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British Dyes.

IN view of the present large importation of German dyes into this country, a strong appeal for the protection of the British dye industry is made by Dr. Herbert Levinstein in the *Morning Post* of November 19. Dr. Levinstein points out that the pledge given by Sir Albert Stanley, President of the Board of Trade, on May 15, 1918—namely, that the importation of all foreign dyestuffs should be controlled for a period of not less than ten years after the end of the war—has never been redeemed, and adds: "Nobody suggests that a prohibition of imports except under licence should be permanent. Ultimately, the industry must flourish on its own merits, prosper by its efficiency, by the originality of its inventions, and by the scale of its operations."

It would seem to be a simple matter for the Government to allow imports under licence of such dyes as are required, but not yet manufactured, in this country, and to exclude those which can be shown to be produced here in adequate amount. That the position is not quite so simple as would appear from this is shown by the statement of the Prime Minister so recently as November 11, to the effect that no guarantee could be given that this measure would be brought in before Christmas unless it could be shown that the measure was non-contentious, and by Dr. Levinstein's own very serious and alarming statement that since July last, owing to the large importation of German dyes which has taken place, a great injury has already been inflicted on the dye industry, and consequently on the textile industries. Progress has been arrested, developments brought to a standstill, great plants closed down, and large numbers of workmen thrown out of employment. At the same time, whilst in July, 1914, the German supplies were above 80 per cent. of the dyes used in this country, in July last the output of the British Dyestuffs Corporation, Ltd., was greater in quantity, though less in variety, than the total quantity of dyes imported from Germany in July, 1914.

The only conclusion that can be drawn from the Prime Minister's statement is that opposition exists to the apparently logical measure which the dye manufacturers desire to see introduced, and this can come only from the dye users. Dr. Levinstein's statement shows, further, that German dyes, of the same kind as are being manufactured here, are being bought on the large scale in preference to the dyes made at Huddersfield and Manchester. Evidently the dye users have a very strong preference for German dyes, even of the commoner kind. It was to be expected that the more complicated dyes which the Germans produce, but which are not yet made in this country, would be eagerly acquired by the dye users when available, but that the British Dyestuffs Corporation would be compelled to close down great plants and discharge large numbers of workmen immediately following importation from Germany was not anticipated, and is a matter of most serious moment.

There can be only two reasons for this: either the products made by the British Dyestuffs Corporation are not of the same quality as the German, or they are of the same quality, but must be sold at a higher price. Dr. Levinstein suggests that the latter is the case, for he says: "Owing to the depreciation of the mark, they [the Germans] can undersell any English makers, and yet make large profits." Whatever may be the depreciation in the value of the mark, it does not appear that the Germans are underselling the English manufacturers. As was stated recently in these columns, the average price of the 1500 tons of German dyes mentioned in the House of Commons as having been imported during the first nine months of this year was 7*s.* 11*d.* per lb. Even supposing that part of this quantity consisted of very highly priced dyes, presumably not manufactured here, yet the quantity of the cheaper class of dyes must have been large if, as we may presume, they were at least partly

responsible for the collapse referred to by Dr. Levinstein, and, therefore, their average price could not have been very much less than 7*s.* 11*d.* When it is considered that the average pre-war price of the majority of dyes advertised at present by the British Dyestuffs Corporation was very much nearer 1*s.* than 8*s.*, it is difficult to imagine that there can be such underselling as is suggested.

On the other hand, will the dye users say that the quality of the dyes made at Huddersfield and Manchester is equal in every respect to that of the pre-war (and present) German product? Although the shade of the dyes is probably the same—and there is no doubt that the product made by the chemist in the works is fully equal to the German—this product must necessarily be reduced, by adding salt or other inert material, to a given standard. Precision and exactness in seeing that all deliveries conform to this standard of strength are of vital importance to the dyer, and divergence from this may well lead him to seek his supplies elsewhere.

Antarctic Research.

(1) *Scottish National Antarctic Expedition: Report on the Scientific Results of the voyage of S.Y. "Scotia," during the years* 1902, 1903, *and* 1904, *under the Leadership of Dr. William S. Bruce.* Vol. vii., Zoology; parts i.–xiii., Invertebrates; pp. viii + 323 + 15 plates. (Edinburgh: The Scottish Oceanographical Laboratory, 1920.) Price 50*s.*

(2) *British Museum (Natural History). British Antarctic ("Terra Nova") Expedition,* 1910. *Natural History Report. Zoology.* Vol. xi., No. 9. Mollusca. Part iii., Eupteropoda (Pteropoda Thecosomata) and Pterota (Pteropoda Gymnosomata). By Anne L. Massey. Pp. 203–232: No. 10. Mollusca. Part iv., Anatomy of Pelecypoda. By R. H. Burne. Pp. 233–256 + 4 plates: vol. iv., No. 3. Echinoderma (part xi.) and Enteropneusta. Larvæ of Echinoderma and Enteropneusta. By Prof. E. W. MacBride. Pp. 83–94 + 2 plates. (London: British Museum (Natural History), 1920.) Prices 7*s.* 6*d.* and 8*s.* 6*d.*

(1) THE seventh volume of the results of the successful voyage of the *Scotia,* under the able leadership of Dr. W. S. Bruce, contains a series of interesting memoirs. Mr. Pearcey identifies 267 species of Foraminifera, eleven of which are new. He thinks the group richer south of 70° than north of it, and that the Foraminiferal fauna of the arctic and antarctic regions is strikingly similar, from the generally uniform conditions of temperature extending over the bottom of the deep sea (*more* Sir J. Murray). The collection was especially rich in Sponges, which are ably described, with excellent figures, by Prof. Topsent. Ten Hexactinellids were obtained, including new species of Malacosaccus, Acæocalyx, Docosaccus, and Caulophacus, the size of the first and last being remarkable, whilst the wonderful megascleres and microscleres enhance the interest of the group.

The antarctic seas abound in Tetractinellids, though the *Scotia* procured only three known forms. The Monaxonida are grouped as antarctic and subantarctic. Amongst the striking forms is *Cladorhiza thomsoni*, a relation of the interesting little Cladorhiza of the *Challenger,* which was sent as an Alcyonarian to Prof. Arthur Thomson, of Aberdeen. The author repeats his antagonism to the bipolarity theory by pointing out the richness of the antarctic region in Hexactinellids and their paucity in the arctic seas. The wide distribution of the Siphonophores Porpita, Velella, Physalia, and the Diphyidæ is shown by J. H. Koeppern. An elaborate memoir on the structure and relationships of the Hexactinian Porponia, Hertwig, is given by Prof. Carlgren, of Lund, showing, amongst other things, its close connection with Halcuria, mesenteries in both occurring regularly in the endocœls. The new species is *P. antarctica.*

Five species of stony corals are dealt with by Prof. Stanley Gardiner, the most important being a new species, *Madracis scotiae,* from the Abrolhos Bank. Mr. Laidlaw notices the pelagic Polyclad Turbellarian, *Planocera pellucida,* from St. Paul's Rocks; whilst Mr. Pringle Jameson describes the Chætognaths, the wide distribution of which, and the large size of *Sagitta gazellae,* are noteworthy. Mr. L. N. G. Ramsay again takes up the Nereids (Polychæts), of which there were six known forms and one new—*N. falklandica.* The peculiar genus Sclerocheilus receives important treatment from Prof. Ashworth, and a new form, *S. antarcticus,* is described. Miss Helen Pixell (Mrs. Goodrich) gives a careful account of the four Sabellids and the six Serpulids. The resemblance in certain respects of Ehlers' Sabellid genus Potamis to the genus Jasmineira, St. Joseph, merits further attention.

Mr. Tattersall deals with the Schizopods, Stomatopods, and non-antarctic Isopods, together with a few Schizopods collected by the *Discovery* in the tropical Atlantic. A new Boreomysis and the re-discovery of *Exosphaeroma tristense,* Leach, are interesting. The occurrence of a new species of the primitive Dorid, Bathydoris, has enabled

Mr. J. T. Evans to give an account of its anatomy, which is in the main Doridiform, though the length of the nerve-collar, the position of the cerebral ganglia, and the absence of separate gastro-œsophageals diverge, and point to a condition earlier than that in the Pleurobranchids and Tritonia. The fusion of the ganglia of the visceral loop, again, is a modern feature, like the loss of the eyes in deep water.

(2) The three parts of the zoology of the *Terra Nova* antarctic expedition published by the British Museum comprise the anatomy of the Pelecypoda by Mr. R. M. Burne, viz. the structure of the Filibranchiate Arcidæ, Pectinidæ, and Limidæ, that of the Eulamellibranchiate Carditidæ, Veneridæ, and Anatinidæ, and traverse much of the ground worked by Pelsener. A curious feature is the occurrence of a finger-shaped glandular cæcum on each side behind the mouth in Lissarca, Adacnarca, and Philobrya, in connection with a ridge of modified epithelium between the body and the gill-axis. The presence of vestigial cephalic eyes in these and in Barbatia is also noteworthy, and the author thinks that at 250 fathoms their function may be other than that connected with light. The incubation of eggs in the mantle cavity in Adacnarca, in the supra-branchial chamber of Anatina, and in the interlamellar space in Venericardia is rare in marine Lamellibranchs, and may be an antarctic habit.

In her report on the Pteropods, Miss A. L. Massey adopts the terms of Boas, viz. Eupteropoda and Pterota for the older Thecosomata and Gymnosomata, since they are really not closely related, except for the presence of fins. All the seventeen specimens are known forms. If Bonnevie's view is correct, some species frequent the surface and others occur in the deeper water, so that surface-netting only might explain the absence of the latter. Miss Massey, however, does not allude to possible changes of vertical distribution from temperature, storms, light, or darkness. The materials have been worked out most carefully, structurally and otherwise. The wide distribution of Limacina and Clione suggests the possibility that several species of the former may yet be reduced to varieties, as Vayssière holds, and the same may be said with respect to *Clione limacina* and *C. antarctica*.

Prof. MacBride's description of the Larvæ of Echinoderma and Enteropneusta includes four species of the former, two of which, a Bipinnaria and an Auricularia, are new, whilst the latter is represented by a species of Tornaria. It is noteworthy that he was enabled, by the examination of *Auricularia antarctica*, to confirm H. Bury's original view that the anterior division of the cœlomic sac does not become directly converted into the hydrocœle. The latter grows out as a bud from its hinder aspect. Interesting points in the structure of *Auricularia nudibranchiata* are given, demonstrating that Chun's interpretations of the hydrocœle were erroneous; and what he thought to be a median pouch of the intestine is really double, so that the larva cannot belong to the Elasipoda, in which the diverticulum is single. Two examples of Tornaria furnished the author with stages in the development of the so-called "glomerulus," or "proboscis gland." He terms the glandular tissue around the blood-space "heart-gland," which he thinks an organ of internal secretion. All the three memoirs are illustrated by excellent figures.

W. C. M.

The Physiology of Pregnancy.

Radiant Motherhood: A Book for Those who are Creating the Future. By Dr. Marie C. Stopes. Pp. 246. (London: G. P. Putnam's Sons, Ltd., 1920.) Price 6*s*. net.

THE publication of the report of the Royal Commission on Venereal Diseases in 1916, and of two reports by the National Birth-rate Commission in 1916 and 1920, if it did not in itself bring in a new era of frank, open discussion of what had been regarded as the secrets of *la vie intime*, at any rate gave to that era official recognition, and perhaps something also of the nature of a benison. When, further, it became evident that civilised mankind (including womankind) had begun to show its intense interest in its own reproduction by experimenting upon it, and even by attempting to control it, it followed with an almost gravitational certainty that individuals would in separate volumes set forth the hitherto unrevealed aspects of such subjects, and would each try to outdistance competitors in what may be called a race to lay bare all the phenomena of the sexual relations which precede and of the obstetrical results which follow (when they are permitted) the cohabitation of man and woman.

Dr. Marie C. Stopes is one of the authors who have trodden this path in literature in her earlier works, entitled "Married Love" and "Wise Parenthood," and now in her latest book, which she has named "Radiant Motherhood." She is a doctor of science, London, a doctor of philosophy, Munich, a fellow and lecturer in palæobotany in University College, London, and she was a member of the National Birth-rate Commission when it was preparing its second report; but she lays no claim on her title-pages to the possession of any

medical qualification or obstetrical diploma. These restrictions may not to the author seem to matter much, but they inevitably lessen the value to be assigned to the more strictly medical and obstetrical portions of her work.

For example, on p. 34 Dr. Stopes writes of the tendency for the head of civilised man to get larger and so to make the birth of the babies of the future through "the gateway of pain" (*i.e.* the mother's pelvis) almost impossible unless Cæsarean section, which may have become a racial necessity by that time, is perfected; but on p. 155 she ascribes the survival of more girl than boy babies to the strength of the former, apparently forgetting her conclusions about "the gateway of pain," for surely the heads of the boy babies (who weigh on an average more than the girl babies) are more likely to be compressed injuriously in their exit.

A careful reading of the whole book leaves the reviewer in two minds whether to praise it on account of the many beautiful and far-seeing thoughts in it and the practical suggestions it contains for the relief of the distresses and difficulties of expectant mothers and fathers, or to censure it for the impracticability of many of its recommendations and for the lack of distinction between matters which have been fairly well established and those which are little more than speculations. It is only fair, however, constantly to bear in mind that the appeal of the book is pre-eminently to the "young happy and physically well-conditioned pair who, mating beautifully on all the planes of their existence, are living in married love" (p. 13), and to "middle- and upper-class women" (p. 168). With this group as audience it is less surprising to read that for the man who "desires to have a child who may become one of the *master* minds" it is wise "to mate himself with the long-young late-maturing type of woman and let her bear that child some time between the age of thirty-five and forty-five." At the same time, even that type of woman within these years is likely to have rigidity of the "gateway of pain" just as any other elderly primipara has, so the expected "master mind" may come to be a still-birth. All the way through her book Dr. Stopes is impeded by the confusion of thought which reigns when one group of parents is being advised and another is being scolded. The radiant motherhood which is written about is for the few. This becomes clear when we read (p. 50) that "the ideal way of spending the earlier months of coming parenthood is in the form of an extended honeymoon, in which the couple, travelling slowly, should follow the guide of seasonal beauty," etc.; that the fertilising union should take place "on a holiday into wild and inspiring solitudes"; and that after giving birth to her child the mother "should lie about for the whole of six weeks" (p. 174).

With two very difficult subjects Dr. Stopes deals in her own way. In the chapter which she calls "The Weakest Link in the Human Chain," she tries to decide the best way of answering the child when he or she asks about sexual and reproductive matters. She cuts the Gordian knot by recommending that "the child's first instruction in its attitude towards its sex-organs, its first account of the generation of human beings, should be given when it is two or three years old"; and she adds: "A child so tiny will usually not remember one word of what was said to it, but the effects on his outlook will be deep." The other difficult question is that of sexual connection during pregnancy. Several of the chapters contain very useful advice, and that (the tenth) on the physical difficulties of the expectant mother is full of such; but is Dr. Stopes aware that at antenatal clinics these things are being commonly taught to all expectant mothers, sometimes with quite usefully irradiating effects? Not a few obstetricians believe that morning sickness and some of the other impedimenta of pregnancy are preventable.

In other chapters, as has been hinted already, the author reveals a rather extraordinary readiness to consider strange stories, such as that Oscar Wilde's character was determined by thoughts which his mother cherished about him whilst she was carrying him in her womb. Some of her suggested remedies for existing evils are sound, although difficult of accomplishment, such as the endowment of motherhood; but the sterilisation of the unfit by Acts of Parliament might tend to do what she herself condemns so much—the manufacturing of revolutionaries. Her suggestion of a safe method of controlling parenthood by preventing conception is taken for granted in this volume; it was described in detail in an earlier one.

Roscoe and Schorlemmer's Chemistry.

A Treatise on Chemistry. By the Rt. Hon. Sir H. E. Roscoe and C. Schorlemmer. Vol. i., *The Non-metallic Elements*. Fifth edition, completely revised by Dr. J. C. Cain. Pp. xv+968. (London: Macmillan and Co., Ltd., 1920.) Price 30*s*. net.

IT is forty-three years since the first edition of Roscoe and Schorlemmer s "Treatise on Chemistry" appeared. The volumes on Organic Chemistry have now passed out of general use,

but those on Inorganic Chemistry show no sign of any decline in popularity, and maintain their position almost unchallenged as the standard work on chemistry in the English language. It is not easy at the first attempt to discover what are the special qualities that give to Roscoe's book this attribute of perpetual youth and long-sustained utility, but the refusal of the author to sacrifice either clearness of exposition or scholarly writing in order to reduce the size of the treatise, or to overcrowd its pages with detail, has perhaps been one of the most important factors in securing these enviable attributes. Thus it is still possible to turn to the work for the detailed story of the investigation of the fixed or variable oxygen-content of the atmosphere, or of the composition of the distillate from hydrochloric acid, without finding that the narrative has been so abbreviated as to be valueless except as a guide to the original papers. The editors of successive editions must have exercised considerable restraint in order to allow a full account to be preserved of experiments which were becoming too old to be modern, but were still too modern to be classical.

In bringing out the new edition, Dr. Cain has been handicapped by the fact that he has no longer been able to refer his work to Roscoe himself for approval; but, having been associated with Roscoe in the preparation of the preceding edition, he has had special advantages in striving to preserve the character and style of the book, and has succeeded so well in his task that the later dates which now appear in the footnotes are the most conspicuous marks of modernity. Here and there a paragraph remains which shows signs of obsolescence, and in an occasional instance (*e.g.* the electrical method of making carbon disulphide) modern work has escaped notice; but the new edition is a worthy successor to those that have gone before, and will contribute its share to the long life of the treatise.

One fault which was formerly characteristic of Roscoe's "Chemistry" has almost disappeared in the new edition—namely, the conversion of classical apparatus into a modern form, without any indication in the text of the transformation that had been effected. Only one example of this curious process appears to have survived—namely, the introduction of a gas furnace with a row of Bunsen burners in the figure illustrating the experiments on the composition of air carried out by Dumas and Boussingault in 1841, although the joints of the apparatus are still shown with the original rubber bandages instead of rubber tubing. This last link with an old tradition will perhaps be broken when the time comes for a sixth edition to appear.

It is some satisfaction that the printing and paper show no sign of deterioration, so that the appearance of the book is as attractive as in former years. Roscoe's "Chemistry" has never stooped to the use of black type as a means of emphasis, nor to the use of smaller type for matter of less importance. Even the conventional division of the text into chapters is missing. These features have given to the book a character of its own, which clearly appeals to the more scholarly type of reader, even if the student finds that he is obliged to read the book instead of skimming through it from one key-word to another. The student will still find, however, that he has in Roscoe the best available guide to the literature of inorganic chemistry, directing his attention to all the more important papers, and passing lightly over the mass of detail which has converted so many of the larger works from text-books into dictionaries. Roscoe's "Chemistry," in spite of its increasing size, still possesses all the essential qualities of a book rather than of a catalogue, and this is perhaps the principal reason why its approaching jubilee is unaccompanied by any marks of old age. T. M. L.

Archimedes.

Archimedes. By Sir Thomas Heath. Pp. ii+58. (Pioneers of Progress Series.) (London: S.P.C.K.; New York: The Macmillan Co., 1920.) Price 2*s.* net.

BY the general consent of all competent judges Archimedes is one of the greatest mathematicians the world has ever seen. It is not easy to justify this opinion to a popular audience, most members of which know little and care less about mathematics; but Sir Thomas Heath's book ought to succeed in making the ordinary reader understand to some extent the nature of Archimedes' discoveries, and in arousing interest in the achievements of Greek mathematicians.

Chap. i. gives such fragmentary (and often legendary) notes as we have on Archimedes' personal career; chap. ii. is an excellent account of Greek geometry before Archimedes' time; chaps. iii.–vii. give analyses of Archimedes' extant works. Special attention may be directed to the paragraphs (pp. 31–35) on the "Method," discovered by J. L. Heiberg so lately as 1906 in a palimpsest at Constantinople. This work shows how Archimedes was led to some of his theorems by quasi-mechanical considerations. It should be

observed that Archimedes does not give a so-called "statical proof" of any purely geometrical theorem; this would be contrary to Greek ideas of mathematical propriety. But the theorem having suggested itself as probable from mechanical (or other) considerations, strict methods were applied to test it—such, for instance, as the process of "exhaustion." In connection with this exhaustion method it is properly pointed out that the Greeks virtually laid the foundations of the integral calculus, much in the same way as Apollonius, in his "Conics," virtually anticipates the results of modern analytical geometry.

