures as are likely to be fruitful of results. It will not suffice merely to provide unlimited funds even on the scale of a "day's cost of the war," if at the same time a well-considered plan of operations has not been framed. Scientific research in agriculture in the past has suffered from a failure to attract a sufficient number of men of first-class scientific talent. This failure has been largely due to the fact that agricultural research offered no career. Not only were such posts as were available inadequately paid, but essential needs, such as well-equipped laboratories with adequate provision for maintenance, had not been provided.

In the forefront, therefore, of the measures that should be taken to link together practical agriculture and science should be placed the recruitment of the best scientific talent that the country can provide, and this can be secured only by providing suitable openings with reasonable prospects of advancement for the best of the graduates in science turned out annually by the universities. Programmes of research avail nothing in the absence of competent men to carry them out. We should like to see a scheme inaugurated under which promising graduates in science would be attracted to the study of the agricultural sciences by the provision of special fellowships under a guarantee that a certain number would eventually be selected for permanent posts carrying adequate salaries.

It is true that in the past most of the great discoveries have been made by men actuated merely by a love of knowledge for its own sake, and no doubt the future will not differ from the past in this respect; but the real point is that, if anything is to be accomplished by State action, an appeal must be made to the motives by which the majority of men are actuated in choosing their life career. There can be no question that if emoluments were placed upon a basis which would enable workers to live in reasonable comfort, while prospects of advancement were also improved, the fruits of the vineyard would be ample. Agriculture and horticulture are still in the main ruled by empiricism and tradition, and while it is true that many of the more recent advances in science go to confirm the wisdom of the ancients, no one can doubt that we are still far from possible ends in many directions. Scientific methods of plant breeding alone are capable of indefinite expansion. Scientific methods of controlling plant diseases can be foreshadowed with considerable confidence. The crop-bearing capacity of the soil may, as Mr. Lloyd George suggested, be increased by scientific means, and in the region of diseases of live stock the possibilities of progress have scarcely been explored.

The Prime Minister's declaration should not be forgotten. If agriculturists are alive to their interests they will see that it is not allowed to lapse into the oblivion which so ruthlessly overwhelms many of the platform promises of politicians.

NOTES.

IN a letter to the *Times* of November 28, under the heading of "Gas Warfare," appears a plea for the establishment of "fresh safeguards" to prevent any nation from ever again employing gas as a weapon. The letter is signed by eight of the most highly placed members of the medical profession, who know from experience what immense suffering has been caused from the employment of asphyxiating gas in the present war. Those who have knowledge of the operations of our own gas offensive service will tell us that there must be very many of our present enemies who will heartily agree with the views expressed in this letter, so that on this point opinion would no doubt be unanimous. One of the objections raised in the letter to the *Times*, that gas is not a controllable weapon the effects of which can be limited to combatants, cannot be regarded as more true for gas when used under modern conditions than for shrapnel or high-explosive shells. There remains the view that the use of gas involves needless suffering; this argument applies with equal force to all the operations of war. If in the coming comity of nations mutual confidence can extend so far as to agree to the abolition of a form of warfare which has now been removed from the realm of theory (and in theory gas warfare is at least a century old) to that of accomplished fact, surely it can go one small step further and so abolish war altogether. This would be a more practicable measure; preparations to arm would attract attention, while preparations for this particular form of armament could be carried on in secret by any Power so inclined. In past wars the issue has been determined almost solely by military skill and valour; in the present war there has been an increasing application of scientific knowledge. Science has not merely striven to destroy enemy life; it has striven, and with equal success, to save British and Allied lives. The British pattern of gas respirator is the triumphant product of much exceedingly careful work, and has probably saved more lives than any other contrivance or procedure adopted during the war. Whether it is decided to drop the use of gas or not, it would be extremely unwise for us to discontinue to train our men in anti-gas measures unless general disarmament is agreed upon.

IT might reasonably be expected that by now most people would know more about the aims and ideals of science than to repeat the old formula that science is in opposition to religion and detrimental to culture, yet in the *Scientific Monthly* (vol. vii., No. 5) Mr. E. P. Lewis finds it necessary to protest in an article entitled "The Ethical Value of Science" against the attitude of many current writers who directly or indirectly express such views. He quotes from various recent articles to the effect that science is largely responsible for the extirpation of culture and the growth of materialism; some writers attribute the war to the suppression of spiritual values by the influence of scientific doctrines, and its horrors to malignant investigators who spend their lives devising agencies of death and destruction. Such people overlook the fact that the statesmen immediately responsible for the outbreak and conduct of war are not scientific men. Science has nothing whatever to do with conquest, with commercial exploitation, or with upholding the divine right of dynasties. The end of all scientific investigation is to discover the truth about all things, including man, his instincts and impulses, his organisation in society. Were economists and politicians imbued with the scientific spirit it would be of incalculable benefit to the effective organisation of society. Science has no intention of decrying genuine religion, or of denying the importance of the so-called humanities, but it does maintain that the habit of mind developed by scientific studies is at least as important as an ethical agency. With the completion of the war it will be in a large measure the mission of science to rebuild a shattered civilisation; it will restore industries, house the homeless, feed the hungry, and cure the sick, and, not least, must aid in healing the deep-seated ills of society, the consequences of past social misconduct. If men will use for destruction the discoveries of science, it is not the scientific worker who is to blame.

IN his recent speech at Wolverhampton Mr. Lloyd George, when referring to agriculture, spoke of the possibility of providing a national supply of fertilisers. It seems likely that a scheme has been put before him for the continuance of the present arrangements under which the Ministry of Munitions controls the manufacture of artificial fertilisers. In fact, it may be that the intention is that the State should actually undertake the manufacture of certain fertilisers. It is common knowledge that there are now in existence a number of State-owned sulphuric acid factories, and, further, that, inasmuch as the State has agreed to purchase a large proportion of the Australian output of zinc ores containing sulphides of the metal, it will be in a position to control the sulphuric acid output of the country. A State-owned supply of sulphuric acid naturally suggests the State manufacture of superphosphate and sulphate of ammonia in the interests of increased food production. Schemes of this nature for State trading of many kinds are likely to be put forward, but whether they will survive the opposition of manufacturers is perhaps doubtful.

IN London the Registrar-General's returns show a very substantial decrease in the number of deaths from influenza in each of the two weeks ending November 16 and 23. The climax of the epidemic was attained in the two weeks ending November 2 and 9, in both of which influenza caused 57 per cent. of the deaths from all causes, whilst for the week ending November 23 only 42 per cent. of the total deaths were due to influenza. The epidemic has caused 9441 deaths in London during the seven weeks ending November 23, which is 47 per cent. of the deaths from all causes, whilst the percentage of deaths from pneumonia was 12, and from bronchitis 6. Chicago during the two weeks ending October 19 had respectively 571 and 1242 deaths from influenza, whilst in London the deaths were 80 and 371. In Paris the deaths for the week ending November 9 were 629, which is a decrease of 490 on the preceding week, whilst in London the decrease of deaths was 25 for the corresponding week. The closing week of November experienced a return of milder and more humid weather, and this possibly may lessen the continued decrease in the deaths from the epidemic. The re-issue of the weather tables in the Registrar-General's returns is a welcome feature. The meteorological results for certain towns are already recommenced, and the table of Greenwich daily values is promised from the beginning of next year.

WE regret to learn from *Science* of the death of Mr. H. S. Coe, agronomist in the United States Department of Agriculture, and author of numerous botanical and agricultural papers, on October 25, at thirty years of age; and of Prof. W. G. Mallory, associate professor of physics in Oberlin College, on October 19.

WE regret to note that the death of Mr. Edmund Sharer is recorded in *Engineering* for November 29. Mr. Sharer, who was sixty-two years of age, was, up to a few years ago, shipyard director at the Dalmuir naval construction works of Messrs. William Beardmore and Co. He was responsible for the construction of many notable naval and mercantile vessels, and was a member, since 1894, of the Institution of Naval Architects.

BY the death on December 3, at eighty-four years of age, of Dr. John Percival, formerly Bishop of Hereford, the nation has lost a vigorous worker and independent thinker whose whole active life was devoted to the furtherance of progressive aims. Dr. Percival was the first headmaster of Clifton College, and during his fifteen years' work there he brought this public school to the high position which it occupies. He was one of the founders of University College, Bristol, and took a leading part in all educational matters, particularly the education of women and the extension of university teaching. From Clifton Dr. Percival went to Oxford in 1878 as president of Trinity College, and in 1887 he became headmaster of Rugby School, where he had formerly been an assistant master. He was nominated Bishop of Hereford in 1895, and while in the Upper House he maintained on all occasions the broad principles and courage in expressing them which distinguished his career. He was the author of "The Universities and the Great Towns," and was president of the Educational Science Section of the British Association at the Cambridge meeting in 1904.

THE death is announced of Mr. G. P. Rose, C.I.E., who began his career on the Indian State railways, and afterwards acted as executive engineer in the construction of the Chappar Rift works and bridge in the sand-swept, tortuous defiles of the river gorge on the Sind-Peshin railway. Mr. Rose also won the respect and confidence of the gangs of wild border men—Afridi, Waziri, and Baluch—upon whose assistance the success of the work depended. He superintended works on the line from Quetta to New Chaman and the Khojak tunnel. After acting as deputy manager of the North-Western State railways, his services were lent to the Nizam's Government, and he afterwards became junior consulting engineer to the Government of India. After his retirement in 1904 he joined the board of the Hyderabad (Deccan) Mining Co.