Scattered about the book there are numerous references to Greek discoveries and speculations which are not so well known as they ought to be. Thus Archimedes determined the angular diameter of the sun to a comparatively close degree of accuracy (p. 47); Aristarchus of Samos enunciated the Copernican hypothesis (p. 46); and, of course, all mathematicians of the time assumed the earth to be a sphere, and had a very fair idea of its dimensions.

The book is well printed and attractive in appearance; it is adorned by a frontispiece which is a reduced facsimile of that in Torelli's edition of Archimedes' works. The original is a good example of eighteenth-century copper-plate—amusing in one respect, because, although the landscape is put into proper perspective, two mathematical diagrams supposed to be drawn on the sand are drawn in their proper shape in the plane of the paper. The process reproduction appears to be very satisfactory, considering the amount of reduction involved. G. B. M.

Australian Meteorology.

Australian Meteorology: A Text-book, including Sections on Aviation and Climatology. By Dr. Griffith Taylor. Pp. xi+312. (Oxford: At the Clarendon Press, 1920.) Price 12*s.* 6*d.* net.

THIS text-book of meteorology is written for readers in the southern hemisphere, where, as the author truly points out, European and American text-books are to some extent inapplicable by reason of the fundamental difference in the wind circulation around centres of high and low pressure in the two hemispheres. The examples introduced for purposes of illustration in the present work are mainly drawn from Australian conditions, though the author's wide knowledge of world climatology is also freely used. The 300 or so pages of the book are divided into twenty-six chapters, which cover the practical work at observing stations, as well as the more theoretical aspects of dynamical meteorology and climatology. The author has achieved his object in producing a work which will give the reader of fair intelligence, but without advanced knowledge of mathematics or physics, a good general grounding in the subject. In this connection the pages devoted to pressure gradient and Ferrel's law may be particularly commended. One or two parts are less satisfactory, and in particular the reviewer suggests that in a future edition the chapter devoted to upper-air research might be recast, giving less space to the methods employed, and more to the very important results which have been obtained during the past few years in this field. At the same time, a little more attention might be devoted throughout the book to defining the technical terms used, and to explaining in more detail a few of the less obvious types of diagram, which do not at first glance convey much meaning to the unaccustomed reader.

In chap. xviii. a novel theory is put forward to account for the origin of the tropical lows which form over Australia and drift away to the south-eastward. The theory postulates that domes of warm ascending air are formed over the hottest inland regions in summer, and that the upper north-westerly current, striking these fixed domes, forms gigantic eddies which pass away to the south-eastward, being marked at the surface by a low-pressure centre and often by falls of rain. Any theory of the formation of depressions will be received with interest. The one here put forward is certainly not lacking in originality. It is surprising to learn that the words "backing" and "veering" are used in Australia in the sense of turning against and with the sun respectively instead of with the meanings counter-clockwise and clockwise as recommended by the International Meteorological Committee in 1905. In a modern text-book of meteorology one misses any reference to G. I. Taylor's eddy conductivity. In dealing with the diurnal change of wind at the surface and in the lower layers the simple convection theory of Espy is referred to, but no reference is made to the more complete explanation put forward by G. I. Taylor, in which the observed facts are well accounted for on the reasonable assumption of a diurnal variation of "K."

In his preface the author offers a half apology for the roughness of the diagrams with which the book is illustrated, but this seems scarcely necessary, as the numerous figures form one of its most valuable features, being mainly of small size, and yet showing just the details required to illustrate the point under discussion. J. S. D.

Our Bookshelf.

Elementary Practical Biochemistry. By Prof. W. A. Osborne. Pp. v+184. (Melbourne: W. Ramsay, 1920.)

THIS book represents the course of elementary instruction in practical biochemistry which the author has found suitable for large classes. The conception of biochemistry is, however, limited to the chemistry of the animal body, so that the title may prove misleading. The work actually comprises a course of elementary physiological chemistry, and is divided into twenty-six lessons, each representing a period of laboratory work. A short statement on the theory of the subject of the exercise is given, followed by directions for the practical work. The latter is almost wholly qualitative in nature, and consists of the usual test-tube experiments on the properties of the chief constituents of the animal body. This mode of treatment is always open to the criticism that the theoretical discussions are too short to be of real value, and it is, indeed, difficult to imagine that the small amount of space allotted, *e.g.*, to the carbohydrates will be of much teaching value. On the other hand, they serve a useful purpose in refreshing the student's memory, so that the tests are more intelligently performed.

We note that the author still uses the term "lipoid," and includes the sterols under this head, in spite of the recent suggestion for the abolition of this term. The question of hydrogen-ion concentration is not touched upon, and this constitutes a serious defect, as this conception is of great importance, even for elementary students, and the work on ferments, proteins, and colloids suffers greatly from its omission.

Dietetics receives a good share of attention, and a useful appendix is given containing an elaborate table of food values. Within the limitations of the author's scheme the treatment is quite adequate, but it is to be regretted that more attention is not paid to quantitative and preparative work. A. H.

Monograph of the Lacertidae. By Dr. George Albert Boulenger. Vol. i. Pp. x+352. (London: British Museum (Natural History), 1920.) Price 2*l.*

THIS volume comprises only forty species, but it contains the important genus Lacerta, and this has been submitted to an intensive study of the individual variations of the species and their many varieties. The author rightly calls the available material unique in its vastness, due, we may add, to his untiring, purposeful exertions during the many years he has been in charge of the cold-blooded vertebrates in the national collection. He deemed it important to ascertain the extent of variation of which a given form is susceptible and in what direction a given variation trends, and then to decide what characters have been modified, or lost, and what new ones produced.

The way in which certain combinations of orthogenetic and adaptive modifications have, by their recurrence, led to various parallel series is of prime importance. Ten characters, mostly concerning the scaling, have been selected to show from what each has arisen, whither it trends, and how the resulting combinations have produced thereby those recognisable varieties of the several species, and then in turn the genera, which have been evolved from the more central or older genus Lacerta. To trace all this required immense study of the numerical variations in the Lepidosis, as attested by the tens of thousands of measurements.

Lastly, "if the interpretation of these evolutionary series of lizards is at all sound, a step will have been made in the advance of our knowledge, and a more rational basis laid down for the discussion of the probable mode of geographical dispersion of the genera, species, and varieties."

The Centenary Volume of Charles Griffin and Co., Ltd., Publishers, 1820–1920. With Foreword by Lord Moulton. Pp. xx+290+plates. (London: Charles Griffin and Co., Ltd., 1920.)

As a member of the council of trustees of a public library, the present writer has often smiled when the name of Messrs. Charles Griffin and Co. has been accepted as the guarantee of a book rather than that of the less known but aspiring author. He well remembers an interview with Miss Elizabeth Eaves Griffin, who selected him, after the manner recorded on p. 8 of this memorial volume, to prepare a very dry and formal text-book, because she had read a sketch of midnight travel written by him in a school magazine. No wonder, then, that he joins with many others in applauding the perspicacity of the firm. It was a happy thought to bring together its history, told by writers who understand what scientific progress means. Prof. Beare thus deals with engineering, Sir W. Abell with naval architecture, Prof. Gowland with metallurgy, and Prof. Louis with mining. In each case the works published in Exeter Street are mentioned in connection with researches and technological developments that have affected the world at large, and the excellent portraits of authors, such as those of Sir W. Roberts-Austen, Sir Edward Reed, and Mr. Alfred Brothers, are a pleasing record in themselves. The founders and directors of the house are also happily represented, and Mr. F. J. Blight is revealed to us in a welcome moment when he is not called upon to write his well-known signature. The book rightly characterises many of the works issued as "pioneers." It is edited with as much good taste as is shown in its technical production.

Rudiments of Electrical Engineering. By Philip Kemp. Pp. viii+255. (London: Macmillan and Co., Ltd., 1920.) Price 6*s.*

THIS book is intended for those with practically no electrical knowledge, but whose daily work brings them into touch with electrical apparatus. The recent rush of students to join classes in elementary electrical engineering in technical

schools shows that there is a demand for this knowledge. We think, however, the author has included too much in the scope of the work. We read about magnetism, primary batteries, electric bells, and kinema sets. We also read about three-core cables, rotary converters, boosters, interpoles, etc. The book would have been more useful if the description and elementary theory of the more intricate apparatus had been excluded. It does not advance our technical knowledge of what is meant by "candle-power" to be told that "a source of light is said to possess candle-power." It is also not very instructive to be told that the back E.M.F. of a motor can be obtained by Fleming's right-hand rule. We failed to follow the theory given for the action of the balancers in a three-wire system of distribution (p. 246). The reader ought to be told why the difference of pressure between the two ends of a circuit is called the "potential difference." The introduction of the word "potential" must strike him as mysterious. In electrical science, more almost than in any other, it is impossible to be perfectly exact "at once," but a beginning at precision should be made early, even although the author should run the risk of being called "academic."

The Nomenclature of Petrology: With References to Selected Literature. By Dr. Arthur Holmes. Pp. v+284. (London: Thomas Murby and Co., 1920.) Price 12*s.* 6*d.* net.

THERE is probably no department of science in which the nomenclature is in such a state of confusion as in petrology. The rocks that form the earth's crust include an innumerable variety of types which pass by imperceptible degrees into one another, so it is not surprising that rock names have been multiplied to an extraordinary degree, and that there has been considerable variation in their application. The student of petrological literature, therefore, frequently finds himself faced with unfamiliar terms or those which are used in a sense different from that with which he is acquainted, and he will owe a debt of gratitude to Dr. Holmes for the labour expended in compiling this invaluable work of reference. He will no longer be dismayed when he meets in the pages of geological publications with "lavialites," "ledmorites," "leeuwfonteinites," and "leidleites," all of which are explained in a single page. The book deals not only with the names of rock types, but also with those indicating their structures and other characters, and we shall know now what is meant when a rock is referred to as being "lepidoblastic" or "glomeroplasmatic."

A useful feature is a list of the commoner prefixes and suffixes and the meanings usually attached to them by petrologists, and there is a glossary of French and German terms. A tabular classification of rocks, including ore deposits, follows, and presents many novel and interesting features. It is based partly on fundamental principles of rock genesis, and so far it is likely to hold its own in the future; and partly on arbitrary numerical criteria, and must to that extent be considered only a provisional stage in the evolution of a scientific classification. There is an instructive synopsis of processes of alteration due to igneous exudations, and of their products; and the classification of metamorphic rocks according to their structure into maculose, schistose, gneissose, and granulose appears to be distinctly useful.

J. W. E.

Liquid Air and the Liquefaction of Gases. By Dr. T. O'Conor Sloane. Third edition, revised and much enlarged. Pp. 394. (London: Constable and Co., Ltd., 1920.) Price 21*s.*

IT must be confessed that the *raison d'être* of this book is not easy to discover. From its sub-title ("A Practical Work," etc.)—and, we may remark, from its price—one might expect an authoritative book of reference for the engineer. It is, however, intended as a popular exposition of the history of the liquefaction of gases.

An introduction to the elementary facts of physics is followed by a series of chapters on the personalities, methods, and apparatus of some leading experimenters, beginning with the work of Faraday, and culminating in the achievements of Mr. Charles E. Tripler. An outline is given of the Linde, Hampson, and Claude processes. Numerous experiments, such as that of pouring liquid air on the floor, or boiling it on a block of ice, are described and illustrated. Indications are given of some applications of liquid air.

The author has evidently read with care much of the historical literature, and his digests of some of the early work are well told. He would probably not lay claim to a first-hand acquaintance with the scientific and industrial cryogenic developments of the twenty years which have elapsed since the book was first written; and it may be doubted whether the information imparted is of a kind to satisfy any but the most superficially minded of readers.

George Stephenson. By Ruth Maxwell. (Heroes of All Time.) Pp. 192. (London: George G. Harrap and Co., Ltd., 1920.) Price 3*s.* 6*d.* net.

AN account is given in this book of the more important events which marked the career of George Stephenson. A few pages are devoted to a brief account of his childhood and early struggles. Then comes an account of the invention of the "Geordie" safety lamp for use in mines, which was brought out simultaneously with Sir Humphry Davy's famous lamp. The remainder of the book records in detail the more interesting points in the history of the great engineer from the time when he built the Stockton and Darlington Railway onward, and it is amusing to read of the struggles he had from time to time to secure the requisite Parliamentary authority for building railways on which traffic would travel at ten miles an hour! Nine excellent full-page illustrations showing some features of British railways in Stephenson's time make an agreeable addition to an interesting book.

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.]*

Heredity.

MAY I bring the following considerations before readers of NATURE interested in the study of heredity and evolution? I daresay I am wrong, but I should be glad to learn just how I am wrong.

The multicellular individual springs from a germ-cell. Presumably he inherits solely through that cell. In the germ are none of the characters which he afterwards develops—limbs, scars, instincts, knowledge, and the like. These are characters not of a cell, but of a cell-community—the soma. The germ contains nothing but potentialities (powers, capacities, diatheses, tendencies) for producing in its massed cell-descendants these communal characters in response to fitting influences (stimuli)—food, internal secretions, heat, light, moisture, functional activity (use), injury, and the like. Strictly speaking, therefore, nothing is inherited save potentialities—powers to develop in this way and that in response to this and that stimulus. Lacking the right influences, an individual may not reproduce all that he inherits, but he can reproduce nothing that he did not inherit. Reproduction is inheritance *plus* development. In the case of variations development occurs without inheritance; the individual does not then reproduce; he merely produces. Such colloquialisms as "The son has inherited his father's muscles" do no harm so long as the real truth be borne in mind; but if the truth be forgotten, endless loose thinking, confusion, and futile discussion may result, and often has resulted, as we shall see presently. Problems concerning potentialities are, of course, matters for the student of heredity. Problems concerning reproduction (as to what influences cause development) are equally, of course, matters not for the student of heredity, but for the student of physiology.

The sum of the potentialities in the germ whence the individual springs is his nature; the sum of the influences which play on him and cause, or prevent, or change his development is his nurture. Both nature and nurture are necessary and equal factors in the development of all characters. The query as to whether nature or nurture is the stronger is akin to a query as to whether the steam or the engine is the more potent in moving the train. Nature and nurture are never warring, but always co-operating, factors.

Individuals differ by nature and by nurture. They vary, and then their differences are *innate* or *germinal*. They are modified, and then their differences are *acquired* or *somatic*. Obviously, the words in italics are used intelligibly when employed to describe likenesses and differences between *individuals*. Thus we know what is meant when we are told that one man is by nature or by nurture darker than another. But, obviously again, they are used incorrectly and unintelligibly when employed to describe likenesses and differences between characters. How, for example, is a head more innate and germinal and less acquired and somatic than a scar? Can anyone tell us in precise language? The scar is as much founded on germinal potentiality as is the head; the head is as much a product of nurture and as much situated in the soma as is the scar. Evolution has so fashioned the race whence the individual sprang (has conferred on it such a nature) that, given a certain kind of nurture, he produces a head, and given another kind of nurture, he produces a scar. Plainly, all characters are both innate and acquired, germinal and somatic, in precisely the same sense and degree. Plainly, also, inheritance (*e.g.* of latent ancestral traits) is one thing, while reproduction is another and quite a different thing.

Of course, we may, if we please, give arbitrary, limited, unusual meanings to our words. But we shall then, with the multiplicity of meanings, risk confused thinking. As Bacon said, "Men believe that their reason rules over words; but it is also the case that words react, and in their turn use their influence on the intellect." Thus we may limit the terms "acquired" and "somatic" to those characters which develop in response to use and injury, while reserving the terms "innate" and "germinal" for all other characters. This, indeed, is commonly done. Thus the abnormal musculature of the blacksmith is termed "acquired," while the normal development of the ordinary man is supposed to be innate. But the result is confusion worse confounded, for the muscles of the ordinary man also develop from birth forwards in response to use. Like most human structures, unused muscles, even in childhood, do not develop; they atrophy; they owe not only their development, but even their maintenance to use. If, then, we give these meanings to our words, we must apply the term "acquired" to vastly more than we do now, and we must go back to the infant, or beyond him, to find the natural man. Or, again, the word "innate" may be limited to the "normal," and "acquired" to the "uncommon." In that case we should have to term variations "acquirements," and call the English language germinal in England and acquired in France. In fact, no matter what arbitrary meanings we take, the moment we embark on them we are swamped in a sea of confusion.

Darwin founded his theory of natural selection on the supposition that innate likenesses and differences between individuals were transmissible. However he expressed himself at times, his meaning was usually clear. Lamarck founded his theory on the supposition that acquired likenesses and differences between individuals were transmissible; but he expressed himself in terms of characters, and his meaning, as we shall see immediately, was never clear. Gradually, especially after the advent of Weismann, discussion centred more and more on characters, some of which were termed "germinal" and others "somatic." At present most biologists hold that "acquired characters are not transmissible." But here again, can anyone explain precisely what he means? So far as I am able to judge, that pronouncement is neither true nor untrue; it is purely nonsensical.

Consider the following, which I think most biologists will consider true, and, I suppose, all will consider intelligible: "Heads, being germinal characters, are inheritable; but scars, being somatic, not germinal, are not inheritable." But since only potentialities are present in the germ, all we can mean by the statement that heads are transmissible is that offspring, inheriting like natures from their progenitors, reproduce, under like conditions, like heads. If we gave our words the same meanings, we should say that a scar is inherited when a child reproduces it under the same conditions as the parent did (*i.e.* in response to the nurture of injury). The child would then be like, both by nature and by nurture, to the parent. But no biologist regards a scar so reproduced as inherited. It would be regarded as inherited only if the child reproduced it

in a way in which the parent did not, and could not, have produced it, *i.e.* only if the child became profoundly different by nature from the parent, *only if it varied*. It follows that the word "inherit" (because often used as synonymous with "reproduce") is employed, commonly but quite unconsciously, with two directly opposite meanings. When applied to "germinal" characters it is given its ordinary meaning; it then means *inherit* (in the only sense in which anything can be said to be inherited). When applied to "acquired" characters it means *vary*. All this loose use and misuse of words—innate, germinal, acquired, somatic, inherit, reproduce—is a legacy from the days, before the discovery of cells, when students of heredity thought in terms, not of the germ-tract, but of the whole individual, the soma. "Germinal" and "somatic" are modern terms, but they reproduce ancient, inaccurate, popular ideas. The result has been half a century of futile labour, discussion, and confusion. If it be thought that I am mistaken as to all this, can anyone tell us in precise terms what in the world the Lamarckian controversy was *about*; or what is meant when it is said that some characters have "representatives in the germ-plasm" while others are merely due to "light, heat, moisture, and the like"; or what is intended when an inquirer seeks to ascertain to what categories (germinal or somatic) certain characters belong, and so on?

Is not the following universally and indisputably true? Does it not cover the whole Neo-Darwinian-Lamarckian field, and much besides? *The sole antecedent of non-inheritance is variation. Apart from variation, like exactly begets like when parent and child develop under like conditions.* But if this general statement be true, the study of heredity is relatively simple. Its difficulties have resulted not so much from the complexities and obscurities of reality as from those of language.

The natural inference from the discovery of cells and their mode of origin is that heritage travels down the germ-tract. The *necessary* inference from this, in turn, is that all the characters of the individual are innate, acquired, and inheritable in exactly the same sense and degree. The inference which Weismann, hypnotised by words, drew was that acquired characters are not transmissible. If we give our words their natural meanings (which is not the meaning the Lamarckians gave), there is sense in the statement that acquired characters are transmissible. *Of course,* acquired characters are transmissible in exactly the same sense and degree that any characters are transmissible. But there is absolutely no meaning in the Neo-Darwinian statement that acquired characters are not transmissible. It is like a declaration that five miles weigh five pounds.

G. ARCHDALL REID.
9 Victoria Road South, Southsea.

Squalodont Remains from the Tertiary Strata of Tasmania.

DURING a recent visit to the north-west coast of Tasmania I was fortunate enough to discover in the Tertiary beds at Wynyard—usually regarded as Miocene—the skull and a good proportion of the skeleton of a Squalodont whale. The fossil is in a particularly good state of perservation, and has been removed to the biological department of the University of Tasmania.

The remains so far discovered in Australia which can be assigned definitely either to the Archæoceti or to the primitive Odontoceti comprise in all some six or seven teeth, so that the present discovery is of more than passing interest. A detailed description of this specimen will be published later, but I have thought that a preliminary notice might be of interest to British naturalists.

The following is a short summary of the characters of the skull of this fossil:

Measurements.—Total length, 56 cm.; zygomatic breadth, 37·6 cm.; snout length (from bottom of antorbital notch), 25·5 cm. Whole skull, dolphin-like; snout shorter in proportion to skull than in Squalodon, longer than in Prosqualodon or Patriocetus; shape of snout triangular, but slightly concave on each side. Nasal bones similar to those of Prosqualodon. External nares not so far back as in Squalodon. Supra-orbital plate of frontal not entirely covered by the supra-orbital process of the maxilla. Supra-occipital strongly developed, meeting frontals anteriorly, and so preventing the parietals from entering into the formation of the skull-roof. Symphysis of mandible extends to posterior edge of first molar.

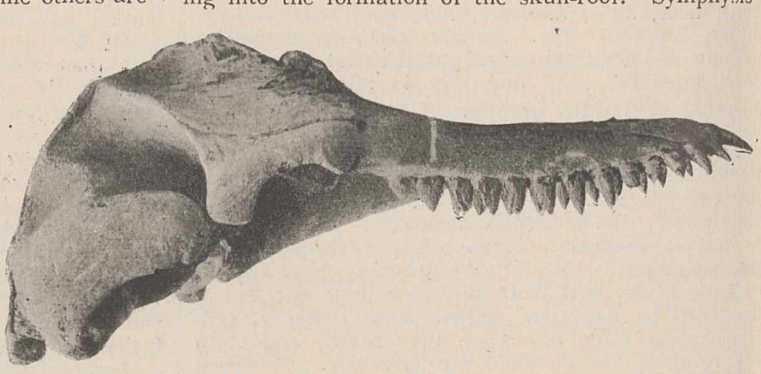

FIG. 1.

Dental formula: I 3/3, C 1/1, P 4/4, M 6/6 (Van Beneden's notation).

Posterior molar in each jaw degenerate. All molars two-rooted, with indications of disappearing third root. Roots of molars connected by an isthmus as in Prosqualodon; roots of premolars coalesced, though separated by a groove in some cases. All teeth closely packed in jaw, sometimes overlapping. Molars with three cusps on each edge, making, with the primary cusp, seven cusps in all. Pattern of surface of molar teeth can be seen from Fig. 2, (B) and (C).

The arrangement of the bones of the skull-roof marks this skull as being that of a Squalodont, but there are features in which the specimen closely approaches the Archæoceti, *e.g.* in the form of nasals, the position of the external nares, and the shortness of the rostrum. The problems centring round the dentition need not be discussed here.

It is possible that these remains might be referred to one of the genera Parasqualodon and Metasqualodon founded by Hall on an examination of the Australian teeth referred to above.

This is a point on which a definite opinion can be given only after a detailed examination of the teeth in the National Museum, Melbourne. I have refrained, therefore, from referring the specimen to any genus.

With regard to the figures accompanying this letter, Fig. 1 shows the skull from the right side, and Fig. 2 (A) the posterior premolar, (B) the fourth molar,

and (C) the posterior molar, all of the left ramus of the mandible. In (B) and (C) can be seen the isthmus joining the roots of the molars and the traces of the original third root. The peculiar cusp-like pattern on the face of the teeth is also well shown.

It should be mentioned that the knob which is

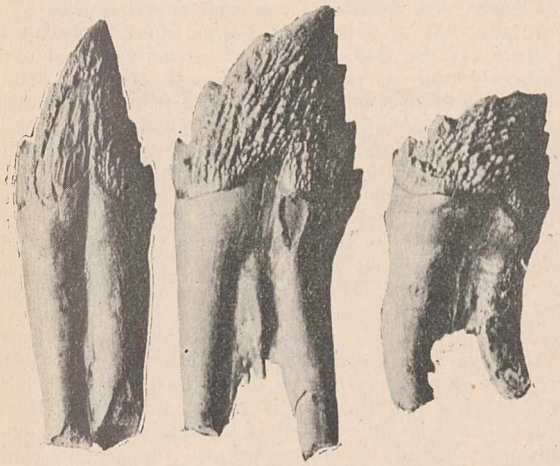

FIG. 2.

apparent in front of the nasal region of the skull in Fig. 1 is merely a concretion difficult to remove without damage to the skull.

T. THOMSON FLYNN,
Ralston Professor of Biology.

University of Tasmania, Hobart, September 9.

The Energy of Cyclones.

I DO not find that people in general are aware of an important source of energy for the maintenance and intensification of cyclones, nor am I acquainted with a clear exposition by a meteorologist that the condensation of aqueous vapour will suffice.

Atmospheric pressure being a ton weight per square foot, the disappearance or collapse of a cubic foot of ordinary air would yield a foot-ton of work. The disappearance, by complete condensation, of the aqueous vapour in 760/12·7, say 60, cubic feet of atmosphere would yield the same amount.

If, then, the temperature of saturated air fell from 18° to 12° C. by reason of condensation and rainfall, so that the vapour-pressure diminished from 15·36 to 10·46 mm. of mercury, a foot-ton would be generated in each 155 cubic feet of that region of the atmosphere. Incidentally, the corresponding deposit of liquid would be 5 grams per cubic metre, or a rainfall of $\frac{1}{3}$ in. from a vertical mile of air.

Assuming that the above fall of temperature in the central region of a travelling cyclone is not excessive, the energy available in each cubic mile of it would be nearly a thousand million foot-tons.

OLIVER LODGE.

WITH reference to Mr. R. M. Deeley's letter on the above subject in NATURE of November 11, may I suggest that the energy of a cyclone is derived from the heat-energy of the earth's surface? If we assume that the air which ascends in the centre of the vortex is less dense on the whole than the air which is at the same temperature outside the vortex, then, since the ascending current must be compensated by a descending current elsewhere, the air will go through a thermodynamic cycle in which positive work will be done at the expense of the heat communicated at the earth's surface.

The process may be compared roughly to a Carnot's cycle, in which the inflowing air at the earth's surface is isothermally raised in temperature, expands adiabatically as it ascends, cools isothermally by radiation at the higher levels as it flows outwards, and contracts adiabatically in descending again. The work done would appear as increased vortical motion if the conditions were favourable, and the mechanical forces causing the motion would be due to the differences of hydrostatic pressure within and without the cyclone.

J. R. COTTER.

Trinity College, Dublin, November 13.

Molecular and Cosmical Magnetism.

RECENT researches on magnetism tend to suggest that the negative electron may be a magneton or unitary electromagnet as well as a unitary electric charge, consisting, that is, of an anchor-ring of negative electricity in rotation about its axis of symmetry. Such a magneton would behave mechanically like a gyroscope; magneto-gyroscopic effects have been previously considered and observed in relation to ferromagnetic bodies on the assumption that the ferromagnetism is due to electrons in orbital motion as a whole. Wider conclusions can be drawn, however, if the magneton hypothesis is adopted, and the deductions are of importance, not only in the theory of atomic and crystal structure, but also in relation to cosmical magnetism. The following notes describe a few of the more important consequences; a detailed account of the theory and of some experiments designed to test its validity will be published shortly.

A magneton rotating with any kind of matter will tend to align its axis parallel with the axis of rotation. Since the electricity of the magneton is negative, the direction of magnetisation will be related to that of rotation, as is the direction of translation to that of rotation in a left-handed screw. This is the right direction in order to account for the general magnetic fields of the earth and sun as due simply to their rotation. The explanation of the observed magnitudes of these fields seems to present no difficulty; numerical details will be given in the forthcoming paper, where also a theory will be suggested to account for the rapid radial diminution of intensity in the sun's general magnetic field.

Mr. S. J. Barnett has shown by delicate experiments on ferro-magnetic bodies that they become magnetised slightly on being rapidly rotated, and has propounded a theory according to which such bodies should acquire magnetisation of amount proportional to the angular velocity, the factor being a universal constant depending on the ratio (mass/charge) for an electron. The fields observed and calculated (on this theory) agree as to order of magnitude, but are quite inadequate to account for solar and terrestrial magnetism. The theory, however, apart from the fact that it is based on the hypothesis of electrons in orbital motion, seems to require serious modification.

On the present theory, magnetisation by rotation should be shown by dia- and para-magnetic bodies as well as by ferro-magnetic substances, and the intensity should be proportional to the angular velocity only when the substance is in such a state that the constraints exerted on the magneton by neighbouring nuclei and electrons are strictly elastic. In this case, moreover, the factor of proportionality will not be a universal constant, but will vary with the nature of the constraints, and in particular with temperature; in hot bodies the intensity of magnetisation should

be greater than in cold ones. An extreme case is that in which the temperature is so high as to produce general dissociation of the electrons from the nuclei, as appears to occur in the interior of stars. Apart from the disturbance produced by collisions, the magnetons are then free to set their axes parallel to the axis of rotation, and a large proportion of them would seem to do this in certain cases (*vide infra*). The upper limit of magnetisation is reached when all the magnetons are set parallel to the axis; this limit can be calculated in some cases, it being possible to estimate the number of electrons in electrostatically neutral matter of given kind and density. Other things being equal, the maximum magnetisation will be proportional to the density and independent of the speed of rotation.

The magnetic fields of the earth and sun can thus be accounted for on the present theory because these bodies are at a high temperature (in the case of the earth this is so except for the parts near the surface); what has hitherto been an obstacle in framing theories of their magnetic fields is here regarded as probably the determining factor as regards magnitude.

The same explanation applies to sun-spots. These occur in pairs of opposite magnetic polarity, and it has been pointed out that the polarities are such as would be accounted for by negative electricity in rotatory motion such as is observed (with opposite directions) in the members of a sun-spot pair. The sun-spot pair is thus regarded as the surface portion of a "line"-vortex continuously connecting the ends beneath the surface. The difficulty has been that no Stark effect is observable, such as would accompany rotating charges of the required amount; it has therefore been suggested that the magnetism of sun-spots is due to galvanic currents, *i.e.* electrons in translatory motion through electrostatically neutral matter. This hypothesis is unnecessary; it seems possible to account for the observed fields, of order 3000 gauss, simply by the observed rotation of the matter composing the vortex, on the above magneton hypothesis.

The obliquity of the magnetic axes of the earth and sun requires some additional hypothesis for its explanation, since an unsymmetrical condition cannot be accounted for by a cause, like rotation, symmetrical about an axis. The obliquity being present, however, it seems possible to explain the secular variations of the solar and terrestrial magnetic fields as due to precessional motion of the magnetons. A magnetic field applied obliquely to a magneton will tend to cause it to precess round the lines of external magnetic force. The magnetic fields of the earth and sun, due mainly to rotation, will exert this effect on any magnetons the axes of which are inclined to them; the speed of precession depends solely on the strength of the applied field if the magnetons are free, and the direction of precession agrees with the direction of rotation of the magnetic axes of the earth and sun.

S. CHAPMAN.

The University, Manchester, November 13.

Physiological Effects of Alcohol.

DURING recent years a good deal of work has been done and a great many results have been published on the above subject. Some of these have been very recently reported in the general Press. In most, if not in all, of the researches which have been made on the physiological effects of moderate doses of alcohol, taken in the form of beer, spirits, or other alcoholic beverages, but little attention has been paid to the very important disturbing influence of what may be called "secondary products"—whether extractive matters normal to the beverages in question or volatile by-products of the alcoholic fermentation process itself. Most people are aware that there is no *definite* relationship between the intoxicating effects of certain wines and the amounts of alcohol which they contain, and the marked difference in the physiological effects of new whisky on one hand, and of well-matured spirit *of the same alcoholic strength* on the other, is a matter of common experience.

In the case of beer the soporific effect depends not a little on the hop and other extractives, and consequently there is no scientific justification for drawing any definite conclusions of a quantitative character as to the physiological effects of small doses of alcohol unless the beer used in the whole series of experiments had been of precisely the same character throughout, and even then the "personal equation" would introduce a further serious difficulty. Most beer-drinkers of middle age are well aware that the physiological effects of bitter beer on one hand, and of mild ale or lager (which are less heavily hopped) on the other, are not by any means the same, even for equal percentages of alcohol. The investigation of the effects of these various "secondary" constituents undoubtedly presents great experimental difficulties, but until their physiological significance is better understood there must always be an element of uncertainty in any conclusions arrived at in regard to the physiological effects of small doses of alcohol taken in the form of the usual alcoholic beverages.

A. CHASTON CHAPMAN.

London, November 15.

Atomic Structure.

THE arrangement of the non-nuclear electrons in the atom is being determined by work along two lines: first, from the Bohr-Sommerfeld theory of characteristic frequencies, and, secondly, from the Lewis-Langmuir or Born-Lande theory of the structure of molecules, supported by Prof. W. L. Bragg's work on atomic radii in crystals. It has been stated several times recently that the conclusions drawn from the two sources are mutually inconsistent, in that the first indicates that the electrons are revolving in planetary orbits, and the second that they are fixed in constant positions. The essential truth of the first theory is now beyond doubt; the second is extremely plausible. If they are really inconsistent the position would be intolerable.

But they are not really inconsistent. The Bohr-Sommerfeld theory does not make explicit use of the assumption that the electrons in their stable states are moving; it assumes only that in those states they have the energy, calculated by Hamiltonian (relativity) dynamics, which they would have if they were moving in certain orbits. It is not logically impossible to maintain that they have that energy and are yet at rest. Nor is it physically impossible if we accept Bohr's principle of "correspondence," which has been so astoundingly successful in explaining the Stark effect and in predicting the number of components in lines of the hydrogen and helium spectra. According to that principle, the intensity and polarisation of components can be predicted by the application of classical dynamics to certain assumed orbits, although it must be assumed at the same time that the electrons are *not* moving in those orbits. If intensity and polarisation can be predicted from orbits that are wholly fictitious, why not energy?

Of course, the adoption of Bohr's principle in this extreme form would sever the last connection between classical dynamics and the real structure of the atom. But we are surely now all convinced that we must abandon part of that connection. Is there any reason

but mere conservatism that makes us hesitate to abandon all of it, and to admit that, even in respect of energy, a fixed electron can have the properties which classical dynamics attributes to a moving electron? Classical dynamics, it is clear, is only "statistical"; what are the principles of the elements of the statistical group is the main problem of the physics of the future. NORMAN R. CAMPBELL.

November 16.

The Testing of Balloon Fabrics.

ON p. 130 of the Report of the National Physical Laboratory for 1919 reference is made to the testing and experimental work carried out in connection with the manufacture of balloon fabrics for war purposes, and in connection with this we wish to place on record this company's work in the manufacture of materials, especially hydrogen-proof fabric, for lighter-than-air craft.

The North British Rubber Co., Ltd., first took up the manufacture of this material in 1908, and, realising that the problems involved in manufacture necessitated scientific control, as a preliminary installed in its laboratory an apparatus for measuring the permeability of rubber to hydrogen, and thereafter initiated research into the factors responsible for the deterioration of rubber under the influence of light.

When the Admiralty installed its test station at Manchester we were requested by the officer in charge to furnish drawings of the special type of hydrogen diffusion apparatus which had been designed at Castle Mills, and one of its staff received a course of instruction in the company's laboratories on the procedure to be followed in testing balloon fabric. At a later period of the war this department was taken over by the newly formed War Office Aircraft Fabrics Department, which installed an extended testing plant, and another member of that staff also received his training in this work in our aeronautical laboratories.

The Aeronautical Inspection Department was also indebted to the laboratory of the North British Rubber Co., Ltd., for the training of some of its scientific staff, and its testing equipment was in many respects also based on the results of this experience.

During the course of the war our output was steadily increased, and at the armistice we were manufacturing more than 35,000 yards of balloon fabric per week, every piece of which was tested in our aeronautical laboratories for weight, strength, and hydrogen leakage.

The investigation of the research laboratory into the action of light on rubber resulted, moreover, amongst other things, in a discovery which, without any increase in weight, permitted the production of a fabric of vastly enhanced durability specially suitable for use in the tropical theatre of the war.

Our reason for asking for the publication of this communication is only for the purpose of stating that at least one manufacturer was sufficiently well equipped, not only in the manufacture, but also in their scientific staff and laboratories, to carry on without outside help, and it is not intended to detract in any way from the very useful and great assistance which the National Physical Laboratory gave to Government Departments and others starting out in what was probably new ground to them.

W. A. WILLIAMS,
Works Manager.

The North British Rubber Co., Ltd., Castle Mills, Edinburgh, November 12.

Luminosity by Attrition.

WITH reference to Sir Ray Lankester's suggestion in NATURE of November 4 that chemists should endeavour to ascertain the cause of the "empyreumatic" odour which accompanies the flashes of light produced by rubbing two quartz pebbles together, may I suggest also that the inquiry might be extended to include other substances which possess this property of triboluminescence?

The property is not confined to *crystallised* silica; it is displayed also by the amorphous varieties (opal, etc.) and by flint and chert.

Felspars possess the property in varying degrees; in general, it is more pronounced in the alkali felspars than in the lime-soda species. Fused albite displays the property.

Certain types of igneous rocks, both crystalline and glassy, behave in the same way. The property is most marked in the acid types; in the basic types (*e.g.* picrites, etc.) it is feeble or wanting.

Among the sedimentaries, sandstones, arkose, etc., and among the metamorphics, gneiss and some crystalline schists, display the property. The empyreumatic odour is a general accompaniment in the cases referred to above.

Saccharin and certain varieties of sugar possess the property in a moderate degree, and Dr. Lawson (Newcastle) has observed it in uranium nitrate when crystals of the salt are shaken up in a bottle.

I have investigated a large number of other substances (artificial glasses, rocks, and minerals); in the main, the results are negative.

Luminescence occurs between any pair of the "active" rock or mineral substances mentioned, and it would seem that the property is not dependent on crystallinity or wholly on chemical composition, but its relation to silica content (in silicates, etc.) is as yet obscure.

As regards the crystalline substances, the idea prevalent on the Continent is that during the process of crystallisation some of the outer electrons of the atom-system become detached, as it were, from the rest, but can recombine, with accompanying luminescence, under the stimulus of violent vibration. On the other hand, it may be a piezo-electric phenomenon; strain and deformation may induce positive and negative electrical charges on neighbouring particles, discharge being accompanied by luminescence. As the investigation is incomplete, further discussion would be out of place. A. BRAMMALL.

Imperial College of Science and Technology (Royal School of Mines), South Kensington, S.W.7, November 13.

Spiranthes autumnalis.

IN NATURE of September 16, p. 79, I reported the occurrence of this orchis, new to Scotland, in Lower Strathspey. As I can find no record of the species growing on soil other than cretaceous, and as there is no lime in the soil where I found the plants, I suspect that I may have been deceived by the superficial resemblance between Spiranthes and *Goodyera repens*. The point, of course, might have been decided at once by lifting a root; but, being very unwilling to disturb rare plants, I refrained from doing so. I hope to return to the place next summer to verify the species; until then I must ask botanists to dismiss my note as *non avenue*. If it should prove that I have erred, I have done so in good company, for was not Sir Joseph Hooker deceived by the decussate, scale-like leaves of *Veronica cupressoides* into pronouncing that plant to be coniferous from specimens sent from New Zealand? HERBERT MAXWELL.

Monreith.

Negro Life in South Central Africa.[1]

By SIR H. H. JOHNSTON, G.C.M.G., K.C.B.

THERE have been very few books like the two volumes before us published about any people of arrested development, even in Germany, where, before the war, a certain standard of perfection was reached in ethnological treatises. It is difficult to find any fault with the work, in regard to either what has been put in or what left out. The authors are the Rev. Edwin W. Smith, an honorary chaplain to the Forces and a Church of England missionary to the Ba-ila, and Capt. Andrew Murray Dale, a magistrate in the British South Africa Company's administration. Capt. Dale died (unhappily) last year of blackwater fever, worn out with much war service. The Rev. E. W. Smith, if I mistake not, saw considerable war service in Italy and elsewhere, and his work with the Forces kept this remarkable book back from publication for some little time. Incidentally, I might mention him as well known to students of Bantu. He was the author of a handbook of the Ila language, and an important contributor to the information on South-west African languages in my "Comparative Study of the Bantu."

The Ila people inhabit the central part of Northern Rhodesia, especially the region through which flows the great river Kafue. (This name seems to be a corrupted and abbreviated form of Kavuvu or Kafubwe, which means "Hippopotamus.") They have evidently been a conquering race of invaders from the north-east which has imposed its language and customs on less courageous tribes of inferior physique. The true Mu-ila is—for a pure Bantu negro—rather a handsome type, at any rate in beautifully formed and proportioned body and limbs; but other tribes speaking the Chila language to-day are of different stocks; some may even go back for their ancestry to Bushmen or to Congo pygmies, and in remembrance of this they are called "Batwa" (dwarfs) to this day. Others, again, belong to the Luba group, the men of which have almost an Arab cast of features and a full beard.