THE death is announced, at the age of eighty-six, of Mr. N. C. Macnamara, consulting surgeon to Westminster Hospital, and vice-president of the Royal College of Surgeons in 1893 and 1896. Mr. Macnamara was appointed assistant surgeon in the Indian Medical Service in 1854, and became surgeon-major in 1873. During his career in India, which ended in 1876, he wrote on diseases of the eye, the history of Asiatic cholera, and other medical subjects. Returning to this country, he was in due course appointed surgeon and lecturer on clinical surgery at the Westminster Hospital, and later became consulting surgeon to the Westminster Ophthalmic Hospital. He published, among other works, "Lectures on Diseases of Bones and Joints" and "Instinct and Intelligence," which was published in 1915, when he was eighty-three years of age. In addition to numerous other activities, Mr. Macnamara was a member of the Departmental Committee on the Army and Navy Medical Service appointed by the War Office in 1889, a member of the Government of India Commission on Leprosy, and president of the Commission of the British Medical Association on Medical Education and a Teaching University for London.

THE last of the first series of lectures arranged by the Industrial Reconstruction Council will be held in the Saddlers' Hall, Cheapside, E.C.2, on Wednesday, December 11. The chair will be taken at 4.30 by the Marquess of Salisbury, K.G., and a lecture on "Science and Industry" will be delivered by Sir William S. McCormick, of the Department of Industrial and Scientific Research. Applications for tickets should be made to the Secretary, I.R.C., 2 and 4 Tudor Street, E.C.4.

A GENERAL discussion on "The Relation of Science to the Non-ferrous Metals Industry" will form the central feature of the forthcoming annual general meeting of the Institute of Metals. At that meeting there will also be presented several important papers, the publication of which has been withheld owing to the operation of the censorship. The meeting is, therefore, to be anticipated with interest, as is also the annual May lecture, which will be delivered by Prof. F. Soddy on the subject of "Radio-activity." A local section of the Institute of Metals has been formed in Sheffield, the recently dissolved Sheffield Society of Applied Metallurgy forming the nucleus of the new section. The roll of the institute has increased by more than two hundred during the current year, and, in view of the probable advent of peace, it is expected that a total of 1200 members will soon be recorded, and that within a few months of the institute's tenth birthday.

THE first part of what will prove an extremely valuable report on the mammals of equatorial East Africa has just been issued by the United States National Museum (Bulletin No. 99). This is the work of Mr. N. Hollister, and embraces the Insectivora, Cheiroptera, and Carnivora. While great attention has been paid to synonymy and tables of measurements—matters of very real importance—a considerable amount of space has been devoted to notes on life-histories furnished by the various field collectors on expeditions sent out by the Museum during the last few years. No fewer than sixty type skulls are figured here for the first time. Furthermore, those interested in the phenomena of variation and in the skeletal changes wrought by captivity will find in this report some very striking facts.

SOME very disconcerting figures anent the slaughter of penguins for the sake of their oil appear in the *Victorian Naturalist* (vol. xxxv., No. 6). We are assured that, though as many as 1,500,000 are annually killed for this purpose, the colonies show no diminution in their numbers. We are glad to know that a representative of the Australian Ornithologists' Union is to visit the islands during the coming slaughtering season to investigate the charges of cruelty made against those engaged in this traffic, and also the assurances which have been given that, though the birds are slain by the million, their numbers show no reduction. This scarcely seems credible. Ornithologists the world over look with grave misgivings on the continuation of this devastating work, to which we trust an end will speedily be put.

THE observations on the nesting habits of the bullfinch by Miss Frances Pitt, which appear in *British Birds* for November, deserve the careful attention of students of animal behaviour as well as of ornithologists. During incubation, Miss Pitt remarks, the female is fed entirely by the male, and for the first six days after the hatching of the young he feeds both his mate and their offspring. He also, for the first few days, attends to the cleaning of the nest, passing some of the excrement to the female to swallow, and disposing of the rest himself. After the first day or two both parents undertake the removal of the excrement, which is no longer eaten, but carried off and dropped at a distance. At first the young are fed at intervals of about fifteen minutes, but by the time they are ready to fly nearly an hour elapses between each meal. As with so many young birds, the nestlings are greatly distressed by the midday heat, and lie gasping for breath, with their heads hanging over the edge of the nest. Each parent has its own path, which it invariably uses in returning to and departing from the nest—a trait which appears to be common to most birds. By the eighth day the nestlings show signs of developing feathers, and begin even to attempt to preen the growing stumps, probably to allay slight uneasiness, akin to itching, due to the ferment of vigorous growth.

DR. A. L. DU TOIT (Trans. Geol. Soc. S. Africa, vol. xxi., p. 53, 1918) describes an interesting intrusion of aplite into serpentine in Natal. The aplite has become overcharged with alumina, which has separated as corundum, while the serpentine has become penetrated by silica and locally converted into talc. The ferrous iron of the serpentine has separated out completely as minute octahedra of magnetite during the process. The same paper describes the occurrence of two sheets of magnetite containing ilmenite in a gabbro in the Tugela Valley. These cannot have separated by gravitation from the gabbro, and are regarded as intrusive bodies which retained their fluidity and oozed upwards under squeezing processes from the lower portion of the cauldron, leaving behind a residue of pyroxenes, and corroding and including silicates that had already separated in the overlying gabbro.

THE report of the fifth Indian Science Congress held at Lahore in January last, published in the Journal of the Asiatic Society of Bengal for August, consists of the usual presidential addresses and short abstracts of upwards of ninety papers; but with a few exceptions, notably in the sections of physics and zoology, the addresses and papers deal mainly with matters of economic, agricultural, and commercial interest. Without disparagement, the report may be said to illustrate chiefly the interested official view of science, which is fixed steadfastly on material benefits rather than lifted into the grand realms of creative imagination. From a considerable mass of such useful information we extract the interesting statement that, as one of the results of the war, several distilleries for the extraction of essential oils have been established in Southern India, and that experts now have confidence in the ability of India to supply the world's demand for sandal-oil and thymol. In the papers of purely scientific interest Messrs. Southwell and Baini Prashad have followed out the life-history of a new tapeworm of a shark, which passes its larval stage in the muscles of the Indian shad; Mr. M. J. Narasimhan mentions the isolation of a bacillus from root-nodules of Casuarina, which behaves like the nitrogen-fixing bacillus of the root-nodules of Leguminosæ; Messrs. E. Vredenberg and Das Gupta report the discovery at last of Upper Palæozoic fossils in the Krol beds of the Simla region; and Mr. C. A. Matley gives a brief description of Dinosaur remains from the Lameta beds of Jubbulpore.

THE forty-seventh annual report of the Deputy Master and Comptroller of the Royal Mint has just been issued. It refers to the operations of the year 1916. The total number of coins struck was 265·5 millions, which was nearly 59 millions more than in 1915, and is the highest figure on record. Owing to the continued withdrawal of gold from circulation, the great demand for silver coin which arose in the previous year was continued, and no fewer than 127 million pieces were struck, against an average of 49 millions for the previous ten years. A very great increase in copper coinage also took place, and 136·8 million coins were struck. On the other hand, only 1·5 million gold coins were struck, as compared with an average of 24 millions in the previous ten years. The sterling value of the total coinage in 1916 was 10,386,137*l*., as compared with 29,385,568*l*. in 1915. During the year the Mint, Birmingham, Ltd., struck 33·7 million coins, under the supervision of the Royal Mint, for British Colonies and Dependencies. This firm also

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supplied the Royal Mint, for Imperial coinage, with silver and bronze blanks. The general account of expenses and receipts shows a profit of 4·5*l.* millions, as against 4·7*l.* millions in the previous year. The principal item included is the profit on the silver coinage, but although the issue of silver coins in 1916 was greater than in 1915, the higher cost of the bullion resulted in a reduction in the net profit under this head. Receipts of work done for the War Office show a considerable increase in value, but the suspension of Colonial coinages has resulted in the disappearance of any item on this account. As was to be expected, general expenses were decidedly higher than in previous years.

THE important bearing on the food supply of artificial manures containing phosphorus lends particular interest to a communication by Dr. C. Doelter in the *Oesterreichische Chemiker- und Techniker-Zeitung* for September 15 and October 1 regarding the mineral wealth of the Ukraine. Phosphorite is found there in many districts, in some parts in great abundance. Large quantities are said to be obtainable from open-cast workings at low cost. Ground phosphorite was exported to Austria in considerable quantities before the war. It generally contains a high percentage of calcium phosphate, while analysis shows 27·5 per cent. of phosphoric acid. To derive the full value from the deposits they should be worked systematically, and not by the primitive methods employed formerly.

DR. BECKMANN recently gave an account before the German Institution of Electrical Engineers of the progress that has been made in training disabled soldiers to enable them to carry out work in engineering factories. A number of photographs are reproduced in *Elektrotechnische Zeitschrift* for September 19 and 26 (in which the account is published) showing the methods adopted to enable such men to operate machine-tools. Particular stress is placed on the success of a method, devised by Dr. Krukenberg, to enable soldiers who have suffered amputation of the forearm to work machines. A further communication by P. Perls refers to the employment of the blind in factories. The photographs show men at work on a variety of machining operations and the means of protecting them from accidents. It is stated that blinded soldiers have been employed with success in twenty-six occupations.

THE law of decay of phosphorescent light emitted by a body after stimulation has hitherto been taken to be of simple form. If I is the intensity and t the time since stimulation, I was taken inversely proportional to $(a+bt)^2$. According to a communication to the National Academy of Sciences of America by Prof. E. L. Nichols and Mr. H. L. Howes, which appears in the October issue of the Proceedings of the Academy, the law of decay is not so simple. They find that there are two types of decay for the phosphorescence of short duration. If the inverse square root of the intensity as ordinate is plotted against the time as abscissa, in the first type the curve rises as the time increases, but the rate of rise decreases as time goes on; and in the second the curve rises, and the rate of rise increases with the time. The first type of phosphorescence the authors propose to call the "persistent," and the second the "vanishing," type. The two types may be exhibited by the same material, *e.g.* calcite, stimulated by ultra-violet light, gives phosphorescence of the vanishing, and, when stimulated by cathode rays, of the persistent, type.

AMONG forthcoming books we notice "Technical Handbook of Oils, Fats, and Waxes," P. J. Fryer and F. E. Weston, vol. ii. (*Cambridge University Press*); "Lice and their Menace to Man," Lieut. Ll. Lloyd, with a chapter on "Trench Fever," by Major W. Byam, R.A.M.C., illustrated (*Henry Frowde and Hodder and Stoughton*); "The Iron Circle: The Future of German Industrial Exports," Prof. S. Herzog, translated (*Hodder and Stoughton*); "Textbook of Military Aeronautics," H. Woodhouse (*T. Werner Laurie, Ltd.*); "Boiler Chemistry," J. H. Paul, a new edition of Bale's "Handbook for Steam Users" (*Longmans and Co.*); and "The Mechanics' and Draughtsmen's Pocket-book," W. E. Dommett, and a new edition of Poole's "Telephone Handbook" (*Sir Isaac Pitman and Sons, Ltd.*).

OUR ASTRONOMICAL COLUMN.

DISTRIBUTION OF GLOBULAR CLUSTERS.—In continuation of his previous investigations of the distances of globular clusters, based upon the interdependence of absolute luminosity and period in the case of Cepheid variables, Dr. Harlow Shapley has reached important conclusions regarding the extent and arrangement of the sidereal system (Proc. Nat. Acad. Sci., vol. iv., p. 224). The clusters appear to form a large flattened system, the centre of which is in the galactic plane, at a distance of between sixty and seventy thousand light-years, in the general direction of the star-clouds of Sagittarius and Scorpio. The arrangement of the clusters and the relative densities of various parts of the Milky Way clouds strongly suggest that the whole sidereal system is roughly outlined by the globular clusters, and that stars, nebulæ, and clusters are all members of a single unit. The mean diameter of the proposed system appears to be at least 300,000 light-years. A further investigation has verified the existence of a local cluster of stars having a diameter of about 2500 light-years, and containing most of the brighter B stars, a majority of the A stars, and many stars of redder spectral types. The motion of the cluster as a whole is in the galactic plane, and nearly radial from the galactic centre. The observed systematic motions of the stars may be explained by the movement of the cluster through the general field of stars.

A NEW TYPE OF NEBULAR SPECTRUM.—Dr. V. M. Slipher has made the interesting discovery that two of the variable nebulæ give an emission spectrum which is quite unlike that of the ordinary gaseous nebulæ (Lowell Obs. Bull. No. 81). The spectrum of Hubble's variable nebula, N.G.C. 2261, was photographed in December, 1917, with a total exposure of nearly thirty-seven hours, the slit being placed north and south over the nebulosity and nucleus. In most essentials the spectrum of the nebula is identical with that of a new star in the early bright-line stage, when the majority of the lines, other than those of hydrogen, are identical with enhanced lines. The resemblance to the typical nova spectrum is further emphasised by the presence of absorption bands on the more refrangible sides of the bright lines of hydrogen. The variable nebula N.G.C. 6729 reaches only a low altitude at Flagstaff, but, so far as can be judged from the photograph obtained, its spectrum is a duplicate of that of Hubble's nebula. The latter is of "cometic" form, and the nucleus is the variable star R Monocerotis, which was of the 12th magnitude when the spectrum photograph was obtained. The light of the nucleus is identical with that of the nebula, and it is therefore probable that the nebulosity derives its light from the star. The further study of these objects may well be expected to throw considerable light on the nature of temporary stars.

SPECTRUM OF THE CORONA.—Several additional faint lines have been found in the spectrum of the corona by the Rev. A. L. Cortie, S.J., on photographs taken at Hernösand, Sweden, during the total eclipse of the sun on August 21, 1914 (Monthly Notices, R.A.S., vol. lxxviii., p. 665). In the region extending from 6615·7 to 4780 A thirty-six lines were measured, of which twenty-four do not appear in any previous records. The wave-length of the prominent red line which was first noted at this eclipse is given as 6373·3.

AGUE IN ENGLAND.[1]

IN 1917 there were reported 136 military, 19 naval, and 23 civilian cases of malaria contracted in England, *i.e.* in people who had not been out of the country. Fifty-three of the military cases occurred in the Sheerness and Sheppey areas, and fifty-three in the Sandwich area. As these cases, all of simple tertian malaria, began to arise, the attention of medical officers of health and other medical men was directed to the matter by the Local Government Board, and the problem of the possible danger to the civilian population of the influx of malaria-infected soldiers from abroad was considered. This report records the action that was taken to deal with the situation, and that it is proposed to take should the cases assume any serious magnitude in 1918.

It would appear from the information collected that the evidence is fairly clear that malaria had not completely died out in this country, as was generally thought to be the case, perhaps, with very rare exceptions; but, on the other hand, the cases in 1917 were a new phenomenon, and there can be no reasonable doubt that the cause of these cases was the new supply of infection, viz. soldiers from overseas.

Whether the whole official action as recommended in this report has not been "much ado about nothing" it is, perhaps, a little premature to say, but it was noticeable in some areas in 1917 that, although there were numerous infected soldiers, the number of indigenous cases that occurred amongst the surrounding non-infected population was in some instances a solitary one, giving ground for the hope that in 1918 the number of cases might still be small, and not such as to be dignified by the term "epidemic." Should, however, an epidemic occur, the problem of the best line of action has to be faced. We agree with the view expressed in the introduction of the report, that "comprehensive anti-mosquito work is impracticable," and believe that the use of quinine would make such work unnecessary. It is true that we cannot by the use of quinine "disinfect," *i.e.* destroy *all* the parasites in a person's system, but we can readily do so partially—*i.e.* we can, in these cases of simple tertian malaria, by adequate doses of quinine, render *the blood* completely free from all parasites, sexual as well as asexual, for long periods (months), so that, as regards Anophelines, such cases are non-infective, and, of course, equally so are the Anophelines. We believe that civilians would readily acquiesce in such treatment, all the more when they appreciated the fact that thereby they were kept free from fever and got a better chance of ultimate recovery. The report contains a special article on the microscopic diagnosis of malaria, but medical men can be taught this only by practical work in a laboratory.

The map showing the distribution of Anophelines in England, prepared by the British Museum authorities, contains some omissions which might have been filled had inquiries been made in likely quarters.

[1] Reports to the Local Government Board on Public Health and Medical Subjects. (New Series No. 119.) Reports and Papers on Malaria contracted in England in 1917. (London: H.M.S.O., 1918) Price 4s. net.

NATURAL INDIGO MANUFACTURE.

IN "Indigo Publication No. 3," issued by the Agricultural Research Institute at Pusa, Mr. W. A. Davis, indigo research chemist to the Government of India, directs attention to a method of avoiding the loss of dyestuff which frequently occurs in the manufacture of natural indigo, due to finely divided particles of the dye remaining suspended in the large volume of extraction water (seet water) which is run off after "beating" is finished and the indigo has apparently settled. In indigo factories where working conditions are good the water running from the filtering tables is of pale sherry colour, but where fermentation in the vats is unsatisfactory, or the quality of the indigo plants grown in the neighbourhood is poor, the water finally run off may be distinctly green in colour, due to finely divided, suspended indigo. Of the two kinds of indigo plant grown in India the loss from this cause is greater with the Sumatrana than with the Java variety, as the former requires a large volume of water for extraction.

The settling agent which Mr. Davis suggests for general use is Dhak gum, a ruby-coloured gum produced by the Dhak or palas tree (*Butea frondosa*). This material has occasionally been employed for the purpose in the United Provinces, and was first brought to Mr. Davis's attention by Mr. Kenyon, of Sultanpur. Trials of the gum as a settling agent were made at a number of indigo factories in Bihar last season, and gave excellent results, the yield from Sumatrana plant at one factory being increased by $37\frac{1}{2}$ per cent., and from Java plant at another factory by 16 per cent., these being average increases throughout the working period. The results of analyses of indigo made at various factories, with and without the use of Dhak gum, showed that the addition of this material to the settling-vat had no appreciable effect on the quality of the dyestuff produced. Further, it was at the factories where the fermentation conditions were unfavourable, or the quality of the plant used was poor, that the use of Dhak gum gave the best results, both in facilitating settling and filtration and in increasing the yield of dyestuff.