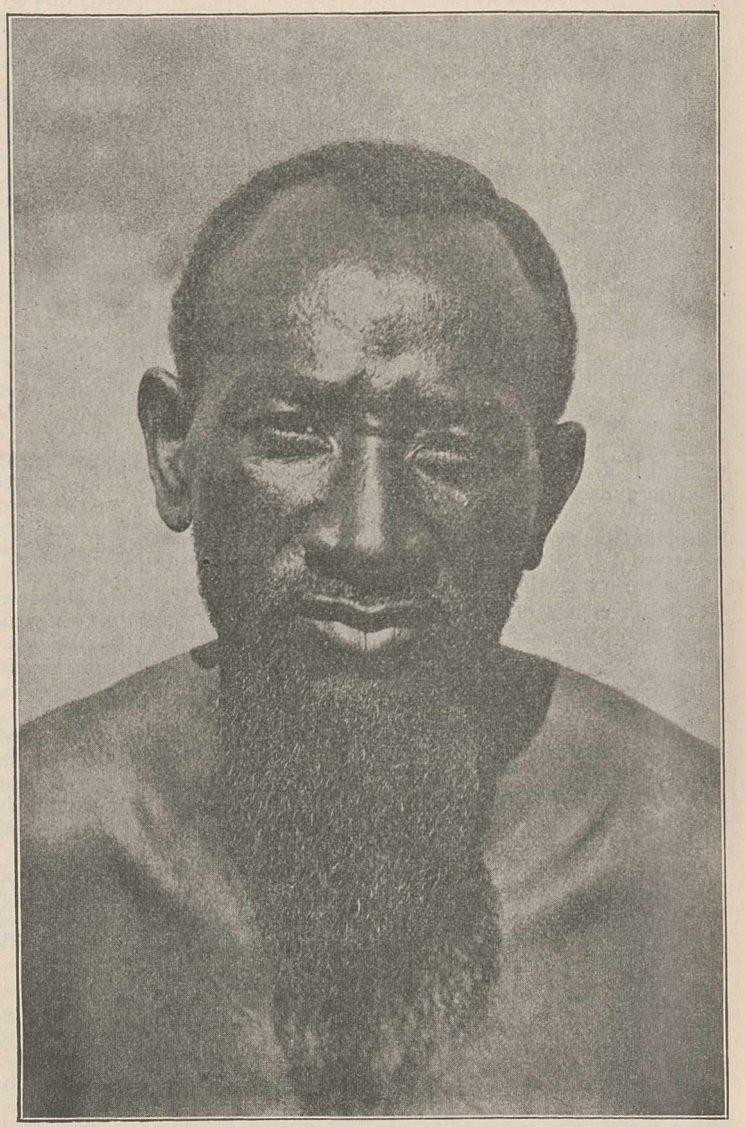

FIG. 1.—A Baluba type. From "The Ila-speaking Peoples of Northern Rhodesia."

This most noteworthy work deals with the history, the physical characteristics, clothing (often lacking in the males), building operations, food, domestic animals (their cattle are straight-backed, and seem to have come to them from the west and south, the old Damara-Ngami breed and Portuguese), hunting, warfare, medicine, iron-work, pottery, social organisation, terms of relationship, religious beliefs, relations of the sexes, folk-lore—and what perhaps is most interesting and novel, their ideas about psychology, astronomy, biology, the undefined external forces of Nature, thaumaturgy, and therapeutics. The chapter on etiquette brings home to one how minutely these seemingly savage men and women may order their lives by prescribed custom, and what slaves they can be to convention. No newly enriched person in our own land, wishing to move

1 "The Ila-speaking Peoples of Northern Rhodesia." By the Rev. Edwin W. Smith and Capt. Andrew Murray Dale. In two vols. Vol. i., pp. xxvii+423; Vol. ii., pp. xiv+433. (London: Macmillan and Co., Ltd., 1920.) Price 50s. net two vols.

without attrition in the highest circles, need undergo such a tax on the memory as the stranger who would desire neither to offend nor to shock a Mu-ila man or woman. The language is full of pitfalls, because it is as rich in double meanings as any European tongue. You may be grossly indecent in alluding to common objects of the house or garden implements.

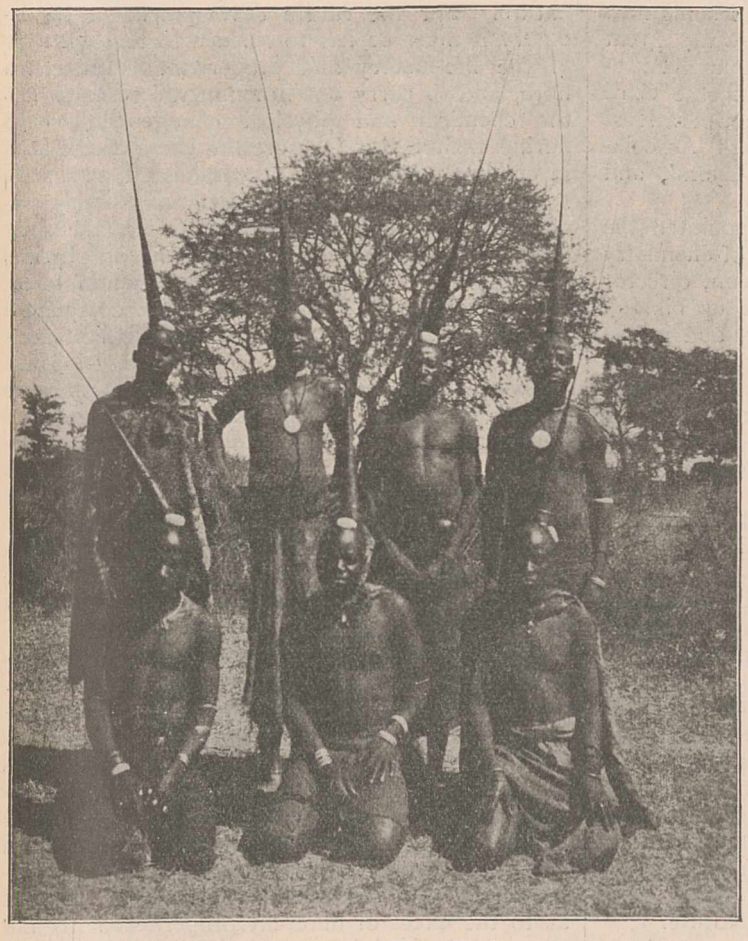

FIG. 2.—Young Ba-ila fresh from the hairdresser. From "The Ila-speaking Peoples of Northern Rhodesia."

The Ba-ila are so sensual that the relations between the sexes are nearly promiscuous. Yet here again everything must be governed by custom. One man may be fined lightly for a gross act of immorality, while another will be mulcted severely for merely alluding to an indecent proposition. Many of the dances and a number of the songs—especially those sung at funeral ceremonies—are termed by the authors "phallic," and here very sensibly they quote the actual words and deeds, lest imagination should exaggerate. The authors conclude that this condition of immorality, especially among quite young people—children not fully mature—is leading to a seriously diminishing birth-rate.

In some writings on Africa missionary work is still sneered at; but one result—especially in South and East Africa—has been to raise the birth-rate amongst the negroes by discouraging polygamy, and, above all, by strenuously urging the abolition of the depraving initiation ceremonies and all immodest behaviour amongst young girls and boys. The worst feature in Ila-land is the abuse of quite young girl-children by adult men.

But the study of these primitive people as a whole leaves one with a very pleasant mental impression, alike of them and of their two interpreters, Mr. Smith and Capt. Dale. The absolute truth is told about them, but it is told so tersely, with so much humour, sympathy, and insight, that the discriminating reader, the ethnologist above all, rises from the reading of "The Ila-speaking Peoples" with a sense of gratitude to the authors and with a wonderfully vivid impression of negro life in South Central Africa—a life in that particular region very little influenced as yet by the white man. One hopes sincerely that the Ila people may turn the corner under wise administration and missionary teaching, and become in time a flourishing race, playing a considerable part in the development of Northern Zambezia.

Industrial Research Associations.

III.—The British Cotton Industry Research Association.

By Dr. A. W. Crossley, C.M.G., F.R.S.

THIS association was incorporated in June, 1919, but much valuable work had been done previously by a Provisional Committee appointed by the Department of Scientific and Industrial Research towards the end of 1916. The Committee was presided over by Mr. J. W. McConnel, to whose efforts it is largely due that more than 90 per cent. of all the spinners, doublers, manufacturers, bleachers, dyers, calico printers, and finishers engaged in the cotton industry have given their support to the association, which now numbers 1461 members, including representatives of the lacemaking and hosiery trade. The first chairman of the association was

Mr. H. R. Armitage, of the Bradford Dyers' Association, who was most unfortunately compelled to resign owing to ill-health after a few months' activity. His place has been taken by Mr. Kenneth Lee, of the Tootal Broadhurst, Lee Co., Ltd. The council of the association is composed of men representing all sections of the industry, and is strengthened by the inclusion of some men of science and leaders of the following great operatives' organisations: the Amalgamated Association of Operative Cotton Spinners, the Card and Blowing Room and Ring Frame Operatives' Association, the Amalgamated Weavers' Association, and the Operative Bleachers', Dyers', and Finishers' Association.

In November, 1919, the council appointed the present writer, then Daniell professor of chemistry in King's College, University of London, director of research. He was unable to take up his full duties until April of the present year, and in the meantime plans for the future development of the association's activities were discussed. It was decided that individual scientific effort would not give the desired results, which could only be obtained by establishing an institute worthy of the great cotton industry, where all the sciences involved in that industry would be found represented and working in the closest co-operation. Apart, therefore, from the annual income of the association, the council has decided to raise a special building fund of 250,000*l*. A property with more than 13 acres of ground has been purchased in Didsbury, and the existing house adapted to serve as the administrative block, with accommodation for offices, library, council room, etc., as well as dining rooms, rest rooms, and some living rooms for the research workers. Owing to the housing difficulty, it has also been decided to build a certain number of houses in the grounds, where the first portion of the laboratories and workshops is also in course of construction. The whole will be known as the Shirley Institute.

The heads of the following departments have been appointed: Information and records bureau; botany; colloid chemistry and physics; general chemistry; organic chemistry; and physics; and, pending the completion of the new laboratories, accommodation has been placed at their disposal by the Manchester University and the College of Technology. The information and records bureau will have for its main object the acquiring of all information regarding cotton, which will be available for the members of the association. In addition, current literature will be abstracted and indexed, and reports on previous work on cotton will be prepared. This naturally means the gradual acquisition of an extensive library, and it is hoped that, in accordance with the suggestion contained in the Report on Libraries and Museums of the Adult Education Committee of the Ministry of Reconstruction (Cmd. 9237), this will become a central library organisation for the cotton industry.

The council has taken a very broad view regarding the nature of the research work to be undertaken, which is necessitated by the almost complete interdependence of the various sections of the industry. Work which will benefit one section must of necessity exert an influence on the whole industry. Hence, as shown by a programme of research drawn up by the research committee for the general guidance of the director and research staff, the work will be mainly of a fundamental nature. For the future development of the industry it must be left to science to find out more of the life-history and properties of the cotton fibre, and to carry out fundamental research into the chemical and physical changes introduced during manufacture, before the users of the fibre, in conjunction with the research staff, can make suggestions for the improvement of existing processes and machinery. For example, the study of the properties (botanical, chemical, and physical) of the single cotton fibre is fundamental to the whole industry. The fibre is of a complicated nature, consisting of differing chemical products enclosed in an outer skin or cuticle, and it is not known certainly whether some bleaching processes remove the cuticle, or how its presence or absence affects the feel, lustre, dyeing, and wearing properties of fabrics. The botanical side will also be concerned with the conditions of growth and breeding of the cotton plant, in so far as these affect the quality of the raw material, and it is hoped that this work will be carried out in the closest conjunction with the research department of the Empire Cotton Growing Committee.

The general purpose of research in cotton spinning will be to connect the properties of the raw cotton with those of the yarn it produces. Evenness of yarn is of importance to both the spinner and the weaver, but methods for improving this and other qualities demand in the first place accurate methods of testing them. During the exploration of this field precise information should be obtained as to the manner in which each existing machine carries out its various functions, and as to the effect of different properties of the raw cotton and of mixings thereof on these functions. Such measurements and information require the invention of special scientific instruments and methods for measuring the properties of raw cotton—*e.g.* length of staple, the diameter, strength, and elasticity of yarns and fabrics, and the effect of temperature and humidity on the spinning properties of the fibre.

The sizing problem is also one of great importance. It is not known, for example, why sizes prepared apparently in the same way should produce in some cases hard, and in others soft, warps, or what is the effect on the size of adding waxes, fats, and other substances, or how these affect the penetration of the threads, strength, and resistance to rubbing; nor is it possible in many cases to trace the cause of defective sizing to its ultimate chemical or physical source, or to predict from an analysis the exact sizing qualities of a given sample of material.

Many other problems could be alluded to—*e.g.* the effect of water and of steam at high and low pressures on the fibre, and the tendering of fibres

and fabrics by acids, light, and heat—but sufficient have been mentioned to show that the whole industry bristles with scientific problems awaiting solution.

In attacking these problems it is certain that a vast amount of purely scientific work will have to be undertaken. The association is fully alive to the fact that pure research has in the past, in this country at all events, been almost the monopoly of the universities; but the scientific workers of our universities have not, generally speaking, been sufficiently in communion with industry fully to appreciate the nature of the problems in pure science which any particular industry required to be solved. The association hopes to keep in close touch with the universities, and that by so doing the ties between the scientific workers and industry may become closer in future. Certainly the association looks to the universities for much help as regards both the pure research work which will emanate from them, and the skilled research workers trained by them.

There is a further way in which relations with the universities may become more intimate, for, owing to the generosity of some of its members, the association possesses a number of scholarships tenable at any university, two of which have just been awarded; it also has the power to endow scholarships and bursaries for the training of persons engaged in studying the principles involved in any of the industries using cotton, or connected therewith, and four such scholarships are now held at universities, two being provided jointly with the Empire Cotton Growing Committee.

The relationship with pure science cannot, however, be strengthened by a policy of the purely "take and be thankful" type; something must be given in return; and it is hoped that science will be enriched by the publication of the pure scientific research carried out in the Shirley Institute. More particularly may this be the case in connection with the development of the department of colloid chemistry and physics, representing as it does a branch of science which has received comparatively little attention in this country.

Obituary.

LORD GLENCONNER.

BY the death, on Sunday, November 21, of Edward Priaulx Tennant, Baron Glenconner of Glen, the country has lost an appreciative friend of all good work, whether in the direction of art or of science, as well as a man of simple, lovable disposition and sterling character.

From his father, Sir Charles Tennant, the first baronet, Lord Glenconner inherited chemical works at Glasgow, to the business of which he attended; but his own tastes lay chiefly in the direction of forestry, natural history, and antiquarian pursuits. To study methods of forestry he had travelled in Germany and in many parts of the world, and his estates bear witness to the care bestowed on tree cultivation. It is well known that he purchased and gave Dryburgh Abbey to the nation a few years ago; and it is more than suspected that he had intended to do the same with Stonehenge had not another benefactor forestalled him. His house, which was characterised by admirable simplicity, was the resort of many distinguished persons, and his picture gallery was often thronged to hear about some discovery of scientific interest.

The loss of his exceptionally promising eldest son in the war was a profound grief to Lord Glenconner, from which perhaps he only half recovered; but he became convinced, and allowed himself to express publicly his conviction, of a reality underlying the old idea of human survival after bodily death.

REGINALD J. FARRER.

MR. REGINALD FARRER, whose death was reported in the *Times* of November 19, was an extraordinarily enthusiastic horticulturist, possessing, in a high degree, a poetic and artistic temperament, an experienced and intrepid traveller, and an accomplished and versatile writer. In horticultural circles he will be remembered as an ardent collector and cultivator of alpine plants, which he knew as few know them. He had studied them on many occasions in their native haunts, and had cultivated them under ideal conditions in his garden at Ingleborough. Many new plants, some of them of great interest and beauty, have been discovered and introduced by him into our gardens, enriching them, and at the same time making a valuable contribution to our knowledge of the flora of China and Tibet. As a geographer also Farrer will be known to many. The award of the Gill memorial medal of the Royal Geographical Society early this year was a recognition of the useful work he had done for geography in his journeys on the Chinese border of Tibet. His lectures before the society on these journeys were published in the *Geographical Journal*, vol. xlix., pp. 106–24, and vol. li., pp. 341–59.

Reginald John Farrer was a Yorkshireman, born forty years ago. At his home, near the beautiful Ingleborough Mountain, he had for many years made gardening, and especially rock gardening, a dominating interest. His natural rock garden is probably a unique example of such a garden in this country. In 1894, when a mere boy, he contributed to the *Journal of Botany* a note on the rare *Arenaria gothica*, which he had discovered in another station at Ingleborough some miles distant from that where alone it had previously been known in Britain. In 1898 he entered Balliol College, Oxford, as a commoner. Later he made several explorations in the European Alps with the special object of studying their vegetation. These explorations were described in

several articles published in the *Gardeners' Chronicle* and in his book "Among the Hills," which appeared in 1911.

In 1903 Farrer undertook a journey round the world, visiting among other places Canada, China, and Japan. He visited Ceylon in 1907, and the years 1914 and 1915 were spent, in company with Mr. William Purdom, formerly of Kew, in exploring the Kansu region of Western China. "On the Eaves of the World," published in 1917, is a narrative of his wanderings and experiences during 1914, which were also the subject of a series of articles in the *Gardeners' Chronicle*. Last year another journey to Eastern Asia was undertaken with Mr. E. H. M. Cox. When about to return home, while travelling on the frontier range between Burma and China, Farrer fell a victim to diphtheria, and died on October 16.

Among the plants Farrer discovered were many new to botany as well as to horticulture. Several new species bear his name; he is also commemorated in Farreria, a new genus of Thymelæaceæ. In addition to works of fiction and those already specified, he wrote "My Rock Garden" (1907), "Alpines and Bog Plants" (1908), "In a Yorkshire Garden" (1909), "The Rock Garden" (Present-day Gardening Series), and "The English Rock Garden"; the last, containing more than 1000 pages and 102 plates, was published in 1919, and was reviewed, perhaps somewhat adversely, in NATURE for February 19 last, p. 664.

In spite of the extravagant, sometimes absurd, language of many of Farrer's writings, he accomplished much work of great value, and his untimely death is a distinct loss, which many will profoundly regret.

Notes.

THE Ministry of Agriculture and Fisheries has issued a memorandum (General Service, November 13) on the mode of spread of foot-and-mouth disease. The outbreaks which have occurred since the beginning of 1919 have enabled a closer analysis to be undertaken of the circumstances favouring infection than has hitherto been possible, the work being carried out by the Chief Veterinary Officer, Sir S. Stockman. One fact emerges as established, viz. that Great Britain, freed from the disease as endemic among animals in a particular district, is invaded only when the disease is prevalent on the Continent, particularly in the North of France, Belgium, and Holland. Live-stock being excluded as a factor of spread of the disease, suspicion falls on human beings, on imported feeding-stuffs, and on litter coming from infected Continental districts. Importation of hay and straw, except for exceptional purposes, has, however, been prohibited since 1908 without materially influencing the occurrence of outbreaks. Carriage of infection by human beings and other means, *e.g.* by bird migration, seems equally improbable. The conclusion is drawn that the virus may be air-borne. The sick animals slobber, and it seems reasonable to suppose that the particles of infected mucus may be carried for long distances in the air, just as volcanic dust is. The outbreaks in this country are more frequent in some districts than in others, and it is suggested that in the areas mostly invaded air-pockets of negative pressure may exist which would account for the suspended virus descending to earth or water.