DYES AND THE DEVELOPMENT OF BRITISH CHEMICAL INDUSTRY.

THE Association of British Chemical Manufacturers sent to the President of the Board of Trade on November 1 the following memorandum, setting forth the views of the executive council of the association on the present situation in that section of chemical industry directly concerned with the production of dyes:—

(1) A wider and more comprehensive scheme of a completely national nature is immediately requisite if a supply of the colours, in variety and quantity essential to the conduct of our great textile industry, is to be forthcoming within a reasonable period of years, and especially with a view to the early elimination of all dependence on overseas supplies.

(2) The fundamental error which resulted in an inadequate policy in British dye production is the failure on the part of the originators of that policy to recognise the fact that the manufacture of dyes is not, by itself, an industry apart; but is precisely an integral part of, and is dependent upon, the operations covered by the chemical manufacturing industry as a whole—*i.e.* the manufacturer of heavy chemicals, of fine chemicals, of tar products, and of explosives have each and all separate functions to perform in developing a successful dye-producing industry in this country.

(3) The apparent failure to grasp the essential condition set forth in paragraph (2) has been the cause of the otherwise incomprehensible unwillingness on the part of the Governmental officials concerned to consult this entirely representative association of chemical manufacturers, and even to refuse the conference offered by an expert committee of the association some months ago.

(4) The general trend of what Lord Moulton said at Manchester in December, 1914, is correct when he pointed out that, broadly speaking, the manufacture of the greater proportion of essential intermediates should be conducted at the existing chemical works of the country, leaving the actual production of the finished colours to be in some measure centralised.

(5) No such comprehensive scheme has yet been formulated, with the result that firms capable of adding useful weight to dye production have had insufficient opportunity for doing so; and unless such opportunity is created, not only will time be lost, but unnecessary capital expenditure will also be incurred in the erection of plant which already exists in whole or in part at the chemical works of the country.

(6) The past and present schemes have not included the whole of the country's resources of knowledge in actual colour production; in short, there are potential dye-makers who have not been used sufficiently, and whose powers of production have not been developed to the extent of which they are capable.

(7) The problem of distributing to the best advantage the large sums of money recently voted by Parliament for the development of the dye industry is one upon which this association should advise. It is also felt that the questions of priority for the purchase of dye-making plant and the utilisation of materials are matters in which the wide knowledge of this association can be used effectively; and it is urged that unless measures of co-operation of this nature are adopted, the danger of duplication of plant and of overlapping in processes will be seriously increased.

(8) Unless co-ordinated action can be brought about to a much greater extent than is at present indicated, the problem of meeting external or overseas competition in peace-time will be more difficult and dangerous than is at present foreseen.

(9) The development of a British organic chemical industry, capable of keeping abreast of industrial achievements in the synthetic production of dyes, drugs, explosives, poisons, etc., is essential to the safety of the Empire. In this connection it is clear that the dye industry should be intimately co-ordinated with the other sections of organic chemical industry if the success of the whole is to be secured.

(10) To sum up, it is considered that:—

(*a*) An immediate co-operative effort is called for, and that a wider interest should be appealed to.

(*b*) The formation of those companies on which colour production will fall should not be confined in any sense.

(*c*) The whole chemical industry should be encouraged to assist, with both knowledge and money, an enterprise which is so vital to the maintenance and development of some of the country's most important industries.

As a consequence of this, the directing or controlling body should be representative, not only of colour-producing interests and colour users, but also of those other and equally important factors in chemical manufacture, the goodwill and assistance of whom are of paramount importance in the national effort which has become essential.

Sir Evan Jones, the Dyes Commissioner, to whom the memorandum was referred by the President of the Board of Trade, has replied to the secretary of the association that "full details of the scheme which his Majesty's Government propose to adopt for affording further assistance to the dye industry were presented to Parliament on the 6th inst. in the form of a White Paper, from which it will be observed that representation of your association on the Trades and Licensing Committee which is to be set up under the scheme has been provided for." This White Paper was summarised in NATURE of November 21. It appears that only one of the points referred to in the memorandum of the Association of British Chemical Manufacturers has been met, and that solely to the extent of the appointment of one representative of the association out of nine members of the Trades and Licensing Committee.

ANNIVERSARY MEETING OF THE ROYAL SOCIETY.

THE anniversary meeting of the Royal Society was held on Saturday last, November 30, being St. Andrew's Day. The officers and other members of council whose names were given in NATURE of November 14 (p. 213) were duly elected. The address delivered by Sir J. J. Thomson, president of the society, is abridged below, and also the report of the council. Prof. Lorentz was unable to attend to receive the Copley medal awarded to him, and it was handed to a representative of the Netherlands Minister to be forwarded to him. Similarly, a representative of the French Ambassador received the medals awarded to Dr. A. Perot and Prof. C. Fabry. Dr. H. F. Osborn and Mr. I. Langmuir were also unable to attend in person to receive their medals.

ADDRESS BY SIR J. J. THOMSON.

With the cessation of the war, problems arise which are certainly no less difficult than those produced by the war itself. To repair the waste and heal, so far as possible, the wounds caused by the war, nay, even to be able to bear the burden of the vast debt which it has created, the country must produce on a much larger scale than it has ever done before. How is this to be brought about? The number of workers has been sadly diminished; the hours of work before the war were quite as long as is compatible with the health and happiness of the workers; in fact, no considerable increase in production seems possible with the methods in use before the war. I do not forget the magnificent contribution made by women to the work of the country during these years of stress, and it is quite possible that there may be a considerable permanent increase in the work done by women. There are few, however, who would think it satisfactory that women should bear through the long years of peace to which we look forward the heavy burden they have shouldered during the war, and no one would regard an increase in the burden on women as a tolerable solution of our difficulties.

But though the amount of labour cannot be very materially increased, it is certain that it can be made more efficient, and that with the same amount of labour more can be produced. This can be done by greater application of scientific methods to industry. It is gratifying that the Government realised the importance of this at an early stage in the war, and by establishing the Advisory Committee of the Privy Council for Scientific and Industrial Research created a department which is now organised and active, and to which we look forward with hope and confidence. But, for this work of reconstruction to be adequate, something more than the creation of a new department is necessary. Sympathy with, and an intelligent appreciation of, the importance of science in this work are required through all the Government Departments, civil and military, in the country. It is unfortunate that in these departments the number of permanent officials who have received the training which would ensure this appreciation is very small, and I venture to direct attention to the recommendation in the report of the Committee on the Position of Science in Education that steps should be taken to introduce into the Civil Service, at a later age than is possible on a scheme based solely on competitive examination, men who have had training in science and experience in research, and would be able to represent efficiently in the various offices this fundamentally important side of Government activity.

To give a training in science to all who will need it for the work of reconstruction will increase the strain on the universities at a time when some of them are faced with a difficulty which will soon become acute. In not a few of our universities, especially the older ones, the stipends of many of the teachers come from endowments which yield incomes of fixed value; but now, and there seems no chance of any immediate improvement in this respect, money has not much more than half the value it had before the war; the salaries of the teachers were certainly never excessive, they are quite inadequate under present conditions. In some way or other increased help must be given to the universities if they are to maintain their efficiency. To increase the resources and equipment of the universities would, I think, be the most effective way of aiding research in pure science. If the grants for this have to come from a fund which has also to provide those for industrial research, there is, I think, no inconsiderable danger that the latter may be regarded as the more urgent, and that the claims of pure science may be crowded out.

To pass on to another point, unfortunately we cannot yet assume that war will be impossible in the future, and that an army and a fleet are luxuries that we shall be able to do without. If our Army or our Fleet is to be effective, it must not be behind others in its equipment with the application of science to war. In the course of the present war, however, practically all such applications have been disclosed, so that all countries are at present in this respect on the same level, and unless we continue our researches we shall be left behind. The experience of the war has shown us the importance of science, and we have seen how the most unexpected and unexplored branches of science have furnished methods which have been of critical importance.

Now a large number of men with scientific training have been working during the war on the application of science to naval and military purposes; some of these have done remarkably well, and know the kinds of problems that have to be solved and the limitations imposed by service conditions. It would be deplorable if all this knowledge should be wasted. It seems to me most important to establish for each Service research departments for promoting applications of science to that Service. In the laboratories of these departments new methods would be sought for and investigated until their peculiarities were thoroughly understood; they would then be handed over to the technical departments of the Services, which would carry the thing from the stage of what might be called a piece of laboratory apparatus to that of an instrument which could stand the wear and tear of service conditions. They would also carry on experiments until the difficulties of manufacture had been so thoroughly overcome that this was a matter of routine. In peacetime it would not be necessary to manufacture in any quantity, but when war came and they were wanted they could be made without delay.

Officers in the Service with special scientific aptitude might at some stage or stages in their career pass some time in such a pioneering laboratory. This would not only improve their own knowledge, but also tend to diffuse a scientific spirit through the Service and make it more ready to welcome new ideas. But for this to happen I am convinced that each Service should have its own establishment. Many of the Services—the Navy, for example—would not, I feel sure, make much use of, or be much influenced by, large establishments for general scientific research, whereas if they had one which could be looked upon as an integral part of their own organisation it would, I think, have a good chance of success.

The Medallists.

The COPLEY MEDAL is awarded to HENDRIK ANTOON LORENTZ, For.Mem.R.S.

Lorentz is generally recognised as one of the most distinguished mathematical physicists of the present time. His researches have covered many fields of investigation, but his principal work deals with the theory of electrons and the constitution of matter considered as an electro-dynamic problem. When Zeeman had discovered the effect of magnets on spectroscopic lines, he perceived at once the theoretical bearing of the effect, which led to the discovery of the circular polarisation of the components of the lines split up by magnetic force. Lorentz's name is also associated with that of Fitzgerald in the independent explanation of the Michelson-Morley effect, from which far-reaching consequences have been derived. An important optical relationship between the density of a medium and its index of refraction (independently by L. Lorentz) was published in 1878, and he has been an active and fruitful investigator ever since.

A ROYAL MEDAL is awarded to PROF. ALFRED FOWLER.

Prof. Fowler's investigations have been, in the main, on spectroscopy, and one of his specialities has been the identification and reproduction of celestial spectra in the laboratory. His extraordinary success in identification of this kind is attributable in part no doubt to a special intuition, but also to a great and laboriously acquired knowledge of detail. For instance, the origin of the bands dominating the spectra of stars of Secchi's third class remained a mystery for many years. Fowler showed that they were due to titanium oxide. He accounted for many of the band-lines in the sun-spot spectrum by showing that they belonged to "magnesium hydride," and several other instances of scarcely less importance might readily be given.

Another important branch of his work is connected with spectrum series. The lines of many elements which appear in the arc spectrum have long been classified into series, and empirical relations have been obtained between the position of a line in the series and its frequency of oscillation. Those lines which are characteristic of the spark, and require higher stimulation, were not included in the scheme. Fowler was the first to show that the spark-lines form series at all. For this purpose he had first to work out experimentally the conditions for obtaining an adequate number of lines belonging to these series. Helium and magnesium were the elements chiefly studied. It was found that the spark-line series could be represented by formulæ similar to those which hold good for the arc lines, but with a fourfold value of the universal constant holding for the arc-line series of all the elements.

Apart from these investigations, leading to results so simple and definite, there is much descriptive work on spectra standing to the credit of Prof. Fowler and his pupils, which is highly appreciated by specialists for its accuracy and technical value.

A ROYAL MEDAL is awarded to PROF. FREDERICK GOWLAND HOPKINS.

Prof. Hopkins was among the very earliest, if not actually the earliest, to recognise and announce that minute quantities of certain bodies, the nutritive value of which had hitherto been unsuspected, exert an enormous influence upon growth and upon normal adult nutrition. He showed that without these accessory factors—vitamines—a diet otherwise full and seemingly complete is incapable of allowing growth, and even of maintaining body-weight or life. He has also made important researches into what may be styled the determination of the specific nutritive values of individual main components of the protein molecule; he has, for example, shown that when, from a certain diet which was proved to maintain nutrition satisfactorily, the two amino-acids, arginine and histidine, were together removed, the diet, though amply sufficient in energy and fully assimilable, failed to maintain life.

More recently Hopkins has attacked the question whether an animal's life can be maintained under the condition that, in place of protein or of the entire set of amino-acids constituting protein, a limited few of the several representative types of these constituents are provided in the diet. He shows that when, instead of the eighteen different amino-acids composing the protein, five only are administered, death rapidly ensues if those five be selected from the simpler aliphatic components, *e.g.* leucine, valine, alanine, glycine, and glutamic acid, but that, on the other hand, nutrition and life are satisfactorily maintained, at least for a considerable period, if the five amino-acids given be chosen from the more complex types, such as tyrosine, tryptophane, histidine, lysine, and cystine, which experiment has shown to lie outside the range of the synthetic power of the animal body.

The RUMFORD MEDAL is awarded to DR. A. PEROT and PROF. CHARLES FABRY.

MM. Perot and Fabry have introduced a new method of measuring wave-lengths by an ingenious method of utilising the luminous rings formed by interference between two reflecting plates. Their researches have proved of fundamental importance:—

(1) In comparing accurately the wave-lengths of different spectroscopic lines with that of some standard line.

(2) In comparing directly the wave-length of the standard line with that of the standard unit of length.

This comparison has confirmed in a remarkable way the previous measurement of Michelson, whose method is less direct and more liable to certain errors. The independent confirmation thus obtained has therefore placed the subject on a much firmer basis.

The DAVY MEDAL is awarded to PROF. F. STANLEY KIPPING.

Prof. Kipping has worked with distinction during the past thirty years on a great variety of problems connected with organic chemistry, involving fatty acids, derivatives of hydrindone, camphoric acid and its halogen compounds, the π-derivatives of camphor, racemism and pseudo-racemism, derivatives of quinquevalent nitrogen, organic compounds of silicon, including derivatives having optical activity due to the asymmetry of the silicon atom.

The DARWIN MEDAL is awarded to DR. HENRY FAIRFIELD OSBORN.

Dr. Osborn's chief work has been in palæontology, and, in connection with it, he has organised many collecting expeditions to the early Tertiary rocks of the West. One of the results of his work is the more precise determination of the relative ages of the extinct mammals in North America, and that has led to a correlation between the order of succession of the Mammalia in Europe and in America. A good deal of this work was summarised in his book, "The Age of Mammals in Europe, Asia, and North America," published in 1910. In 1900 Osborn had come to the conclusion that the common ancestors of Proboscidia, Sirenia, and Hyracoidea would be found in Africa; and the correctness of this view has since been confirmed by Dr. Andrew's discoveries in the Egyptian Fayum. Amongst the more important of Osborn's contributions to our knowledge of extinct Vertebrata are his memoirs on the rhinoceroses, the horses, the titanotheres, and the dinosaurs. In addition to all the work he has done personally, Dr. Osborn has had a wide and most beneficial influence upon biological research in North America, and he has produced a flourishing school of younger vertebrate palæontologists.

The HUGHES MEDAL is awarded to MR. IRVING LANGMUIR.

Mr. Irving Langmuir is a distinguished worker in the physics and methods of production of high vacua. He has studied the vapour pressure of platinum and molybdenum by heating fine wires *in vacuo* and noting the loss of weight. He has investigated the speeds of chemical reaction of different gases on various metals at very low pressures. He has investigated also the dissociation of hydrogen and its apparent abnormal heat conductivity, and the dissociation of chlorine and oxygen; also the chemical activity of dissociated hydrogen. His work on the emission of electrons from hot metals in high vacua led to the evolution of the "kenotron" and "pliotron," and of the "half-watt" lamp. His determination of the melting-point of tungsten is generally accepted. Much of his work, such as the investigation of the cause of blackening of tungsten lamps, is of commercial as well as of academic scientific value.

REPORT OF THE COUNCIL.

Several matters referred to in the report of the council have already been dealt with in these columns. Among these are the resolutions as to enemy aliens and foreign membership of the society, brought forward in June and July last, and the question of the future of international scientific organisations. The former matter was referred to the Inter-Allied Conference, held at the Royal Society in October last (see NATURE, October 17, p. 133, and November 14, p. 212), and it has been further considered by the conference which has just met in Paris. Other subjects dealt with in the report include the following:—

Bureau of Longitude.

At the request of the Admiralty the council has had under consideration a proposal that a body corresponding to the French Bureau des Longitudes should be established in this country, which should form an authoritative body to which any administrative questions involving scientific consideration of time or position could be referred. The following recommendations of a committee appointed by the council were forwarded to the Admiralty:—"(1) That the constitution of an advisory board such as that contemplated would present sufficient advantages to justify its establishment. (2) That the functions of the board cannot be so extensive as those of the French Bureau des Longitudes, or identical with those of the previous Board of Longitude in this country. (3) That it should be formed by representatives of various Government Departments and scientific societies, together with a few *ex-officio* members. (4) That it should meet not fewer than three times a year, and that some safeguard should be introduced preventing its meetings from becoming mere formalities. (5) That the exact definition of its functions should be left to further consideration by consultation." The Admiralty, being of opinion that it would be desirable to proceed with the proposal, suggested that representatives of the Home Office, War Office, Board of Trade, Board of Agriculture, Ordnance Survey, Royal Society, Royal Astronomical Society, and Royal Geographical Society should confer with the Hydrographer and the Astronomer Royal as to the establishment of the suggested board, and its functions if created. The council concurred in the proposal, and appointed Prof. Schuster to represent it at the conference. The matter is still under consideration.

Meteorological Office and Air Board.

At the beginning of the year the council was informed that a scheme was in contemplation for merging the Meteorological Office in the Air Ministry. The council approached the Treasury on the subject, pointing out that, while it appreciated the importance of extending the meteorological organisation so as to render it more effective in dealing with problems of aeronautics, the intimate connection of the science with agriculture, public health, and certain departments of the Admiralty, as well as with the general problems of geophysics, might, in its opinion, be endangered by handing over the Meteorological Office entirely to a department which necessarily concentrates its attention on a single branch of the work. As the result of a conference held in May last, the Treasury has agreed that it is not desirable to change the existing form of the constitution of the Meteorological Office, "which should remain, as in the past, the central institution devoted to the progress of the science of meteorology, and forming the focus for the activities of all departments interested in the various aspects of the science throughout the Empire." In view of the special interest in meteorology of the Air Ministry and of its great importance for the development of aeronautics and the problems connected therewith, the Ministry is now represented on the Meteorological Committee.