IN a lecture on "Eugenics and Religion," delivered on November 16 under the auspices of the Eugenics Education Society, Dean Inge pointed out that antagonism to reasonable eugenics, *e.g.* the prevention of deaf-mutes and epileptics from having children, comes not from religion, but from the anti-scientific temper. A general revolt against the dictatorship of science (surely not yet even on the horizon) had been the most remarkable tendency in modern thought. But it seems to us it would have been more accurate to say that the objections even to considering the scientific control of life have come from a widespread sluggishness of intellect, an instinctive dislike of upsetting innovations, and, not infrequently among the elect, an other-worldliness which regards mundane conditions as a swamp to be crossed as quickly as possible. According to Dean Inge, the prospect for the immediate future is as black as it could be, and partly because society has not the seriousness and courage to replace a relaxed natural selection by a thought-out rational selection. At present we are breeding from our worst stocks, and our best are being squeezed out of existence—an extreme statement, probably too epigrammatically reported. But it has enough of truth in it to make us uncomfortable. We note, however, to take a glimpse of the other side, that, apart from the professional classes, many members of which are now prompted by economic pressure to restrict their family or to have none at all—which, as Dean Inge says, means a diminution of the well-born—there is an abundant supply of strong, intellectually alert, and good-willed men and women among working people. It appears to us to be historically true that a large proportion of the men who count have emerged, not from select castes, but from the general body of the population. Dean Inge attaches great importance to the post-war strain on professional men, which makes for restriction of the family, but this has been going on for a long time. He looks forward to a keen struggle for subsistence, which will force man to become a eugenist or to go under. Towards extreme struggle the nation is at present hurrying blindly.

THE chairman of the Colour Users' Association, Mr. Vernon Clay, has issued an important memorandum on the present position of the dye industry in Great Britain from the users' point of view. It is stated that the necessity for the establishment of dye-making factories is particularly a question of national security, because they are capable of maintaining a larger number of trained scientific workers than any other industry. At present the chief drawback with which the dye manufacturer has to contend is lack

of experience in factory production, and while he is obtaining this knowledge some sort of protection must be afforded him. Three methods of safeguarding the infancy of the industry have been suggested. The first, by tariffs, is regarded as useless on account of the fluctuating rates of exchange; the second, by subsidy, is also ruled out owing to the difficulty of allocating a grant in an industry which has numerous by-products; and the third, by prohibition and licensing, is regarded as the only practicable scheme. Only dyes the home manufacture of which was inadequate in quantity or quality would be admitted under licence as imports. Under the Peace Treaty Germany must sell a proportion of her dyestuffs to this country until 1925 at rates similar to those which she obtains from other customers, so that the consumer is protected until that date. The manufacturer receives no benefit, and probably will require financial assistance to enable him to establish his industry. Assuming that after January, 1925, a licensing body were set up, the State, the dye makers, and the dye consumers should be represented on it; the last should have the preponderating voice because they will bear the brunt of the expense and inconvenience caused, and are the persons who can best gauge the effects on export trade, but the Government would retain the right of veto. The Government urges that this would place the power to defeat legislation in the hands of the consumers, and therefore negotiations between the association and the Government have proved unsatisfactory.

A DECISION which will be of interest to all scientific workers was given by Mr. Justice Eve in the Chancery Division of the High Court on Wednesday, November 17, on the motion for an injunction to prevent Messrs. Brunner, Mond, and Co. from distributing 100,000*l.*, as it was authorised to do by an extraordinary general meeting on August 5. It will be remembered that at this meeting the directors were empowered to distribute that sum to such universities or other scientific institutions in the United Kingdom as they might select for the furtherance of scientific education and research. The money was to be provided from the investment surplus reserve account. It was urged that in carrying out the resolution the directors would be acting in a way which was outside the scope of the stated objects of the company, but Mr. Justice Eve ruled that the resolution came within the bounds of what was likely to lead to the direct advantage of the company, and therefore refused to make an order on the motion.

FROM time to time scanty information has reached this side of the Atlantic of developments in the use of "colloidal fuel," and experts have looked forward to receiving fuller information by which they could judge the value of the many claims put forward. Mr. Lindon W. Bates, with whom has been associated Mr. Haylett O'Neill, has been the pioneer of colloidal fuel, and these gentlemen read papers before the Institution of Petroleum Technologists on November 16 in which they put forward all that could possibly be claimed for this particular type of fuel. It was described as a stable, mobile, atomisable fuel displaying colloidal characteristics, comprising particles of solids, droplets of liquids, or minute bubbles of gas suspended in one or more varieties of liquid hydrocarbons. For commercial purposes it contains 25 to 40 per cent. of pulverised coal, which is held in stable suspension in oil, so that the product can be handled and fired with the usual oil-burning apparatus. The solid components may be coal, coke, charcoal, hard pitch, or any grindable carbonaceous substance, for the best results ground so fine that 97 per cent. will pass through a 100-mesh screen and at least 85 per cent. through a 200-mesh screen, and but little is stated to settle out in reasonable periods. The colloidal fuel is often volumetrically richer in heat units than the straight oil, and a saving of cost as compared with straight oil is shown, but this is far from holding as compared with powdered coal. In general, the efficiencies of oil and colloidal fuel are claimed to be substantially the same, and it is stated that there is some evidence that a surface combustion effect on the myriads of fine particles of solid is favourable to efficiency.

SIR FREDERIC KENYON has been elected a foreign associate, and Sir George Grierson a foreign correspondant, of the Paris Academy of Inscriptions and Belles Lettres.

BY the will of Mr. E. W. Smithson, who died on August 11, leaving estate of the value of 40,010*l.*, the ultimate residue, after the death of his wife, is bequeathed to the Royal Society "for the furtherance of research in natural science, with a view of new laws or principles rather than the exploitation of what is known."

THE Cavendish Society, Cambridge, has decided to reinstitute its annual dinner, and has fixed the date this year for December 10. This dinner, with its post-prandial proceedings of topical physics songs, is a well-known function to former physics research workers at Cambridge. Information may be had from the Secretary, Cavendish Laboratory.

THE KING has given orders for the following appointments to the rank of Commander of the British Empire (C.B.E.), to be dated June 5, 1920:—Dr. A. C. Jordan, for work in connection with radiology at Queen Alexandra's Hospital; Mr. H. A. Madge, principal technical adviser on the wireless telegraphy staff of H.M. Signal School; and Dr. F. Mollwo Perkin, for valuable services rendered to various Departments of State.

THE Secretary of State for the Colonies has appointed a Committee to consider and report what steps can be taken to secure the assistance of the universities of this country in carrying out the research work which is essential to the protection of the inhabitants of the Colonies and Protectorates from disease and to the successful development of their veterinary, agricultural, and mineral resources. The members of the Committee are:—The Right Hon. Lord Chalmers (chairman), Sir H. Birchenough, Sir J. Rose Bradford, Sir W. Fletcher, Prof. E. B. Poulton, Sir D. Prain, Sir H. Read, Sir S. Stockman, and Sir A. Strahan. Mr. A. B. Acheson, Colonial Office, is the secretary of the Committee.

THE following have been elected members of council of the Röntgen Society for the ensuing year:—*President:* Dr. R. Knox. *Vice-Presidents:* Prof. A. W. Porter, Prof. J. W. Nicholson, and Dr. G. H. Rodman. *Hon. Secretaries:* Dr. R. W. A. Salmond, 51 Welbeck Street, W.1, and Dr. E. A. Owen, National Physical Laboratory, Teddington, Middlesex. *Hon. Treasurer:* Mr. Geoffrey Pearce. *Hon. Editor:* Major G. W. C. Kaye. *Other Members of Council:* Dr. J. Metcalfe, Mr. E. P. Cumberbatch, Dr. A. E. Barclay, Mr. F. J. Harlow, Dr. W. Makower, Mr. J. Russell Reynolds, Prof. A. O. Rankine, Mr. Cuthbert Andrews, Major C. E. S. Phillips, Dr. R. Morton, Sir A. Reid, and Mr. A. E. Dean. The names in the above list are in order of seniority.

THE Forestry Commission, in consultation with the India and Colonial Offices, has appointed an Inter-Departmental Committee to prepare a scheme for giving effect to the resolutions of the British Empire Forestry Conference with regard to a central institution for training forest officers, including (1) its location; (2) its organisation, constitution, and control; (3) its cost and method of financing; (4) its relation to forest research; and (5) the qualifications, selection, and cost of maintenance of students. The Committee consists of the following members:—Right Hon. Lord Clinton, representing the Forestry Commission (chairman); Mr. P. H. Clutterbuck, representing the India Office; Major R. D. Furse, representing the Colonial Office; Sir Ronald Munro-Ferguson; and Prof. J. B. Farmer. Mr. W. H. Guillebaud, Forestry Commission, 22 Grosvenor Gardens, S.W.1, will act as secretary to the Committee.

MR. L. H. DUDLEY BUXTON, of the department of human anatomy, University Museum, Oxford, has been invited by Dr. Zammit, of the Malta University, to conduct an investigation of the physical characters of the ancient and modern inhabitants of Malta. A party, consisting of Mr. Buxton, Mr. A. V. D. Hort, of Brasenose College, Mrs. Jenkinson, of Somerville College, Miss Moss and Miss Mond, of Lady Margaret Hall, under the leadership of Mr. Buxton, will visit the island for this purpose during the coming Christmas vacation. Archæological investigations will also be undertaken, but only in so far as these may be necessary to throw light upon the physical anthropology. The expedition has received the approval of the Governor of Malta, and the expenses will be met by a grant from the Mary Ewart Trust and by a generous donation of 100*l.* from Sir Alfred Mond. A report on the results of the expedition is to be presented at a meeting of the Royal Anthropological Institute to be held early in the spring.

THE Institute of Industrial Administration is holding a meeting at the Central Hall, Westminster, on December 7, at 7 p.m., when Mr. Richard Twelvetrees will read a paper on "Road Transport as an Aid to Industrial Management." The chair will be taken by Mr. E. Shrapnell-Smith, chairman of the Commercial Motor Users' Association, and the subject will be discussed from various aspects, including the development of roads, traffic congestion, handling of goods, and the design and maintenance of road motor vehicles. The lecture will be illustrated by kinematograph pictures, and various interesting models will be on view. Up to the present time the development of road transport has been largely regarded as the province of the engineers responsible for the manufacture of the actual vehicles employed, but it is expected that a much wider field of discussion will be opened by the lecture, which should be of scientific interest, and readers of NATURE are invited to attend.

THE Institute of Physics has now been incorporated and has begun to carry out its work. The object of the institute is to secure the recognition of the professional status of the physicist and to co-ordinate the work of all the societies interested in physical science or its applications. Five societies have already participated in this co-ordination, namely, the Physical Society of London, the Optical Society, the Faraday Society, the Royal Microscopical Society, and the Röntgen Society. The first president is Sir Richard Glazebrook, who will preside at the opening statutory meeting of the institute, which will be held early in the new year. The list of members now includes the names of more than two hundred fellows. Sir J. J. Thomson, the retiring president of the Royal Society, has accepted the invitation of the board to become the first, and at present the only, honorary fellow. It is a tribute to the status already acquired by the newly formed institute that its diploma is now being required from applicants for Government and other important positions requiring a knowledge of physics. Particulars with regard to the qualifications required for the different grades of membership can be obtained on application to the secretary, Mr. F. S. Spiers, 10 Essex Street, London, W.C.2. Fellows elected before May 1, 1921, will have the privilege of being styled founder fellows.

THE new premises of the London School of Tropical Medicine and the Hospital for Tropical Diseases, Endsleigh Gardens, N.W.1, were opened by the Duke of York on November 11. Lord Milner in an introductory address sketched the history of the school, which owed its inception to Sir Patrick Manson during the Colonial Secretaryship of Mr. Joseph Chamberlain, who welcomed and helped the scheme. Opened in 1899, the work of the school was carried on for twenty years in buildings at the Branch Hospital of the Seamen's Hospital Society, Royal Albert Dock. During the war it was found desirable to remove the school to a more central position in London. Through the generosity of the Red Cross Society 100,000*l.* was received for the purchase of the new buildings, and it became necessary to raise an additional sum of 150,000*l.* for the endowment of the school, of which more than 100,000*l.* had been collected. The Duke of York, in declaring the buildings open, paid a tribute to the successive Colonial Secretaries who had furthered the progress of tropical medicine, and unveiled a tablet recording the munificent gift of the British Red Cross Society and the Order of St. John of Jerusalem. One of the

wards in the hospital has been endowed by the Mesopotamia Comforts Committee in recognition of the services of Sir Stanley Maude, to whose memory a mural tablet was unveiled. It is a pleasure to record that Sir Patrick Manson, the "father" of the school, was able to be present at the ceremony.

SIR CHARLES LYELL in his "Antiquity of Man" remarked that "neither need we despair of one day meeting with signs of man's existence in the Cromer Forest bed, or in the overlying deposits, on the ground of any uncongeniality of the climate or incongruity in the state of the animate creation with the well-being of our species." Mr. J. R. Moir in a paper republished from the Proceedings of the Prehistoric Society of East Anglia for 1919–20 (vol. iii., part ii.) describes a series of humanly fashioned flakes found in the cliffs and on the shore at Mundesley, Norfolk. Discoveries of similar flakes were made by Mr. Lewis Abbott in 1897 and by Dr. W. L. H. Duckworth in 1911. So far no human bones have been found in these strata, but the author notes that the Mauer Sand in which the famous Heidelberg mandible was found corresponds in date of formation with the Cromer Forest bed.

THE definition of the term "species" in biology is a perennial source of discussion. Dr. J. Massart considers that the Linnean definition—"the smallest assemblage of organisms that resemble one another more than they resemble others, and that transmit their peculiarities to their descendants"—corresponds neither to the Linnean species nor to the Jordanian species, but to the pure line of Johannsen. This last, however, need not be propagated by self-fertilisation, nor need the parents be homozygotes, for self-sterile and heterozygote lines are known. Dr. Massart illustrates his remarks by observations on the ilex, in a single grove of which tree he claims to have detected thirty-two distinct lines. Clearly, as he says, the systematist and the geographer must content themselves for the present with Linnean, or at the most with Jordanian, species. Dr. Massart's paper is published by the Belgian Academy (*Bull. Classe des Sciences*, 1920, pp. 366–81).

THE *Review of Applied Entomology*, now approaching the completion of its eighth volume, is a monthly publication of widely recognised value. For the modest sum of 18*s*. per annum one is enabled to keep abreast of all published work in the agricultural, medical, and veterinary aspects of the subject. Since the review was commenced an increasing number of articles in out-of-the-way periodicals have been abstracted, particularly those in the Russian and Spanish languages. It may be said that it is largely due to these abstracts that the work of Russian economic entomologists is being more widely known in this country and America. "Economic" entomology is interpreted in a liberal sense, and no very hard-and-fast line of demarcation is drawn between it and "scientific" entomology. For this reason the professedly scientific student should not neglect to peruse the pages of this valuable journal, for only by its means are many unfamiliar papers likely to be brought to his notice.

THE *Volta Review*, the Washington monthly devoted to speech-reading, speech, and hearing, is printing and issuing in the form of reprints a series of profusely illustrated articles on the mechanism of speech by Dr. E. W. Scripture, the author of the Carnegie Institution publication on "The Study of Speech Curves," of "Elements of Experimental Phonetics," and other related works. The series promises to be of great interest to students of phonetics, to those with normal hearing no less than to those who are handicapped in this respect. The voiced *h* of the Sanscrit grammarians is not quite such a novelty in Europe as would appear from p. 5 of the first article (July, 1920). Its existence in English was recognised by David Lyle in his "Art of Shorthand Improved" (1762), and its claims, though denied by Whitney and others, were fully admitted by Sweet.

AN address by Mme. Curie on the radio-elements and their applications appears in the *Revue Scientifique* for October 23. After reviewing succinctly the marvellous progress in the subject during the past two decades, and the current views to which the study of radio-active substances has led, reference is made to their applications for the manufacture of luminous compounds and in medicine. The first, though largely developed during the war, are obviously of application in innumerable ways for peaceful purposes wherever the cost of the radio-active materials is not prohibitive. In addition to the medical applications, such as for the treatment of lupus and arthritis, radium-therapy was during the war applied to the treatment of unhealthy scars and wounds, healing in numerous cases being assisted by irradiation. In spite of the slowness of the progress so far made, radium is regarded as a very powerful means of combating cancer, the number of deep cancers successfully treated steadily increasing. It is important that in all countries full use should be made of all resources in radio-active materials. As possible new sources the more active springs are referred to, one in Italy being mentioned which gives about 30 millicuries of emanation in 250 cubic metres of water daily. If this could be separated it would prove of great service in medicine. The proper utilisation of these resources would be facilitated by the establishment of central national institutions for pure researches in radio-activity in connection with an industrial laboratory for the treatment of large quantities of materials, and a section devoted to radium-therapy and its teaching. In conclusion, a strong plea for such an institute is made for France which shall be worthy of the country and its capital. Hitherto the requirements of medical men and physicists have been too exclusively considered.

IN the May and November issues of the Journal of the Royal Photographic Society Dr. W. H. Mills and Sir W. J. Pope publish the results of their work during the last few years on photographic sensitisers. In the first communication they describe the preparation and sensitising effect of twenty different *iso*-cyanine derivatives, one of which, trimethyl*iso*cyanine iodide, is now well known as pinaverdol or sensitol green. They find that the total induced sensitiveness diminishes steadily as the molecular weight of the

dye is increased by the introduction of heavier radicals, and they are able to draw other inferences that may prove useful guides in seeking for new sensitisers. Of these twenty derivatives, which include ethyl red and pinachrome, it appears that none is so generally advantageous as sensitol green. The second communication treats of the "carbocyanines," and describes the preparation and action of eighteen different derivatives. One of the diethylcarbocyanine iodides is pinacyanol or sensitol red, and it is found that the sensitising power for gelatino-silver bromide is far less in the dimethyl derivative, and that it sinks gradually on passing to the dipropyl and dibutyl compounds. In the *iso*cyanines the two quinoline residues are linked by the group :CH·, while the joining group in the carbocyanines becomes :CH·CH:CH·. The lengthening of this linking chain is accompanied by an extension of the extra sensitisation far into the red region of the spectrum, and the authors suggest that if methods were available for still further lengthening this chain it would be possible to produce compounds that would sensitise still further into the infra-red. Inferences are also drawn with regard to the effects of the positions of the substituting radicals and other matters.

THE Research Defence Society has lately published four pamphlets of general interest, namely: (1) Vaccination, by Dr. Mary Scharlieb; (2) The Prevention of Tetanus during the Great War by the Use of Antitetanic Serum, by Sir David Bruce; (3) The Work of the Medical Research Committee, by Sir Walter Fletcher; and (4) The Value of Experiments on Animals: Notes of Personal Experience, by Sir Leonard Rogers. The set, price 2*s*., may be obtained from the society's Secretary, 11 Chandos Street, Cavendish Square, London, W.1.

IT is eight years since the first edition of Prof. F. Soddy's volume, "The Interpretation of Radium," was published, and during that momentous period the necessity for enlarging and revising the original version has been proved. Mr. Murray announces that the author has been at work, and, with due compressions and the right additions, particularly those that bear upon the problem of the constitution of the atom, has brought the volume as closely up to date as is possible with a large and rapidly extending subject.

Our Astronomical Column.

LONGITUDE BY WIRELESS.—The scheme for linking up the observatories of the world by utilising wireless time-signals was referred to in NATURE for May 20 last (vol. cv., p. 370). It must be understood that no appreciable increase of accuracy over the older method by cable signalling is claimed; indeed, where the observers are not interchanged the precision is less. But the gain in convenience, expense, and wide distribution of signals is considerable, and it is known that where the travelling-wire method of observing transits is adopted, personality is greatly reduced; what remains is of the same order as the small local deflections of gravity, which can be eliminated only by extensive geodetical operations.

Mr. Dodwell, the director of Adelaide Observatory, has communicated the longitude which he deduces by the reception of the Lyons and Annapolis signals at Adelaide and Greenwich. It is 9h. 14m. 19·95s. using Lyons signals, and 19·78s. using Annapolis ones. The Nautical Almanac value is 20·30s. Allowance has been made for time of transmission, assuming a speed equal to that of light.

Many of the Australian boundaries are defined as meridians east of Greenwich by a specified number of degrees. They were determined by lunar observations and are known to be in error by some miles. It is not, however, expected that any change will now be made in them.

AN APPARENT EARTH-EFFECT ON THE DISTRIBUTION OF SOLAR FACULÆ.—The Monthly Notices for June contains a paper on this subject by Mr. E. W. Maunder, who acknowledges important help from several others in discussing the material, which consists of the Greenwich photographs from 1878 to 1916. The research was undertaken to test the result announced by Mrs. Maunder in 1907 that there was a preponderance of spots on the eastern half of the visible disc. Suggestions were made that this might arise from the spots sloping backwards or from the surface being heaped up behind the spot, thus avoiding the necessity of invoking an "earth-effect." The faculæ, however, since they are evidently above the surrounding surface, could scarcely be affected in either of these ways, so that an eastern preponderance seems very hard to interpret otherwise than as an earth-effect. Such a preponderance is, in fact, shown for the greater part of the period under discussion. The average excess for thirty years is about 3 per cent.—a quantity of the same order as that found by Mrs. Maunder for spots, and later for prominences. The northern and southern hemispheres of the sun are plotted, and show a general accordance, with differences of detail. There is fairly clear evidence that the eastern excess varies with the progress of the sun-spot cycle, being least marked during the increase of solar activity and most marked during its decline. In other words, regarding the earth-effect as a damping influence on the spot activity, then the solar resistance to this damping is greatest at the time of increasing activity.