The National Physical Laboratory.

Important changes have taken place during the year under review in the relations between the society and the National Physical Laboratory. On April 1 last the transfer to the Department of Scientific and Industrial Research of financial responsibility for the laboratory took effect, and in the future the expenditure incurred in the work of the laboratory will be carried on the Vote of the Department.

While the normal extension of the scope of its work has been in many directions retarded or stopped by the war, in certain sections work already in progress has greatly increased in volume owing to the special conditions which have arisen, and during the past year it has been necessary to provide further accommodation for work of pressing importance. Three additional permanent buildings are, in consequence, at present in course of erection; two of these provide for extension of the aerodynamics researches and of the gauge work; the third will be devoted to the testing of volumetric glassware—largely made and tested in Germany before the war—and to work on optical instruments. The standardisation of scientific glassware is being carried on at present in temporary premises adjoining the laboratory. Temporary buildings have also been put up to accommodate other special war-work.

With the return of peace conditions provision must be made for the development of branches of technical research which hitherto, for lack of facilities, have received little or no attention. A scheme for the establishment of a National Electrical Proving House has been prepared by the committee of the Institution of Electrical Engineers. This provides that the proving house should be set up at the laboratory, and that a representative advisory committee should be appointed to assist the executive committee in its management. Proposals have been made that the laboratory should in some form undertake the responsibility for testing gauges and for other standardisation work in Birmingham. Similar proposals for the establishment of standardising laboratories have been brought forward in other centres of industry.

With the assistance of the Research Department, industrial associations are being formed to promote research and investigation in connection with important national industries. Research laboratories will, no doubt, be established at the principal centres of these industries working in immediate touch with associated manufacturing firms. Some of the work can best be done in the central laboratory more completely equipped for dealing with the more complex problems, and the laboratory has been invited in many cases to co-operate in the work.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—Lord Rothermere, who, as Sir Harold Harmsworth, gave 20,000*l*. for the endowment of the King Edward VII. professorship of English literature in the University, has now offered a like sum as an endowment fund for a professorship of naval history, to be called the Vere Harmsworth chair of naval history, in memory of his second son, who was killed in the Battle of the Ancre while serving with the Royal Naval Division.

LIVERPOOL.—The Vice-Chancellor, Sir Alfred Dale, has sent in his resignation, to take effect in September next year. In his letter to the President of the University Council he says:—"Our superannuation scheme, as you know, requires me to retire from my post in December, 1920, two years from now, but I am convinced that the University would suffer if I held on till then." The University Council, in accepting the resignation with regret, has placed on record its appreciation of Sir Alfred's invaluable services during nineteen years, first as Principal of University College, Liverpool, and afterwards as Vice-Chancellor of the University.

WAR conditions have depleted the technical schools in Germany, and the supply of trained engineers after the war is jeopardised. To meet this difficulty, a committee of engineers and manufacturers proposes (*Elektrotechnische Zeitschrift*, September 12) that special facilities should be given to students who renew their interrupted studies, and that the curricula and examinations should be modified to meet their requirements. Scholarships should be provided on a liberal scale to promising students. The Army should contribute to the relief of the situation by demobilising prospective students as early as possible.

A COPY of the report for last session, 1917–18, of the Faculty of Engineering of the University of Bristol, which is provided and maintained in the Merchant Venturers' Technical College, has been received. The number of tests on materials made for various industrial firms in the district in which the University is situated has grown very much in recent years. Some idea of the growth of this work of national importance may be gathered from the fact that in the department of civil engineering 53 tests were made during the session 1914–15, while during the session 1917–18 the number was 3661. As indicating the improvement in the general education of students taking up engineering, it may be stated that of the 102 day students, 83 are matriculated students of the University; the percentage of matriculated students is 81, as compared with 40 in the first session of the faculty.

THE trustees of the Carnegie Trust have sent a cheque for 300*l.* to the library of the Rothamsted Experimental Station for the purchase of important reference books. This is the second donation made by the Carnegie trustees to the library, a cheque for a like amount having been given two years ago. The purpose of their donation is to afford agricultural students and experts using the library the opportunity of consulting the most recent and important treatises on agriculture and allied sciences. Two other valuable gifts have been received, both from Capt. the Hon. Rupert Guinness. The library is fortunate in possessing an unusually good collection of early printed books on agriculture of the fifteenth, sixteenth, and seventeenth centuries. To these Capt. Guinness has now added perfect and beautiful copies of the first and second printed books on the subject, viz. the great volume on agriculture by Crescentius, printed in 1471 at Augsburg, and Jensen's edition of the Latin agricultural writers, printed at Venice in 1472.

THE following list shows the number of seats in the House of Commons of the University constituencies of the United Kingdom, and the candidates for them at the General Election on December 14. Representatives of the constituencies in the late Parliament are indicated by an asterisk:—*Oxford* (2): Mr. R. E. Prothero* (President of the Board of Agriculture), Lord H. Cecil,* Prof. Gilbert Murray, and Mr. H. S. Furniss. *Cambridge* (2): Mr. J. F. P. Rawlinson,* Sir Joseph Larmor,* and Mr. W. C. D. Whetham. *London* (1): Sir P. Magnus,* Mr. Sidney Webb, Mr. A. A. Somerville, and Sir Wilmot Herringham. *Wales* (1): Mr. Herbert Lewis* and Prof. Joseph Jones. *Northern Universities* (2): Mr. H. A. L. Fisher,* Sir Martin Conway, Mr. H. G. Williams, and Mr. J. A. Hobson. *Scottish Universities* (3): Sir Henry Craik,* Sir Watson Cheyne,* Mr. D. M. Cowan, Dr. P. Macdonald, Dr. J. Dunlop, Mr. T. M. Watson, and Prof. W. R. Smith. *Irish Universities.—Dublin* (2): Dr. A. W. Samuels* and Capt. Stephen L. Gwynn. *National*: Mr. J. P. Boland and Mr. J. MacNeill. *Queen's (Belfast)*: Sir William Whitla.

AN abridged calendar for the current session has been issued by University College (University of London). It contains in a conveniently arranged form full particulars as to the courses arranged for students wishing to graduate in the different faculties of the University, details of the scholarships and exhibitions offered for competition, as well as a history of the college. In the various departments of science every encouragement is given to the study of the technical aspects of the science, in addition to the more academic side of the work. Thus, in the chemical laboratories courses are provided in applied chemistry and chemical engineering, the work being done in close co-operation with the department of engineering. Similarly, instruction is offered in the economic aspect of geology and in applied physiology, to name two of many instances. Every facility, too, is afforded to properly qualified students to take up original research in science under the guidance of the professors. The departments of civil and mechanical engineering—with sub-departments of graphics, surveying, and heating and ventilating engineering—and of electrical and municipal engineering provide students wishing to become engineers with a systematic training in the application of scientific principles to industrial purposes. The very complete arrangements described in the calendar should be studied by all persons who find themselves responsible for selecting a college for boys and girls entering upon university work.

THE council of the Sheffield Association of Metallurgists and Metallurgical Chemists appointed a committee last May to ascertain what educational facilities exist of interest and value to the association, and to recommend to the council any desirable modifications and extensions of such facilities. The committee has now issued a short report recommending that all students entering upon any specialised course of applied science should first have passed a general examination of matriculation standard. The report suggests that the present low status of assistant chemists can be traced to their not having received the amount of general education indicated by the examination, and recommends the council to endeavour to arrange for the provision of educational facilities in the evening with the view of remedying this defect. Assistant chemists who are not up to a matriculation standard in mathematics and experimental science are urged to qualify in these subjects so as to be ready to take up special courses in science and mathematics, which it is hoped to get arranged. This movement to secure for future workers in applied science a sound general education on which to build the superstructure of technical knowledge deserves every encouragement, and it may be hoped that the example of the Sheffield metallurgists will be followed in other industrial centres. The First School Examination recently instituted by the Board of Education for pupils of between sixteen and seventeen years of age in State-aided secondary schools should in a large measure ensure a good supply of youths suitably educated for later work in pure and applied science.

SOCIETIES AND ACADEMIES.

LONDON.

Optical Society, November 14.—Prof. F. J. Cheshire, president, in the chair.—T. **Smith**: Some generalised forms of an optical equation. The paraxial equation for refraction at a spherical surface $\mu'/x' - \mu/x = (\mu' - \mu)/r$ connecting the distances x and x' of conjugate points on the axis from the vertex may be made an exact equation for all rays by the inclusion of an additional factor. Any ray which intersects the axis is completely specified by two of three angles, α, γ, δ, some one of which vanishes when the rays are refracted without axial aberration. The angle α is the semi-angular aperture at which the ray is refracted; γ is the angle made with the axis by the line joining the centre of curvature of the surface to the intersections of the incident and refracted rays with the aplanatic surfaces; and δ is the deviation suffered by the ray. The correcting factor may be the product of the tangents of the halves of any two of these three angles. The form taken by the equation depends upon which pair of angles is selected.—H. S. **Ryland**: Notes on the design and manufacture of binoculars. The author discussed the faults which usually develop in binoculars from rough usage and ordinary wear; also the changes of design necessary to overcome them. It was shown that by small changes of design, the use of die-castings and press work could with advantage be developed. The more extensive use of moulded blanks for lenses and prisms was advocated, and the methods of moulding (or pressing) glass were described. Types of optical construction were shown, and it was suggested that "a three-piece cemented objective appeared to give a more brilliant image than those of the usual two pieces" construction, while, owing to the flatter curves, it was probably but little more expensive to produce. Various methods of adjustment were described suitable for use where instruments are, and where they are not, available. Finally, various methods of testing definite and light transmission were shown, including methods for the rapid comparison of binoculars with a measured standard.

Zoological Society, November 19.—Dr. A. Smith-Woodward, vice-president, in the chair.—Miss K. **Lander**: Method of preparing skeletons by the use of trypsin. A number of successful examples from the society's prosectorium were exhibited.—E. **Hatschek**: The forms assumed by drops and vortices of gelatin in various coagulants. A series of the formations was shown which simulated animal structures, and the author demonstrated the method by which he obtained his results.—Prof. F. **Wood-Jones**: A cast and a set of Röntgen-ray photographs taken from a chimpanzee belonging to the society. The animal had recently died from pulmonary tuberculosis, and attention was directed to the possibility of diagnosing tubercle in living subjects by the method described.—Dr. D. M. S. **Watson**: Seymouria, the most primitive known reptile.

Royal Microscopical Society, November 20.—Mr. J. E. Barnard, president, in the chair.—R. **Paulson** and Miss A. Lorrain **Smith**: Paper on microscopic preparations which were mounted during an investigation, in collaboration with Somerville Hastings, respecting the actual penetration of the living algal cells (gonidia) of a lichen by the fungal hyphæ. Reference was made to the papers of Schneider, Elenkin, Elfving, and Danilor in order to show that there was no agreement regarding the details of the penetration observed. Methods of fixing, staining, and mounting were explained. Bonney's was found most useful for differentiating alga and fungus, and for showing the various structures of the algal cell as the chromatophore, the so-called pyrenoid, and an eccentric body. Some slides illustrated the method by which gonidia increase in number, numerous daughter gonidia being shown within the mother-cells. The average diameter of gonidia was 12μ, and that of hyphæ 3μ to 4μ. During the whole progress of the work no clear case of penetration, and very few doubtful cases, were observed. Penetration of the living gonidia by fungal hyphæ occur so seldom that a theory of parasitism based upon its occurrence has very little evidence to support it.

Geological Society, November 20.—Mr. G. W. Lamplugh, president, in the chair.—R. H. **Worth**: The geology of the Meldon valleys, near Okehampton, on the northern verge of Dartmoor. The area dealt with lies between the London and South-Western main railway line, from a point a little east of Meldon viaduct to near Sourton, and the ridge of Dartmoor occupied by Black Tor, High Wilhays, Yes Tor, and West Mill Tor, being the greater part of the valley of the Redaven and a portion of the valley of the West Okement. The southern extreme of this area is occupied by the Dartmoor granite, north of which are shales, in which occurs a patch of limestone, and these are intersected by numerous bands of igneous rock. The shales as a whole, with but slight local deviations, strike north-east and south-west and dip north-westwards, the mean angle of dip being about 50°. The sedimentary rocks are divisible into:—(1) An alumino-arenaceous series, extending from the granite northwards for a breadth of somewhat more than half a mile; (2) a calcareous series, abruptly but conformably succeeding the first; (3) a limestone, which occurs a short distance south of the railway; (4) radiolarian cherts a little above and a little below the horizon of the limestone; and (5) an aluminous bed north of the railway. In the sedimentary series planes of weakness have developed, the surface-traces of which are broadly coincident with the strike, but which frequently lie counter to the dip. These planes have been more or less successfully invaded by at least three series of igneous rocks, the order of which, commencing with the earliest, is as follows:—(*a*) A felsite with phenocrysts of micropegmatite, and quartz which shows good rhombohedral cleavage. (*b*) A series called the "dark igneous rocks." (*c*) Granitoid veins, subdivided into (1) the Meldon aplite and its associates, and (2) fine-grained granites of the ordinary Dartmoor type.

Linnean Society, November 21.—Sir David Prain, president, in the chair.—E. S. **Goodrich**: A fatherless frog, with remarks on artificial parthenogenesis. The author remarked on the artificial development of echinoderm eggs by special treatment into living examples, and that it had been found that frogs' eggs could follow a similar course. A female frog, carefully prepared to guard against previous impregnation, was employed, the eggs obtained by dissection were placed in rows upon glass slips, and punctured by fine glass needles of microscopic tenuity; blood was then applied, and the treated eggs placed in water. A certain number developed into tadpoles, and a few into complete frogs. It was found that the leucocytes in the blood were essential; the serum or ordinary red corpuscles were useless.—Miss Muriel **Bristol**: A review of the genus Chlorochytrium, Cohn. From investigations it appeared certain that the genera Chlorocystis, Reinh.; Stomatochytrium, Cunn.; Endosphæra, Klebs; Scotinosphæra, Klebs; and Centrosphæra, Borzi, were slight variations of Cohn's genus. Thirteen species were characterised in detail, and three doubtful species of Schroeter were mentioned.—A. S. **Kennard** and B. B. **Woodward**: The Linnean species of non-marine mollusca that are represented in the British fauna, with notes on the specimens of these and other British forms in the Linnean collection. There now seems some chance of approximate finality being attainable in the matter of nomenclature on the basis of priority—at least, in the case of the British post-Pliocene non-marine mollusca, with which the authors are particularly concerned. Accordingly, they are attempting a more thorough revision of their synonymy than was essayed by them in 1903 (*Journ. of Conch.*, vol. x., pp. 352–67) and 1914 ("List of the British Non-Marine Mollusca," 8vo, pp. 12).

MANCHESTER.

Literary and Philosophical Society, November 12.—Mr. W. Thomson, president, in the chair.—Capt. D. M. S. **Watson**: Biology and war. After referring to the use of much of the theory of natural selection in the apologies for militarism, and pointing out the confusion always present in the minds of those who so use it, the speaker referred very briefly to the various types of evolutionary changes exhibited by phylitic series of animals known from palæontological evidence, and pointed out that such evidence of this kind as is available suggests that natural selection has played only a very limited part in the actual progress which has occurred in animal structure.

DUBLIN.

Royal Irish Academy, November 11.—Mr. T. J. Westropp, vice-president, in the chair.—Mrs. L. **Porter**: The attachment organs of some common Parmeliæ. The author continues her investigations of the attachment organs of corticolous lichens by examining selected species of the Parmeliæ—viz. *P. physodes, conspersa, saxatilis, borreri, omphalodes, olivacea, caperata,* and *perlata*—and concludes that, except in the case of the first-named species, the organs are rhizines, *i.e.* strands of hyphæ holding the thallus more or less closely to the substratum; the rhizines, as a rule, expand at their apices into cup- or disc-like outgrowths, which may fuse to form a complete layer covering the substratum, and from which hyphæ may enter and disintegrate the bark.—R. W. **Evans**: Some types of cave formation. That limestone caves owe their origin to the enlargement of rock joints either by the solvent or by the mechanical action of water is a well-known fact. Either the one cause or the other may have been predominant in the formation of any particular cave. After reviewing the different types of cave formation Mr. Evans endeavours to show which of the above-mentioned forces has played the most important part in the special instances cited. Mr. Evans's examples of the types of cave galleries are almost entirely derived from Irish caves.

LEEDS.

Society of Glass Technology, November 20.—Mr. F. W. Branson in the chair.—W. J. **Rees**: Silica refractories for glassworks use. The author first outlined the various uses to which silica refractories could be put in glassworks, and dealt briefly with the provisional specification that is being set up by the Glass Refractories Committee. He next dealt with the raw materials required in the manufacture of silica bricks, etc., and the methods employed in this manufacture. He showed that the presence of iron in the form of magnetic oxide of iron was not detrimental to the properties of a silica brick. The lowest silica limit was put at 94 per cent., and it was shown that the presence of much alumina or more than 2 per cent. of lime was not advisable. Lime is certain to be a constituent of the silica brick, as lime slurry is used as a "bind." It is of interest to note that in some cases lime has a bleaching action, and masks any colour likely to be set up by the presence of iron compounds. Some users of silica bricks insist on a white or light-coloured brick, and reject dark-coloured reddish bricks. It has been proved that the colour of a brick is not the least criterion of its refractoriness. Silica bricks may be either coarse or fine in texture, but the texture must be uniform throughout. Coarse-textured bricks are better for withstanding sudden temperature changes, but they are worse from the point of view of attack by chemical fumes. Great advantage is gained in the manufacture of bricks if 25 per cent. of the materials are in the form of impalpable silica powder and the remainder in the form of grains with a maximum diameter of ¼ in.—J. H. **Davidson**, S. **English**, and Dr. W. E. S. **Turner**: The properties of soda-lime glasses. I., The annealing temperatures. A series of fourteen allied glasses had been made, beginning with a simple soda-silicate, and the effect of adding increasing amounts of lime on several of the properties of glass had been studied. The batches used were communicated, and the results obtained for the annealing temperatures. It was shown that the annealing temperatures increased with an increasing amount of lime. Increasing the lime percentage also improved the durability, and caused the glass to "set" more quickly. A batch for a bottle-glass was given, which showed little or no tendency to "crizzle," thus being different from the majority of soda-lime silicate glasses.