THE DENSITIES OF BINARY STARS.—In a paper in *Mem. della Soc. degli Spett. Ital.* (vol. viii., Ott., Nov., Dic., 1919) Dr. G. Abetti discusses the densities of several binaries of which the relative masses and parallaxes are known. The diameters are inferred from the absolute magnitude, and surface brightness is inferred from the spectrum. The extreme values of density are 0·002 for ε Hydræ A and 1·87 for ε Hydræ B. On plotting the mean densities as functions of spectral type, there is a slow but steady decline from 0·60 for A5 and 0·55 for F5 to 0·45 for G0 and 0·2 for K0. This agrees with Prof. H. N. Russell's hypothesis on the assumption that the stars in question are in the giant stage, passing from an early diffused condition (type K0) to one more condensed through the types G, F, and A. Plotting mass as a function of absolute magnitude, all masses above 1·5 have about the same absolute magnitude, while all the fainter absolute magnitudes have about the same mass, the mean for these being about 0·3. The number of stars discussed is too small to lay great stress on the results.

Science and Fisheries.

By H. G. MAURICE, C.B.

I SHALL, without apology, introduce a controversial topic, and endeavour to maintain a view which I myself hold with conviction. That view, expressed in the simplest terms, is that scientific investigations of fisheries are primarily a matter for the State, and can, as a whole, be most successfully conducted by a Government Department charged with responsibility for fishery matters. I believe—and I may say that, in a general sense, it is the view of the Department of State I have the honour to represent—that a Department of Fisheries which does not conduct such investigations is, *ipso facto*, unfitted for the work it has to do and might as well cease to exist, and that in many respects the State is better placed for the purpose than a semi-private institution.

A Live Department of Fisheries Must do Scientific Work.

The function of a Fisheries Department is to promote progress in the industry. All development in the fisheries and in the trades allied to fisheries is dependent, in the long run, upon scientific investigations. A Department of Fisheries which is not adequately equipped for scientific research is, in my view, incapable of developmental work, and ought not to be kept in being at the public expense, because it certainly can do little good, and it may do a great deal of harm. If it is suggested that the Department can act on the reports of others, I say that that is not so. The Department must have a scientific intelligence of its own. In the ordinary course of events scarcely a day passes on which administrative officers have not occasion to seek information or advice of the scientific staff. Supposing that they could rely upon mere reference to scientific reports, the Department must have scientific officers to advise it on the bearings of those reports upon its work, and you can imagine what kind of a scientific staff it would be that existed merely for the perusal of reports and was cut off from every prospect of active scientific work and individual research.

There are many things which a properly equipped Department may do for the maintenance and development of the British fisheries, but there is practically nothing it can do effectively—and it is almost certain that it will do a great deal of mischief—if it has not a thoroughly competent, well-equipped, and earnest scientific staff actively engaged in scientific research. I say, therefore, that the Department of Fisheries *must* conduct scientific investigations.

Fishery Investigations can most Successfully be Conducted by the State.

(1) To begin with, for all practical investigations of the sea there must be a broad basis of statistics, and no person or institution can have the same facilities for the collection of statistics as a Government Department the authority of which is recognised in every fishing port. I have no doubt that if the Marine Biological Association sought statistics of the fish landed in the port of Plymouth, and, indeed, any neighbouring ports, it would get statistics of a sort gladly given in a friendly spirit. It would be difficult for it, however, to guarantee their accuracy, and if it asked for similar statistics at such distant ports as Grimsby, Hull, Fleetwood, etc., it would probably be refused, and the statistics would almost certainly not be accurate if given.

(2) The Department of Fisheries must be in close and constant touch with the fishing industry—that is to say, with the owners of fishing vessels, skippers, mates, and crews. It is, therefore, in a position to get assistance from them in various forms. One very valuable form of such assistance is the suggestions which fishermen themselves may offer, and which, even if wide of the mark, may, at any rate, be pregnant of ideas, as to what needs to be investigated, what lines investigations might usefully follow, or what is actually the cause of a hitherto unexplained phenomenon. Practical assistance can be given in the hospitality of their ships when engaged in commercial fishing. At the present time the Fisheries Department has fourteen fish measurers in its service, the majority of whom are working, by the courtesy of owners and skippers, on commercial fishing vessels. They take and measure all the fish in a definite number of hauls per day, with a view to the correlation of age, length, weight, and maturity, and with regard to the variations which occur corresponding to the differences in the nature of the bottom, position and season, and, to some extent, time. That work is particularly important now, because as regards at least three of the principal food-fishes we have the results of investigations which took place over a period of three years in the case of each fish before the war, and by the work which is being carried on we shall place ourselves in a position to compare the present condition of the stock of these fish in the sea with that of pre-war days, and thus be able to judge of the effect of the greatest measure of closure which has hitherto taken place. As one of the questions which we shall be bound to answer before long is whether in the interests of the conservation of that stock certain areas of the sea should be closed by international agreement to all fishing vessels, or to certain types of fishing vessel, permanently, or at certain times and seasons, it behoves us to make use of the great experiment which the war provided.

(3) Marine investigations on the scale which the preservation of our great fishing interests demands involve the use of deep-sea fishing vessels, which need to be kept in commission continuously throughout the year and from year to year, and they involve also the co-operation and assistance of other Government Departments concerned with shipping and with the sea, especially the Board of Trade and the Admiralty. The last-named Department in particular must of necessity carry out for its own purposes investigations which have a direct bearing upon our work, and, with certain necessary limitations, we can count upon its co-operation with us.

(4) The aim of our investigations, the only justification for them in the eyes of the State, which is calling upon the taxpayer to foot the bill, is the necessity of taking all practical steps to promote the development of the fishing industry, which, though the fact is not generally appreciated, undoubtedly saved this country from disaster in the late war. Moreover, the fishing industry brought into this country invaluable supplies of food; and even now we must, if we reflect, recognise the fact that fish is relatively cheap compared with other food, and, regarded as an import which does not involve any corresponding export, it is nationally by far the cheapest food the nation receives.

[1] Opening of a discussion on "The Need for the Scientific Investigation of Fisheries" in Section D (Zoology) of the British Association at Cardiff on August 26.

It behoves the State, therefore, to look well into the conservation of the stock upon which the prosperity of the industry depends; but it must be remembered that the bulk of the fish landed by our fishing vessels is taken in extra-territorial waters which are accessible to all nationalities alike. If, therefore, scientific investigations point to the necessity or desirability of regulations for the closure of certain areas of the sea or of such measures for the increase of the stock of fish or of the general bulk of the fisheries as transplantation or artificial propagation, it is essential that those measures should be adopted internationally in order that the good which one nation is endeavouring to do may not be undone by another nation which refuses to co-operate. If we are to have international regulations based upon the findings of science, those findings must be internationally accepted, and the simplest road to such general acceptance is co-operation in the work. Moreover, the area to be covered is so vast, the medium in which we are compelled to work is so obscure, the facts in the propagation and lives of fish which we are called upon to correlate are so many, and the study of most of them at the present time is so little advanced, that no one country working alone can hope to cover the whole field except at a prohibitive cost or at a rate which will leave the solution of the main problems to future generations. Therefore, combined international investigations are essential, and to none are they more important than to the greatest sea-fishing nation in the world. If we are to have such international co-operation, I maintain it must be co-operation between Governments.

The Scientific Aims of the Fisheries Department.

Whatever opinion may be held as to the capacity of a Department of the Government to conduct scientific research, at any rate it is something that a Government Department should be so firmly convinced of the importance of such research that it insists on carrying it out. The Ministry of Agriculture and Fisheries had before the war advocated and partly embarked upon a wide programme of investigation framed in consultation with an Advisory Committee of persons eminent in science. That programme was interrupted by the war. It included wholehearted co-operation with the International Council for the Exploration of the Sea in its general programme, and in the particular parts of it in which this country was more especially interested, and so much importance did the Ministry attach to these investigations and to the co-operation of our foreign colleagues that, alone of all the belligerent nations, Great Britain continued throughout the war to subscribe to the funds of the Council in order that the organisation which it represented might be kept in being to facilitate the revival of its work when conditions permitted. There is little doubt that, but for the financial and moral assistance of Great Britain, the International Council would have come to an end. I am convinced that the International Council will justify its existence; and it is interesting to observe that two new Powers, Spain and Portugal, have recently announced their intention of joining the organisation.

I have urged as a general thesis that the Department must carry out scientific investigations or run the risk of stultifying itself. I do not propose to discuss individual researches, but only to state the broad questions to which the Department seeks an answer. They are these:

(1) How can the stock of fish be maintained at its present level so that the prosperity of the fishermen may be preserved and the supply of food for the people not be diminished?

(2) Can the stock be increased by human endeavour while the fisheries continue to yield their present toll—or even an increased toll—to human necessity?

(3) Can we learn to foretell good and bad seasons for this or that fishery?

Having answered all or any of these questions, we must be prepared to answer as regards each one of them the further question:

(4) In what measure is the application of the findings of science practicable in existing circumstances?

I think those questions present with fair accuracy the positive aims of our investigations. I do not refer here to that other aspect of our work which concerns the utilisation of the fish when caught or to investigations affecting only inland and fresh-water fisheries; for the moment I am thinking only of what may properly be described as marine investigations. But these investigations, or rather the motive behind them, have also a negative aspect. The Department must always be prepared to resist what I may describe as panic proposals for legislation or proposals advanced by interested persons who use alleged facts of natural history as a stalking-horse. I need not particularise too closely. Most of you are aware of the outcry raised against the trawl on the ground that it damaged the eggs of fishes on so-called spawning-grounds, and how this allegation was disposed of by the discovery of science that the eggs of all the principal food-fishes of the sea, except the herring, were pelagic, and could not, therefore, be damaged by the trawl. That instance alone is sufficient to prove the importance to the Department, which may be called upon to introduce or to criticise legislative proposals for the regulation of fisheries, of having an adequate scientific intelligence.

The Relation of the Department to the Independent Scientific Worker.

These being the aims, broadly stated, of the Department, does it claim for itself the whole field of fisheries research, and does it seek to suppress independent effort? By no means. To me such a policy is inconceivable. Provided that the Department is itself supplied with funds for an adequate equipment in both apparatus and *personnel*, it must welcome the assistance of the independent worker, for the work to be done is so great and the field of research to be covered so vast that there cannot be too many workers in it.

Moreover, there is, I think, a perfectly clear and obvious distinction to be drawn between investigations proper to the State and those which are more properly confided to independent institutions. The State's business is to conduct investigations which are more or less expressly directed to the solution of clearly defined problems affecting the fishing industry, the demand for the solution of which either has arisen or can be foreseen. The function of the independent worker is to add to the sum of our knowledge without regard to the solution of any particular problem. The line must not be drawn too fine. On one hand, the Departmental staff must seek in the course of its inquiries all the knowledge it can get; and I, for one, hold that the Departmental scientific worker should, so far as is practicable, be given opportunities from time to time to take up and follow up a line of research of his own choosing in order that his vigour and freshness of mind may remain unimpaired. On the other hand, the independent institution or individual worker may properly be invited to take up a line of investigation which the Department foresees may be of importance, but has not the means or the time to prosecute itself. In short, the Department may see that such and such an institution or individual is admirably qualified for a particular piece of work,

and may invite it or him to take it up at the Department's cost.

And so, while the Department maintains—and, in my view, must maintain—that fishery investigations are primarily its concern, and that it must have, so to speak, a first call upon State funds available for such research, its policy is to encourage every competent worker in the field; to procure adequate financial support for every institution which is giving its attention seriously to such researches and is so placed as to be in a position to prosecute them successfully; and to work in the closest and most cordial co-operation with them without seeking in any degree to limit their independence.

We are proud to represent the greatest fishing industry that the world has ever seen, and we are determined, if possible—and the possibility depends largely upon the measure of support we can secure from a nation amazingly ignorant of, and indifferent to, this all-important industry—to make Great Britain lead the world, not only in the practice of fishing, but also in the scientific studies upon which the future prosperity of the industry must depend. We have established close co-operation with our colleagues in Scotland and Ireland, and, I hope and believe, friendly relations with the scientific workers of those institutions which have established a reputation in this field of research and the continued prosperity and efficiency of which it is our hope to secure. And while we seek to lead the world, we seek also to secure the co-operation of the Governments of those other nations which exploit the harvest of the sea; for we have no monopoly of the fishing-grounds, though our position is most favourable for their exploitation, and whatever measures may be devised by science for the maintenance or increase of the harvest can be effective only if they are carried out by international consent, and wisely directed to the attainment of the object which forms the motto of the International Council: "The rational exploitation of the sea."

Scholarships and Free Places in Secondary Schools.[1]

AN interesting and important Departmental Report upon the above subject was published on October 25 by the Board of Education. The inquiry was begun a year ago at the instance of Mr. H. A. L. Fisher, President of the Board, and the Committee appointed was comprised of representatives of the Board, of the local education authorities, of persons engaged in elementary and secondary schools, and of others interested in the question. Some sixty-six individual witnesses were examined, including officers of the Board of Education and of local authorities, as well as teachers and others, representing in all thirty organisations wholly or partly concerned with education. The Committee was directed to inquire into the existing arrangements for the award by local authorities of scholarships tenable at secondary schools or institutions of higher education other than universities or institutions for the training of teachers, and into the provision of free places under the regulations of the Board of Education, and to make recommendations thereon with respect to the improvement of such arrangements so as to bring the facilities of higher education within the reach of all classes of the population and with special regard to the migration of pupils from one school area to another.

The report deals concisely with the history of scholarship provision at the instance of local authorities, and shows that the scholarships awarded by them tenable at secondary schools had risen from 2500 in 1895 to more than 12,000 in 1906, and if there be included those awarded to intending teachers, to more than 23,500. The next important step with the object of facilitating the transfer of suitable pupils from elementary to secondary schools was taken by the Board of Education in 1907, whereby, as a condition of qualifying for the higher rate of grant, secondary schools were required to admit a certain percentage of pupils (ordinarily 25 per cent. of the previous year's admissions) from public elementary schools, subject to an entrance test of proficiency. These were styled "free-place scholars."

The immediate effect of these regulations was to increase the number of pupils receiving free tuition in secondary schools, including those arranged for by local authorities, from 24 to 27 per cent. In 1911–12 the total number of pupils receiving free tuition in such schools had risen to 32 per cent., the actual figures being 52,583, of whom 49,130 had been in public elementary schools, and of this number 38,009 owed their exemption from fees to the scholarship and free-place arrangements of the local authorities. At the present time in 961 grant-aided secondary schools in England with some 246,000 pupils enrolled, the number of "free places" held amounts to 72,386, or about 30 per cent., made up of 53,460 awarded by local authorities, 16,548 by school governors, and 2378 by other endowments.

It is now the duty of the local authorities, made statutory by the Education Act of 1918, to make provision for the means of higher education for all children capable of profiting thereby. It is estimated on the basis of 20 per 1000 of the total population of England and Wales that there should be at least 720,000 duly qualified children in the secondary schools, or more than double the present number. The grave defect of the present system is, the report states, that exemption from fees alone does not, by reason of the poverty of many parents, enable their children to take advantage of the benefits of higher education, or if they do they are quite unable to keep them at school beyond fourteen years of age for the full period of secondary education. It is therefore recommended that maintenance allowances, including all incidental school charges, should be made available for all free-place pupils who are in need of them. Whilst favourable to the abolition of all fees in grant-aided secondary schools, the Committee scarcely considers the time ripe for so drastic a change, and therefore suggests as a tentative measure the raising of the percentage of free places from 25 to 40 per cent. of the admissions. The age of admission of free-place pupils should be between eleven and twelve, determined upon by an examination in English and arithmetic, followed by an oral examination. Free places should be awarded for the full school course, secured by agreement with the parents, and where a pupil migrates to another area he should be entitled to continue his education upon the same terms. It is recommended that children who have not been previously educated in public elementary schools shall be eligible as free-place pupils provided that the parents show inability to pay fees for higher education.

The report is signed by all the members of the Committee, subject to certain reservations on the part of a few members. It concludes with a valuable summary of statistics bearing upon various aspects of higher and specialised education.

[1] Report of the Departmental Committee on Scholarships and Free Places. Pp. vi+82. (London: H.M. Stationery Office.) Price 9*d*. net.

Developments of Wireless Communication.

IN the course of his address to the Royal Society of Arts on November 17, Mr. A. A. Campbell Swinton, chairman of the council of the society, gave a remarkable experimental demonstration of some of the most recent developments in wireless telegraphy. Utilising only a small aerial on the roof, where the conditions were far from favourable, he commenced by picking up some messages of a general news nature which were being sent out by the 7000-metre continuous-wave station of the Admiralty at Horsea, near Portsmouth, about sixty miles from London. These messages were first received by means of a group of thermionic valves, and the clear-cut, distinct Morse signals were rendered audible to the large audience by a telephone receiver with a trumpet attachment.

A printing equipment of the pattern originally developed by Mr. F. G. Creed for line telegraphy, but now most successfully adapted to wireless working, was then put into action under the supervision of Mr. Creed himself, and the receiver was soon seen to be punching a paper strip in accordance with the Morse signals received. The strip was then put into the printer, and appeared on another strip automatically translated into ordinary type. A portion of the printed strip was projected upon the screen, and was seen to contain an extract from a speech by Mr. Bonar Law, with but few errors due to jamming or atmospherics. Between the experiments Mr. Campbell Swinton found time to explain briefly the way in which groups of thermionic valves connected in a particular way can be employed to detect and to amplify the received oscillations, and, by the addition of an auxiliary oscillation, to produce signals at a frequency audible in a telephone, by the method of beats. He also recapitulated the leading principles of the extraordinarily ingenious Creed receiving and printing instruments by which the signals are recorded in the Morse code and afterwards translated into ordinary type by means which we hope to deal with a little more fully later. The most impressive demonstration was the reception and printing of a special message sent from the Eiffel Tower by the kindness of Gen. Ferrié on the same apparatus, but with even more success than in the case of the Horsea messages.

Passing to wireless telephony, Mr. Campbell Swinton attributed the earliest accomplishment of real wireless telephonic communication to Prof. Poulsen, of Copenhagen, and showed diagrams of the latest arrangement used by the Royal Air Force. In conclusion, a special five-valve receiver, made for the purpose by Mr. H. W. Sullivan, was put into action, and the audience was entertained with some spoken remarks, whistling, and gramophone music from a short-wave installation in another part of London. Mr. Campbell Swinton predicts great developments in the field of wireless telephony, and looks forward to the time when a speaker at a political meeting will be able to make himself heard all over the world, or it will be possible for the King to address his subjects throughout his Empire simultaneously.

Engineering at the British Association.

SIXTEEN papers were read before Section G; these covered a wide field, but, with the exception of Prof. Howe's paper on radio-telegraphy, electrical engineering was entirely unrepresented. Several of the papers were of great importance in that they dealt with fundamental properties of materials and of internal-combustion phenomena. Prof. F. C. Lea read a paper on the effect of temperature on some of the properties of materials. Many materials, such as aluminium alloys, have highly desirable properties when cold, but undergo such changes at the temperatures met with in engine cylinders as to make them quite unsuitable. Fireproof buildings must be designed to have the requisite strength at temperatures likely to be experienced during a fire. The tensile strength and hardness of a large number of materials have been determined at various temperatures obtained by means of electric furnaces, details of which were given. In all the alloys tested the tensile strength and the hardness decrease as the temperature is raised, the decrease being very rapid between 200° and 400° C., which is a range likely to cover both the examples mentioned above. Concrete was among the materials tested on account of its importance in view of the behaviour of ferro-concrete buildings in case of fire.

Col. Crompton discussed the nature of the action leading to the blunting of the edges of cutting-tools. Without accurate knowledge of the nature of this phenomenon one cannot scientifically re-design cutting-tools when making them of the recently developed high-speed steels containing, in addition to carbon, such metals as tungsten, cobalt, molybdenum, nickel, and vanadium. These steels can be hardened like carbon steel, but, unlike it, they retain their hardness at the high temperatures caused by taking heavy cuts at high speed. They are also stronger to resist fracture, and can thus be made with a more acute angle. This angle varies from 90° in shears and punches down to 15° in the blades of safety razors. The smaller the angle the less is the force required to drive the edge into the material, but the weaker is the edge to resist breakage. If examined under a microscope the edge is seen to be blunted by the crumbling away of the material of which the tool is made. This crumbling is hastened by the shaving wearing a groove in the upper face of the tool, thus reducing the angle of the edge. The author was of opinion that all the ordinary tool angles could be reduced 25 per cent. when using high-speed steels.

It is not often that a paper is read before Section G by an author who speaks, not as an engineer, but as a critical user of the engineer's products. Mr. S. F. Edge's paper on farm tractors made one realise the importance of such communications. Mr. Edge evidently spoke from a wide experience of tractors of many types, and discussed them not only from the engineering and agricultural points of view, but also from that of their psychological effect on the labour question. He warned makers against sacrificing quality to cheapness, and expressed his belief in the future of the tractor industry if makers will give the farmers the best machines alike in design, material, and workmanship.

Mr. H. R. Ricardo's paper on a high-speed internal-combustion engine for research dealt with experiments carried out with an engine specially designed for fuel research at the request of the Asiatic Petroleum Co. Nothing had been spared to make the experiments trustworthy and exhaustive and of both scientific and commercial value. The author described the design and construction of the engine in detail, together with the arrangements for measuring the fuel supply, etc. With this engine one will be able

to determine the efficiency of various fuels and the best conditions for the use of any fuel, and also to compare the performance with the calculated figures based on thermodynamic theory.

Prof. W. H. Watkinson described a dynamical method for raising gases to a high temperature without the use of high pressures, which consists in drawing the gas into a cylinder through a partly opened valve, so that the pressure in the cylinder is only a quarter, say, of that outside, and then compressing the gas up to the external pressure with consequent rise in temperature. By a cascade arrangement of several such pumps the temperature could be raised sufficiently high to ignite the gas in an internal-combustion engine.

Dr. C. Batho read a paper on the partition of the load in riveted joints, in which he explained that he treated the riveted joint as a statically indeterminate structure, and applied the principle of least work in order to determine the distribution of the load between the rivets. The details of the method have already been published in the Journal of the Franklin Institute (U.S.A.) for November, 1916. The author quoted some experimental results obtained with an extensometer which supported his theoretical treatment.

Prof. J. T. MacGregor-Morris described and demonstrated his portable direct-reading anemometer for the measurement of ventilation in coal-mines. This instrument, which is made by the Cambridge and Paul Instrument Co., consists of an ebonite handle carrying a cage containing four fine nickel wires, two of which are exposed and two shielded from the air. These wires form the four arms of a Wheatstone bridge, and the galvanometer is connected by means of a flexible wire passing through the ebonite handle. The galvanometer is first used as a voltmeter to adjust the applied voltage to the correct value for the observed temperature of the air. It is then used to indicate the out-of-balance bridge current, which depends upon, and is used as an indicator of, the velocity of the air-stream.

Messrs. H. T. Tizard and D. R. Pye read a paper on specific heat and dissociation in internal-combustion engines. Although very little advance has been made in recent years in the thermodynamical theory of internal-combustion engines, there have been great practical advances, and the actual efficiency of a modern high-speed engine is higher than the theoretical efficiency calculated on the old specific heat figures of Clerk and Lange. The temperature reached is about 2500° C., but the specific heats of the gases concerned were not known accurately above 1500° C., and the extent to which dissociation of CO_2 and H_2O takes place was also unknown. Data on these subjects are now available, having been obtained in Nernst's laboratory in Berlin. The authors apply these data to the engine and obtain results which are confirmed by experiment as regards variation of power and efficiency with strength of mixture, with compression ratio, and with different types of fuel. Closely allied with the foregoing was the paper by Sir J. B. Henderson and Prof. Hassé with the attractive title "The Indicator Diagram of a Gun." The diagram is not obtained experimentally, but by calculating the pressure from the temperature, which can be determined only when the specific heat and dissociation are known. The temperature of the explosion is of the order of 3140° C. absolute, and it is calculated that of the energy liberated from 92 to 95 per cent. is converted into kinetic energy in the projectile. A gun is a type of internal-combustion engine, and very similar difficulties arise in investigating the two problems.

A very important but difficult subject is the action in steam-nozzles, and a paper by Prof. A. L. Mellanby and Mr. W. Kerr recorded a great amount of careful experimental work carried out at the Glasgow Technical College, the data from which were analysed and discussed in the paper. Pneumatic elevators for the unloading of grain were invented in England, but, as in many other things, it was in Germany that later study and development took place. Prof. Cramp, who had studied Continental practice before the war and commenced a research on the factors determining the efficiency of such apparatus, was afterwards given a grant by the Department of Scientific and Industrial Research to enable him to continue the work. His paper gave an account of the experiments made by him at Manchester University. To design apparatus intelligently one must be able to calculate the weight of grain which can be lifted a given height through nozzles and pipes of a given shape and size by a given vacuum and a given power. Whereas mechanical elevators can be made to work with 75 per cent. efficiency, the pneumatic type cannot reach a higher theoretical value than 40 per cent., and in practice falls far short of this. In spite of this pneumatic elevators are used because of their labour-saving qualities and freedom from dust.

The most striking and imaginative paper read before the Section was that of Wing-Comdr. Cave-Brown-Cave on airships for slow-speed heavy transport and their application to civil engineering. The author discussed the use of airships with one or more trailing air-barges for the transport of men and material over virgin country through which a railway was being constructed or in which it was necessary to carry on prospecting. In his opinion the present stage of development of airships and of the methods of handling them is such that their use for such purposes is quite practicable and offers great advantages.

Prof. G. W. O. Howe discussed the efficiency of aerials and the power required for long-distance radio-telegraphy. Of the power supplied to an aerial, the fraction which is radiated decreases with increase of wave-length, but, on the other hand, the longer waves are transmitted around the earth with less attenuation than shorter ones. On the latter point, however, there are but scant empirical data; on the usually accepted assumptions the author calculated the power required to produce a given strength of electric field at various distances with different wave-lengths. Using the optimum wave-length in each case, the power required for a range of three or four thousand miles varies as the sixth to the eighth power of the distance. Prof. Howe mentioned that recent experiments between America and Italy indicated the necessity of much smaller powers than those given in the paper. In conclusion, the author pointed out the need for extended research on this subject to enable a network of stations to be designed intelligently.

In the concluding paper Dr. J. S. Owens gave a very interesting description of the removal by drilling and blasting of 11,000 tons of rock-reefs from the bed of a river. No divers were employed, but holes were drilled from a floating barge, using a 5-in. steam drill. "Sausages" of dynamite were fed into the holes through a pipe and fired electrically in groups of about eight holes. The cost was a mere fraction of what it would have been if divers had been employed.

University and Educational Intelligence.

BIRMINGHAM.—The first list of donations in response to the appeal of the University for 500,000*l.* has been published, showing gifts or promises to the amount of more than 250,000*l.* Nearly half of this amount, however, is given to the Petroleum Mining Endowment Fund, and, whilst making the University unique as a centre of instruction and research in this particular branch of engineering, it will not be directly available for relieving the general indebtedness. The largest single gift is an anonymous one of 50,000*l.* for the general fund. A sum of 5000*l.* is earmarked for a chair of Italian, and an equal amount is given by the James Watt Memorial Fund for a James Watt research chair in engineering. The Birmingham Small Arms Co. gives 6500*l.*, and the Daimler Co. 3500*l.* A gratifying feature of the list is the number of names of old students who have contributed. The Birmingham Chamber of Commerce has given 3200*l.*, and the Worcestershire Education Committee has made an additional grant of 200*l.* per annum. It is announced that a second list will be issued shortly, and it is to be hoped that more of the large firms in the city and neighbourhood will appear therein.

CAMBRIDGE.—Mr. A. F. R. Wollaston has been elected a fellow of King's College for his explorations in the Sudan, Ruwenzori, Pacific, and Dutch New Guinea.

DR. W. T. DAVID has been appointed professor of engineering at the University College of South Wales and Monmouthshire, Cardiff.

IT is announced that Prof. H. MacLean, professor of chemical pathology in the University of London, has been appointed director of the clinical medical unit at St. Thomas's Hospital. The appointment of a physiologist and biochemist to be director of a clinical medical unit is significant as indicating the modern tendency of medicine towards recognition of the value of the work of the scientific investigator for purely medical fields.

THE University of Manchester has recently received a bequest of 30,000*l.*, free of duty, under the will of the late Mr. Jesse Haworth. The amount is to be used for the purpose of enlarging the present Jesse Haworth Building for Egyptology. Mr. Haworth, to whose generosity the University owes the greater part of its valuable Egyptological collection, was always a most generous benefactor to the museum, and shortly before his death subscribed 10,000*l.* to the University Appeal Fund, this amount being earmarked for museum purposes. The University Appeal Fund now stands at about 217,000*l.*

THE Toronto correspondent of the *Times* reports that complete success is anticipated in the centennial endowment campaign to raise 1,000,000*l.* for McGill University, Montreal. Up to November 16 ten individual subscriptions of 20,000*l.* each, one of 10,000*l.*, and nine of 5000*l.* had been received. Among the chief contributors are Lord Atholstan, Mr. R. B. Angus, Col. Molson, Mr. J. W. McConnell, Sir Herbert Holt, and the Dominion Textile Co. On November 20 it was reported that the endowment fund exceeded 800,000*l.* Among the later heavy subscriptions are 50,000*l.* each by the Canadian Pacific Railway, the Bank of Montreal, and the Royal Bank, and 25,000*l.* by the Merchants' Bank.

THE annual general meeting of the Science Masters' Association will be held at Oxford from the evening of Tuesday, January 4, 1921, to the morning of the following Friday. Lodging accommodation for members of the association will be provided in the rooms of Balliol and Trinity Colleges. Meals will be served in Balliol College hall. Lectures, discussions, and demonstrations will take place in the lecture-rooms and laboratories of the University. The provisional programme includes the following addresses and lectures:—President's address: Some Aspects of Science and Education, A. Vassall; Indicators and the Law of Mass Action, Brig.-Gen. H. Hartley; The Study of Crystals, T. V. Barker; Glass Blowing, B. Lambert; Recent Advances in Genetics, J. S. Huxley; Spectroscopy, Prof. T. R. Merton; and The Hedjaz, Dr. D. G. Hogarth.

THE Hudson Bay Company, as one means of celebrating the 250th anniversary of its foundation and its long connection with Western Canada and with Winnipeg, recently offered the University of Manitoba a fellowship of the annual value of fifteen hundred dollars for the years 1920–29 inclusive. This fellowship, which the University has gratefully accepted, will be called the Hudson Bay Company Research Fellowship, and is open to graduates of any Canadian university. It is tenable at the University of Manitoba, and each fellow must devote his entire time to original research in some branch of pure or applied science (*i.e.* the natural and physical sciences, the medical sciences, engineering, and agriculture). Each fellow will be appointed for one year, and the first appointment will be made at an early date. The company and the University of Manitoba are to be congratulated upon the creation of this important research benefaction.

THE mayoral statement for 1920 of the Huddersfield Technical College has been issued. During the session there were 658 day and 2590 part-time students; the latter figure included some 300 apprentices who attended special afternoon classes. The total number of students enrolled showed an increase of 876 above the number for the previous year. Ex-Service students accounted in part for the large increase in numbers: those under the Board of Education scheme for the higher education of ex-Service students received training in industrial and general science; the remainder, under the Ministry of Labour industrial training scheme, had a more direct and practical training in numerous crafts and trades. The textile and the dye departments have been enlarged and a new research laboratory has been added to the chemical section, though the demand made by the increase in the numbers of students on the staff of the college has left little opportunity for the pursuit of such studies. External classes in non-vocational subjects have also been established. Two gifts have been received for the endowment of scholarships; one, to be known as the Joseph Blamires scholarship for chemical research, made by Mrs. Blamire, and another, a textile scholarship, made by Sir Charles Sykes.

Societies and Academies.

LONDON.

Zoological Society, November 2.—Sir Sidney F. Harmer, vice-president, in the chair.—Dr. A. **Willey**: A note on the respiratory movements of Necturus and Cryptobranchus.—J. H. **Lloyd**: Some observations on the structure and life-history of the common nematode of the dogfish, *Scyllium canicula*.—Mrs. O. A. Merritt **Hawkes**: Observations on the life-history, biology, and genetics of the lady-bird beetle, *Adalia bipunctata*, Mulsant.—Prof. H. R. **Mehra**: The sexual phase in certain Indian Naididæ (Oligochæta).

Linnean Society, November 4.—Dr. A. Smith Woodward, president, in the chair.—J. H. **Owen**: Further researches into the life and habits of the sparrow-hawk, *Accipiter nisus* (Linn.), Pall. After some preliminary remarks on some of the less known habits of the sparrow-hawk, the author showed a series of nearly eighty lantern-slides depicting various incidents of the incubation and nestling periods. The slides were from photographs of six different nests. Of special interest were series showing (1) the efforts of the hen to protect the nestlings from the effects of the sun, and (2) the behaviour of the hen during incubation as affected by climatic conditions.—H. N. **Dixon**: The mosses of the Wollaston Expedition to Dutch New Guinea. The mosses were, unfortunately, not described with the higher plants, but have since been worked out by the author, and have proved of great interest. Although consisting of only some sixty gatherings, the collection contained types of at least two new genera, Hymenodontopsis and Callistomium, and more than a dozen new species, including two new species of Dawsonia, a genus which is more highly represented in New Guinea than in any other part of its rather limited distribution. A further collection by the Rev. J. B. Clark, of the London Missionary Society, in the neighbourhood of Boku, British New Guinea, is also included, and contains ten new species, comprising a very beautiful Pterobryella, and other interesting things. A small species, probably of Rhizogonium, named provisionally *R. orbiculare*, may possibly represent the ancestral form of the Rhizogoniaceæ.

Mineralogical Society, November 9 (Anniversary Meeting).—Sir William P. Beale, Bart., president, in the chair.—Dr. E. S. **Simpson**: A graphic method for the comparison of minerals with four variable components forming two isomorphous pairs. In the spinel-chromite series the two pairs are MgO,FeO and Al_2O_3,Cr_2O_3, and the general formula is $(Mg,Fe)O.(Al,Cr)_2O_3$. The relative molecular preponderances of the components of each pair stated as a percentage of the maximum are given by the formulæ $x=100(m-f)/(m+f)$ and $y=100(a-c)/(a+c)$, where m, f, a, c represent the number of molecules of MgO, FeO, Al_2O_3, and Cr_2O_3 respectively. The values of x and y, calculated from a number of published analyses, and from new analyses of ceylonite from Camban, Western Australia, are plotted on rectangular co-ordinates. The four corners of the main square are occupied by the pure compounds $MgO.Al_2O_3$ (spinel), $FeO.Al_2O_3$ (hercynite), $FeO.Cr_2O_3$ (chromite), and $MgO.Cr_2O_3$ (here named picrochromite). Sub-species and varieties of intermediate composition are divided off in symmetrical areas within the square.—L. J. **Spencer**: Fibrolite (=sillimanite) as a gem-stone from Burma and Ceylon. Water-worn, prismatic crystals from the ruby mines in Upper Burma measure up to 1½ cm. in length, and are clear and transparent, with a pale sapphire-blue colour and marked pleochroism. A fine faceted gem cut from this material is shown in the British Museum collection of minerals. Determinations were given of the optical constants; the birefringence shows a wide range, $\gamma-\alpha$ being seventeen times $\beta-\alpha$. On a somewhat similar, but etched, crystal from Ceylon the axial ratios were determined. Other crystals from Ceylon are pale greyish-green with a marked chatoyancy.—Dr. J. W. **Evans**: The origin of the alkali rocks. The alkali-igneous rocks form an exceptional series varying in composition from acid to basic, characterised by a high percentage of alkalis, especially soda, and a deficiency in alumina and the oxides of the divalent elements. They appear to occur mainly in areas where the earth's crust has, as the result of ancient folding or the accumulation of granitic rocks, consolidated to a considerable depth, and where the temperature gradient is normally low. Such areas are rarely subject to new folding, but are frequently folded, and with these faults the alkali rocks appear to have a genetic relation. In such areas crystallisation must proceed in the sub-crustal magmas, which are believed to be basic in composition under exceptional pressure, with the result that minerals with low specific volumes, having regard to the materials of which they are composed, will preferentially crystallise out. Garnet, zoisite, fibrolite, and kyanite are examples the materials of which crystallise out under less pressure with greater specific volumes. As these minerals are mainly silicates of aluminium and the divalent elements, the uncrystallised residue will be poor in these constituents and rich in the alkalis, especially soda, which was present in the original magma in greater proportion than the potash. It will also contain the volatile fluxes in large amount. As a result of the faulting of the crust this residue may be pressed out, find its way upwards, and give rise by further differentiation to the alkali rocks.—A. F. **Hallimond**: Monticellite from a mixer slag. The crystals, which are essentially monticellite containing about 20 per cent. of olivine in solid solution, have the following physical characters: Orthorhombic, $a:b:c=0{\cdot}4382:1:0{\cdot}5779$; forms 010, 110, 021; refractive indices, 1·663, 1·674, 1·680; 2V, 73¼°; specific gravity, 3·20.—Dr. H. H. **Thomas** and A. F. **Hallimond**: A refractometer for the determination of liquid mixtures. A telescope and collimator with Websky signal are fixed in alignment; between them is inserted a parallel-sided trough containing the liquid to be determined, in which is immersed a right-angled prism of known index near that of the liquid. Two images of the signal are formed, and the angular distance between them is read on the eye-piece scale; this reading is proportional to the difference of index between the liquid and the prism. The scale division has the same value whatever the index of the prism used.

Royal Meteorological Society, November 17.—Mr. R. H. Hooker, president, in the chair.—C. E. P. **Brooks** and H. W. **Braby**: The clash of the trades in the Pacific. The mechanism of rainfall in the equatorial Pacific. Considering the months January to June, and first the area east of 180° long., the trades meet at a low angle. The south-east wind is the warmer, and therefore the less dense, and rises above the north-east wind on a long slant, beneath which eddies are formed, giving occasional west winds. From the rising south-east trade wind rain is condensed, and falls through the north-east or west winds. East of 180° long. the trade winds meet almost at right angles, and, as their densities are the same, they mingle and produce a great volume of rising air, forming a low-pressure area, into which air is drawn from all sides. This low-pressure area is a mobile "action centre," the position of which determines the character of the season: if it lies far to the west the season is dry; if it takes an easterly position the season is wet.—Dr. W. H. **Steavenson**: The mirage. The visibility of the mirage was found to be dependent solely on the distribution of temperature near the ground, so determined by the altitude of the sun. The appearance was, therefore, not necessarily associated with hot weather, and had been well seen when the shade temperature was below 50°. Investigations had shown that the old reflection theory was untenable, and that the phenomenon was purely a refraction

effect. The appearance of the mirage was subject to variations which were dependent upon such factors as the contour of the ground, the height of the observer, and the altitude of the sun.

PARIS.