PARIS.

Academy of Sciences, November 4.—M. P. Painlevé in the chair.—H. **Douvillé**: The breccia of Salles and of Sère-Argeles.—H. **Parenty**: The genesis of a Cartesian agitation in a jet of steam of which the velocity is limited to the velocity of sound.—M. **Balland**: The rapid alteration of palm-oil. Palm-oil intended for consumption by colonial troops should be used as soon as possible after its preparation, since it undergoes a sort of spontaneous saponification which, after some months, prevents its use for culinary purposes.—Sir Philip Watts was elected a correspondant for the section of geography and navigation in succession to the late Lord Brassey.—E. **Gau**: The characteristics of partial differential equations of the second order.—P. **Sève**: Magnetic gear-wheels. Application to electric clocks.—A. **Sanfourche**: The Curie point in pure iron and ferro-silicons. The specially purified iron was melted in a quartz tube under a layer of boiling common salt, air and other gases being thus excluded. A mass of 80 grams of fused iron showed a point at 1310° C. on cooling, and 1365° C. on heating. These points were lowered by the addition of silicon, iron with 2·5 per cent. of silicon giving 1195° C. as the Curie point (cooling).—P. **Combaz**: The end of the glacial period in the Guiers valley and the Chartreuse massif.—A. **Nodon**: An electro-magnetic storm.—P. **Bertrand**: The great palæontological divisions of the Stephanian in the Loire basin.—E. **Gadeceau**: The submerged forests of Belle-Ile-en-Mer.—M. **Mirande**: A hydrocyanic acid-producing fern, *Cystopteris alpina*. The leaves of this fern contain a glucoside giving hydrocyanic acid by enzyme action. Benzaldehyde is also a product of the hydrolysis of this glucoside.—F. **Gaud**: Some points on the biology of the microfilaria.—S. **Marbaïs**: Specific vaccino-therapy in dysentery.—C. **Cépède**: A curative vaccine for pulmonary tuberculosis.—M. **Lespinasse**: The application of the Cépède method to the staining of the leprosy bacillus. This method gives results more rapidly and certainly than the usual Ziehl-Neelsen method.

November 11.—M. P. Painlevé in the chair.—Ch. **Barrois**, P. **Pruvost**, and G. **Dubois**: The passage beds from the Silurian to the Devonian in the Pas-de-Calais coal basin.—A. **Blondel**: The harmonic analysis of alternating currents by the resonance galvanometer.—Marshal Foch was elected a free Academician in succession to the late Léon Lobbé.—M. **Maggini**: A method permitting the simultaneous photography of stars in two different regions of the spectrum.—A. **Véronnet**: Constitution of the nucleus and atmosphere of the sun.—M. **François**: A method of estimating metals by electrolytic deposit without the use of external electric energy. The solution to be electrolysed is placed in a platinum crucible, and a rod of zinc or aluminium suspended in the liquid in such a manner as to be in metallic contact with the crucible outside the electrolyte. The arrangement forms a miniature battery. The method has been applied to the estimation of mercury, gold, and silver.—L. **Gentil**: The synchronism of the deposits and of the orogenic movements in the North Bætica and South Riffian Straits (southern Spain and Morocco).—C. **Nicolesco**: The genus Parkinsonia (generic characters, affinities, and species).—J. **Chaine**: Remarks on the metamerism of the Vertebrates.—C. **Cépède**: A curative vaccine for influenza. The vaccine is made from three species, Pneumococcus, Enterococcus, and Streptococcus, the exotoxins are removed by washing, and the colonies killed by thirty minutes' exposure at the boiling-point. Details of three cases are given in which the injection of the vaccine caused marked improvement.—R. **Douris**: Modifications of normal or syphilitic human serum under the influence of time.

MELBOURNE.

Royal Society of Victoria, September 12.—Miss Janet W. **Raff**: Abnormal development of the head appendages in the crayfish, *Parachaeraps bicarinatus*, Gray. The chief irregularity was in the position of the mandibles, these being situated at different levels, it thus being impossible for one to bite against the other. The antennæ and antennules also were abnormal in position.

BOOKS RECEIVED.

Hygiene of the Eye. By Prof. W. C. Posey. Pp. x+344+11 plates. (Philadelphia and London: J. B. Lippincott Co.) 18*s*. net.

The Wellcome Photographic Exposure Record and Diary (Northern Hemisphere and Tropics). Pp. 256. (London: Burroughs Wellcome and Co.) 1*s*. 6*d*.

Highways and Byways in Northamptonshire and Rutland. By H. A. Evans. With illustrations by F. L. Griggs. Pp. xv+367. (London: Macmillan and Co., Ltd.) 6*s*. net.

Annales de la Clinique Chirurgicale, du Prof. P. Delbet. No. 6. Biologie de la Plaie de Guerre. By Prof. P. Delbet and N. Fiessinger. Pp. v+460+iv plates. (Paris: F. Alcan.) 30 francs.

Hindu Achievements in Exact Science. By Prof. B. K. Sarkar. Pp. xiii+82. (London: Longmans and Co.) 1 dollar net.

The Evolution of the Earth and its Inhabitants. By J. Barrell and others. Pp. xi+208+iv plates. (New Haven: Yale University Press; London: H. Milford) 10*s*. 6*d*. net.

Memoirs of the Geological Survey. England and Wales. The Water Supply of Essex from Underground Sources. By W. Whitaker and Dr. J. C. Thresh. The Rainfall. By Dr. H. R. Mill. Pp. iv+510+4 plates. (London: H.M.S.O.) 15*s*.

An Introduction to Trade Unionism. By G. D. H. Cole. Pp. vi+128. (London: The Fabian Research Department and G. Allen and Unwin, Ltd.) 5*s*. net.

The Payment of Wages. By G. D. H. Cole. Pp. vi+155. (London: The Fabian Research Department and G. Allen and Unwin, Ltd.) 6*s*. net.

Pioneers of Progress. Men of Science. Galileo. By W. W. Bryant. Pp. 64. The Life and Discoveries of Michael Faraday. By Dr. J. A. Crowther. Pp. 72. (London: S.P.C.K.) 2*s*. net each.

Forced Movements, Tropisms, and Animal Conduct. By Dr. J. Loeb. (Monographs on Experimental Biology.) Pp. 209. (Philadelphia and London: J. B. Lippincott Co.) 10*s*. 6*d* net.

The Origin of Consciousness. By Prof. C. A. Strong. Pp. viii+330. (London: Macmillan and Co., Ltd.) 12*s*. net.

On Society. By F. Harrison. Pp. xii+444. (London: Macmillan and Co., Ltd.) 12*s*. net.

DIARY OF SOCIETIES.

THURSDAY, DECEMBER 5.

ROYAL SOCIETY, at 4.30.—Dr. C. Chree: Electric Potential Gradient and Atmospheric Opacity at Kew Observatory.—E. Nevill: The Value of the Secular Acceleration of the Mean Longitude of the Moon.—S. B. Schryver and Nita E. Speer: Investigations Dealing with the State of Aggregation. Part IV.—The Flocculation of Colloids by Salts containing Univalent Organic Ions.—Emil Hatschek: A Study of the Forms assumed by Drops and Vortices of a Gelatinising Liquid in Various Coagulating Solutions.

INSTITUTION OF ELECTRICAL ENGINEERS, at 6.—Prof. Miles Walker: The Supply of Single-phase Power from Three-phase Systems.

LINNEAN SOCIETY, at 5.—Prof. W. A. Haswell: A Revision of the Exogonidæ.—C. D. Soar: Exhibition of Coloured Drawings of British Mites.—The General Secretary: The Tulbagh-Linné Correspondence.

CHEMICAL SOCIETY, at 8.

MONDAY, DECEMBER 9.

ROYAL GEOGRAPHICAL SOCIETY, at 8.—Sir Martin Conway: The Political Status of Spitsbergen.

ROYAL SOCIETY OF ARTS, at 5.—Prof. J. C. Philip: Physical Chemistry and its Bearing on Chemical and Allied Industries.

ARISTOTELIAN SOCIETY, at 8.—Prof. John Laird: Synthesis and Discovery.

WEDNESDAY, DECEMBER 11.

ROYAL SOCIETY OF ARTS, at 4.30.—Major-General Sir Frederick Smith: The Work of the British Army Veterinary Corps at the Fronts.

THURSDAY, DECEMBER 12.

ROYAL SOCIETY, at 4.30.—*Probable Papers:* Dr. M. C. Stopes: The Four Visible Ingredients in Banded Bituminous Coal.—H. C. Bazett: Observations on Changes in the Blood Pressure and Blood Volume following Operations in Man.

OPTICAL SOCIETY, at 8.—Instructor-Commander T. Y. Baker and Major L. N. G. Filon: An Empirical Formula for the Longitudinal Spherical Aberrations in a Thick Lens.—Major E. O. Henrici: Spirit Levels.

INSTITUTION OF ELECTRICAL ENGINEERS, at 6.—Discussion on Electric Welding.

FRIDAY, DECEMBER 13.

ROYAL ASTRONOMICAL SOCIETY, at 5.

INSTITUTION OF MECHANICAL ENGINEERS, at 6.

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