Academy of Sciences, November 2.—M. Henri Deslandres in the chair.—M. **de Sparre**: The ram-stroke in pipes feeding turbines with strong reaction. The ordinary formula giving the pressure in a water-main set up by a sudden stoppage of the motion of the water cannot be applied without serious error to mains supplying turbines with a strong reaction. The necessary modifications of the formula are given.—G. **Ciamician** and C. **Ravenna**: The biological signification of alkaloids in plants. Alkaloids have been regarded as refuse products which the plant is unable to eliminate. From an experimental study of the action of various alkaloids and substances related to them on young bean plants it is shown that this view cannot be sustained.—M. **Gevrey**: The resolution of problems at the limits relating to equations of the second order of elliptical and parabolic types.—B. **Gambier**: Couples of two minimum surfaces corresponding as focals of a rectilinear congruence, with conservation of the asymptotic lines and the lines of zero length.—M. **Risser**: An application of Volterra's equation to the problem of distribution by age.—MM. **Claude** and **Driencourt**: A new type of prism astrolabe. A description and photograph of the new instrument are given. Compared with the older type, it is less than half the weight and easier to set up and adjust.—M. **Holweck**: Experimental researches on X-rays of great wave-length. In the apparatus described ionising rays were produced for a difference of 70 volts between the anode and cathode; this would correspond to a wave-length of about one-sixth of Schumann's ultra-violet. Determinations were made of the coefficient of absorption of the soft X-rays in different gases.—J. **Cabannes**: Measurement of the luminous intensity diffused by argon. New determination of Avogadro's constant. The value found by this method is $6{\cdot}9\times10^{23}$, in good agreement with the well-known values of Millikan ($6{\cdot}07\times10^{23}$) and Jean Perrin ($6{\cdot}85\times10^{23}$).—MM. **Chauvenet**, P. **Job**, and G. **Urbain**: The thermochemical analysis of solutions. Equimolecular solutions of various salts are mixed in varying proportions, the volume being kept constant. The heat evolved on mixing is measured, taking account of the specific heats of the solutions. Curves are given illustrating the application of this method to the systems potassium iodide–cadmium iodide, copper chloride–aluminium chloride, and copper chloride–magnesium chloride. The formation of the complex salts, K_2CdI_4, $(2CuCl_2,3MgCl_2)$, $(3CuCl_2,2MgCl_2)$, $(CuCl_2,2AlCl_3)$, and $(2CuCl_2,AlCl_3)$, was clearly indicated by this method.—P. **Loisel**: The variations of the radio-activity of the springs of Bagnoles-de-l'Orne and their relation to the rainfall.—M. **Chopin**: An automatic indicator of the amount of moisture in cereals.—J. **de Lapparent**: Crystals of felspar and quartz in the limestones of the Middle Trias of Alsace and Lorraine.—G. **Depape**: The presence of *Juglans cinerea fossilis* in the Plaisancian flora of Saint-Marcel-d'Ardeche.—J. **Touch**: The diurnal variation of temperature in the Antarctic.—A. **Lumière**: The awakening of the soil. The activity in the soil, with rapid germination of seeds, which takes place in the spring, was at one time supposed to be caused by rise of temperature; this, however, was disproved by Müntz and Gaudechon, who showed that a maximum of microbial activity was produced independent of the temperature. Their suggestion that this recurrence of activity was to be ascribed to a predilection of the micro-organisms for a given period of the year, atavism, the author regards as unsatisfactory, and he now suggests another possible cause, the existence in the soil of toxic products secreted by the roots of plants or resulting from the transformation of vegetable débris after the fall of leaves and the death of annual plants. Experiments in support of this view are described. Soil collected in November was thoroughly washed to remove soluble toxic products, and at the temperature of the laboratory this soil produced vegetation with great rapidity. The same soil unwashed was sterile as regards growth. The washings, concentrated, were proved to prevent growth.—F. **Vincens**: Abnormal ligneous formations in the bark of *Hevea brasiliensis*.—J. **Dufrenoy**: The experimental bacterial tumours of Epicea.—J. **Delphy**: The reproduction of mudworms: fecundation, segmentation, and morphogenesis.—M. **Nicolle** and E. **Césari**: The effects and constitution of the antibodies.

NAPLES.

R. Accademia delle Scienze fisiche e matematiche, May 3.—Prof. Monticelli, president, in the chair.—F. **Tricomi**: Series of functions of lines.

May 8.—Prof. Montesano, vice-president, in the chair.—F. **Amodeo**: Researches of a Neapolitan eighteenth-century mathematician on certain theorems of Archimedes. Nicolò de Martino (born at Faicchio in 1701, died at Naples in 1769) rediscovered and proved by new and original methods several theorems in mensuration contained in the lost manuscripts of Archimedes. These, which were published in 1768 in a text-book on solid geometry and conic sections intended for Army cadets, show De Martino to have been a mathematician of great power.

June 7.—Prof. Monticelli, president, in the chair.—C. **Colamonico**: A zone of carso known as "vurgo" in the Bari territory. This forms part of a series of researches by the author on the carso of southern Italy. The present zone occurs in a little-known district of Apulia.—M. **Pascal**: N'ple integrals in the complex field.

June 12.—M. **Pascal**: Multiple integral of a differential form.

June 19.—F. **Tricomi**: Series of powers in the field of functions of lines, ii.

CAPE TOWN.

Royal Society of South Africa, September 29.—Dr. J. D. F. Gilchrist, president, in the chair.—J. R. **Sutton**: A possible lunar influence upon the velocity of the wind at Kimberley. IV. The object of this part of the discussion is to determine whether there are any points of agreement between the air tides and the lunar wind period sufficiently definite to form the nucleus of a theory which could be used to explain the comparatively great air speeds found in previous papers and attributable to the moon. For this purpose the air tides at perigee and at apogee have been determined (by Sabine's method) for the ten years 1897–1906 and compared with the wind movements. A diagram is given showing how the air pressures and wind movements compare one with the other. Both agree in the main, though with certain important exceptions confirming previous conclusions that the lunar influence upon the velocity of the wind cannot be exerted in a very simple way through the medium of the air tides.—J. P. **Dalton**: The integrated velocity equations of chemical reactions. The object of the note is to show how the integrals of many velocity equations which occur in practice may be written down in terms of a certain function of the relative initial concentrations of the reactants and of its derivatives.—C. **Pilper**: Medical folk-lore of the Abantu in the Lijdenburg district.

The paper contains contributions to our knowledge of the methods of treatment used by witch-doctors. —J. W. C. **Gunn**: The action of *Urginea Burkei*. Experiments were performed on frogs, rabbits, cats, rats, and guinea-pigs with extracts of *Urginea Burkei*, Baker, commonly known as the Transvaal slang-kop. It has an action on the alimentary system, producing vomiting and diarrhœa, and on the nervous system, resulting in loss of power in the limbs, diminution of reflexes, and final paralysis. Its main action is on the circulatory system.—G. A. **Boulenger** and J. H. **Power**: A revision of the South African Agamas allied to *Agama hispida*, *A. atra* and *A. anchietae*. The paper contains a revision of the group of South African reptiles which has stood most in need of revision. The account in the British Museum Catalogue of Lizards has long ceased to fulfil its purpose, and the attempt is now made, with the help of a very large amount of material, to arrive at conclusions which will stand the test of time.—S. H. **Skaife**: A species of Microdon (Diptera) from Natal. The paper gives a description of the larva, puparium, and adult female of *Microdon illucens*, Bezzi, the growth being under the author's observation.—J. D. F. **Gilchrist**: Note on living fish brought by H.M.S. *Challenger*.

SYDNEY.

Linnean Society of New South Wales, September 29.—Mr. J. J. Fletcher, president, in the chair.—Dr. J. M. **Petrie**: The chemical examination of *Macrozamia spiralis*. A complete summary of its poisonous record is given. In the leaves the following constituents were identified: Formic, acetic, valerianic, and lauric acids; oleic, stearic, and higher fatty acids; a volatile essential oil; a phytosterol; a paraffin with the properties of triacontane, and an olefine having the properties of octodecylene. The nuts contained 39 per cent. of starch and much mucilage. In feeding experiments white rats were given with their ordinary food (1) crushed fresh leaves, (2) grated seeds, (3) the rich, fatty, and resinous components extracted from the leaves by ether, and (4) aqueous extracts of the leaves and the seeds. The animals showed no signs of being affected after feeding for three weeks.—A. P. **Dodd**: Two new Hymenoptera of the superfamily Proctotrypidæ from Australia. A new genus is proposed in the family Diapriidæ, and a new species of Prosoxylabis (Belytidæ), the former being a primary parasite of the sheep-maggot flies.—Prof. W. N. **Benson**, W. S. **Dun**, and W. R. **Browne**: The geology and petrology of the Great Serpentine Belt of New South Wales. Part ix.: The geology, palæontology, and petrography of the Currabubula district, with notes on adjacent regions. The extrusive rocks comprise keratophyric tuffs of the Burindi and Kuttung series, with which are interbedded soda rhyolite flows and tuffs and basalt. The Werrie series consists of decomposed basalts, occasionally slaggy. Invading these, and also the underlying Kuttung and Burindi beds, is an immense series of sills and dykes comprising quartz keratophyre, quartz trachyte, quartz latite, andesite, lamprophyre, normal and albite dolerite, teschenite, and basalt. Attention is directed to the peculiar association of calcic and alkaline rock-types linked by intermediate types, and evidently derived from a common stock magma. Though the dominant rocks in this area are intrusive, and those in the Paterson, Seaham, and Pokolbin districts are effusive, the petrographical similarity of the Carboniferous igneous rocks in the two districts is most marked.—A. M. **Lea**: Descriptions of new species of Australian Coleoptera. Part xvi. Nineteen species and one variety of Ditropidus, three species of Elaphodes, and three species of Cœnobius are described as new. In addition, notes on synonymy, etc., partly the result of examination of some of Macleay's and Olliff's types from the Australian Museum, are given for seventy-one species belonging to twenty-two genera.

Books Received.

Physics: The Elements. By Dr. Norman R. Campbell. Pp. ix+565. (Cambridge: At the University Press.) 40*s*. net.

Newton. By Gino Loria. Pp. 69. (Roma: A. F. Formiggini.) 2.70 lire.

Text-book of Pastoral and Agricultural Botany. By Prof. John W. Harshberger. Pp. xiii+294. (Philadelphia: P. Blakiston's Son and Co.) 2 dollars.

The Gyroscopic Compass: A Non-Mathematical Treatment. By T. W. Chalmers. Pp. x+167. (London: Constable and Co., Ltd.) 11*s*. net.

Grains and Grammes: A Table of Equivalents for the Use of Numismatists. Pp. 35. (London: British Museum.) 3*s*. net.

Notes and Answers to Exercises in Practical Geometry and Theoretical Geometry. By C. Godfrey and A. W. Siddons. Pp. 26. (Cambridge: At the University Press.) 1*s*. 6*d*. net.

Lehrbuch der Paläozoologie. By Prof. O. Abel. Pp. xvi+500. (Jena: G. Fischer.) 40 marks.

Initiative in Evolution. By Dr. W. Kidd. Pp. x+262. (London: H. F. and G. Witherby.) 15*s*. net.

Territory in Bird Life. By E. Eliot Howard. Pp. xiii+308. (London: J. Murray.) 21*s*. net.

Coal in Great Britain: The Composition, Structure, and Resources of the Coalfields, Visible and Concealed, of Great Britain. By Dr. W. Gibson. Pp. viii+311+viii plates. (London: E. Arnold.) 21*s*. net.

A Text-book of Geology. By P. Lake and R. H. Rastall. Third edition. Pp. xiv+508+xxxiii plates. (London: E. Arnold.) 21*s*. net.

Scientific and Applied Pharmacognosy. By Prof. H. Kraemer. Second edition. Pp. xxviii+741. (New York: J. Wiley and Sons, Inc.; London: Chapman and Hall, Ltd.) 33*s*. net.

The Nature of Animal Light. By Prof. E. N. Harvey. Pp. x+182. (Philadelphia and London: J. B. Lippincott Co.) 10*s*. 6*d*. net.

Some Conclusions on Cancer. By Dr. C. Creighton. Pp. xiii+365. (London: Williams and Norgate.) 42*s*. net.

Kentucky Superstitions. By Dr. D. L. Thomas and L. B. Thomas. Pp. viii+334. (Princeton: University Press; London: Oxford University Press.) 12*s*. 6*d*. net.

The New Calendar of Great Men. Edited by Frederic Harrison. New edition. Pp. xx+708. (London: Macmillan and Co., Ltd.) 30*s*. net.

The Secrets of the Self (Asrár-I Khudí). A Philosophical Poem. By Sheikh Muhammad Igbal. Translated from the original Persian by Dr. R. A. Nicholson. Pp. xxxi+147. (London: Macmillan and Co., Ltd.) 7*s*. 6*d*. net.

A Text-book of Plant Biology. By Prof. W. N. Jones and Dr. M. C. Rayner. Pp. viii+262+vi plates. (London: Methuen and Co., Ltd.) 7*s*.

British Mammals. Written and illustrated by A. Thorburn. In 2 vols. Vol. i. Pp. vii+84+25 plates. (London: Longmans, Green and Co., Ltd.) 2 vols, 10*l*. 10*s*. net.

Organic Chemistry for Advanced Students. By Prof. J. B. Cohen. Third edition. Part i.: Reactions. Pp. viii+366. Part ii.: Structure. Pp. vii+

435. Part iii.: Synthesis. Pp. vii+378. (London: E. Arnold.) 18s. net each vol.

Australasian Antarctic Expedition, 1911–14. Scientific Reports. Series C: Zoology and Botany. Vol. v., part 7: Ostracoda. By F. Chapman. Pp. 48+2 plates. 4s. 7d. Vol. v., part 8: The Insects of Macquarie Island. By Dr. R. J. Tillyard. Pp. 35. 2s. 9d. Vol. vii., part 1: Mosses. By H. N. Dixon and the Rev. W. W. Watts. Pp. 9. 1s. Vol. vii., part 2: The Algæ of Commonwealth Bay. By A. H. S. Lucas. Pp. 18+9 plates. 3s. 6d. Vol. vii., part 3: The Vascular Flora of Macquarie Island. Pp. 63. 6s. 6d. Vol. vii., part 4: Bacteriological and other Researches. By Dr. A. L. McLean. Pp. 130+11 plates. 16s. (Sydney: W. Gullick.)

Diary of Societies.

THURSDAY, NOVEMBER 25.

ROYAL SOCIETY, at 4.—Special General Meeting to consider the Annual Report of Council.—At 4.30.—Prof. L. Hill: The Growth of Seedlings in Wind.—Prof. P. T. Herring: The Effect of Thyroid-feeding and of Thyro-parathyroidectomy upon the Pituitrin Content of the Posterior Lobe of the Pituitary, the Cerebro-spinal Fluid, and Blood.—W. A. Jolly: Reflex Times in the South African Clawed Frog.—Prof. J. A. Gunn and R. St. A. Heathcote: Cellular Immunity. Observations on Natural and Acquired Immunity to Cobra Venom.—L. T. Hogben: Studies on Synapsis. III. The Nuclear Organisation of the Germ Cells in *Libellula depressa*.

CHADWICK PUBLIC LECTURES (at the Medical Society of London), at 5.15.—Prof. J. B. Farmer: Some Biological Aspects of Disease.

INSTITUTION OF ELECTRICAL ENGINEERS (at Institution of Civil Engineers), at 6.—W. B. Woodhouse: The Distribution of Electricity.—R. O. Kapp: Some Economic Aspects of E.H.T. Distribution by Underground Cables.

CONCRETE INSTITUTE, at 7.30.—E. F. Etchells: Presidential Address.

EGYPT EXPLORATION SOCIETY (at Royal Society), at 8.30.—Prof. G. Elliot Smith: The Royal Mummies.

ROYAL SOCIETY OF MEDICINE (Urology Section), at 8.30.

FRIDAY, NOVEMBER 26.

ROYAL SOCIETY OF MEDICINE (Study of Disease in Children Section), at 5.—Dr. D. Drury: Malformation of the Face, Ear, Eye, and Hand occurring in an Infant.

INSTITUTION OF ELECTRICAL ENGINEERS (Students' Section) (at the City and Guilds Technical College, Leonard Street, E.C.), at 6.30.—A. J. C. Watts: Electricity and the Paper-making Industry.

OPTICAL SOCIETY AND PHYSICAL SOCIETY OF LONDON (at Imperial College of Science and Technology), at 7.—The Making of Reflecting Surfaces. (*a*) Technical Methods of Production.—R. Kanthack: Description of the General Features of Published Processes.—H. N. Irving: Methods of Silvering.—J. W. French: Workshop Notes on Silvering.—F. Ellerman and H. D. Babcock: The Silvering of Glass Reflectors.—J. Rheinberg: Platinum Reflecting Surfaces on Glass by the Burning-in Process.—R. S. Whipple: The Silvering of Glass and Quartz Fibres.—H. A. Hughes: Demonstration of a Silvering Process.—C. W. Davidson: The Silvering of a Large Reflector. (*b*) Reflecting Powers of Surfaces, etc.—J. W. T. Walsh: The Photometric Measurement of the Reflecting Powers of Mirrors.—Prof. Féry: A Note on some Permanent Mirrors for Reflecting Heat Radiations.—W. G. Collins: Rustless Steel Mirrors.—R. W. Cheshire or Dennis Taylor: Note on Increasing the Transmitting Powers of Surfaces.—F. Simeon: Demonstration of Apparatus used for Producing Mirrors by Cathodic Bombardment.

JUNIOR INSTITUTION OF ENGINEERS (at Caxton Hall), at 8.—C. O. Mourant: Reinforced Concrete Coal Bunkers and Silos.

ROYAL SOCIETY OF TROPICAL MEDICINE AND HYGIENE (at 11 Chandos Street, W.), at 8.—Resumed Discussion on Paper by Prof. W. Yorke: The Present Position of Trypanosomiasis Research.—G. Dudgeon: Some Important Tropical Fruit Foods.

ROYAL SOCIETY OF MEDICINE (Epidemiology and State Medicine Section), at 8.30.—Dr. A. Chaplin: Measures for Preserving the Health of Seamen on Board Ship.

MONDAY, NOVEMBER 29.

THE INSTITUTE OF ACTUARIES (in Staple Inn Hall), at 5.—Sir Alfred Watson: Address.

INSTITUTION OF ELECTRICAL ENGINEERS (Informal Meeting) (at Chartered Institute of Patent Agents), at 7.—A. F. Harmer and Others: Discussion on Electrical Transmission on Petrol Vehicles.

ROYAL INSTITUTE OF BRITISH ARCHITECTS, at 8.—Professional Questions.

ROYAL SOCIETY OF ARTS, at 8.—A. Chaston Chapman: Micro-organisms and some of their Industrial Uses (Cantor Lecture).

TUESDAY, NOVEMBER 30.

ROYAL HORTICULTURAL SOCIETY, at 3.

ROYAL SOCIETY, at 4.—Anniversary Meeting.

ROYAL SOCIETY OF MEDICINE (Tropical Medicine Section), at 5.—Dr. F. G. Rose: The Incidence of Filariasis in British Guiana.

INSTITUTION OF CIVIL ENGINEERS, at 5.30.

ROYAL PHOTOGRAPHIC SOCIETY OF GREAT BRITAIN (Technical Meeting), at 7.—G. C. Weston: Dark Room Dodges.

WEDNESDAY, DECEMBER 1.

GEOLOGICAL SOCIETY OF LONDON, at 5.15.—Special General Meeting.—At 5.30.—Ordinary Meeting.—Dr. E. Greenly: An Æolian Pleistocene Deposit at Clevedon, Somerset.

SOCIETY OF PUBLIC ANALYSTS AND OTHER ANALYTICAL CHEMISTS (at Chemical Society), at 8.—R. V. Wadsworth: Estimation of Theobromine.—B. S. Evans: A New Process for the Estimation of Small Quantities of Chromium in Steels.—P. V. and F. H. Dupré: Some Notes on the Reactions between Fulminate of Mercury and Sodium Hyposulphite.

ROYAL SOCIETY OF ARTS, at 8.—Miss L. F. Pesel: Embroidery: National Taste in relation to Trade.

THURSDAY, DECEMBER 2.

ROYAL AERONAUTICAL SOCIETY (at Royal Society of Arts), at 5.—Major G. H. Scott: Airship Piloting.—Flight-Lieutenant F. L. C. Butcher: Airship Mooring.

CHILD-STUDY SOCIETY (at Royal Sanitary Institute), at 6.—Dr. W. Brown: The Value of Suggestion in Education.

CHEMICAL SOCIETY, at 8.—Sir Prafulla C. Rây: Varying Valency of Platinum with Respect to Mercaptanic Radicles.—H. E. Cox: The Influence of the Solvent on the Velocity of certain Reactions. Part II. Temperature Coefficients. A Test of the Radiation Hypothesis.—K. J. P. Orton and P. V. McKie: Preparation of Chloropicrin from Picric Acid and Trinitrotoluenes.

FRIDAY, DECEMBER 3.

ROYAL ASTRONOMICAL SOCIETY (Geophysical Committee), at 5.—Discussion: The Cause of Magnetic Storms.—In Chair: J. H. Jeans. Opener: Prof. F. A. Lindemann.—Other Speakers: Prof. S. Chapman, Dr. C. Chree, Rev. A. L. Cortie, E. W. Maunder, C. S. Wright, and Others.

INSTITUTION OF MECHANICAL ENGINEERS, at 6.—Further Discussion on The Human Factor in Industry, by A. Ramsay.

INSTITUTION OF ELECTRICAL ENGINEERS (Students' Section) (at King's College), at 6.30.—A. Serner and Others: Discussion on The Modern Tendency to Trusts. Is it Beneficial?

SATURDAY, DECEMBER 4.

GILBERT WHITE FELLOWSHIP (at 6 Queen Square, W.C.1), at 3.—H. J. Elwes: The Primitive Races of Sheep in Great Britain.

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