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

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SCIENCE IN PARLIAMENT.

THE practical absence of leading representatives of scientific knowledge and research in the new Parliament is the subject of an article in the *Times* of January 21. Among the 707 members there are only two Fellows of the Royal Society, Mr. Balfour and Sir Joseph Larmor, neither of whom can be considered specifically to represent science. The work of Parliament is more and more coming to be a sordid scrimmage of hereditary, vested, class, and sectional interests. Out of the base-metal of the various self-seeking coteries represented — agrarian, commercial, financial, professional, proletarian, and so on—by some obscure alchemy too absurd for belief, Westminster is supposed to effect a synthesis of the pure gold of wisdom, and in its odd moments from this conjuring entertainment to administer the affairs of an Empire on which the sun never sets. The helpless public, as in America at its worst, is on the point of abandoning its government to a peculiar people with aptitudes and codes of conduct which in their private life they abhor and despise, and with an intellectual outlook and unteachableness similar to that of the traditional type of public-school legislator whom they have succeeded, but without their reputation for integrity, altruism, and incorruptibility. The practical problem is, How are the learned men—of whose learning and research the twentieth century is, and from whose brains and laboratories arises the necessity for the metamorphosis now blindly and vehemently convulsing it—to pull with something more nearly approximating their true weight *dans cette galère*?

In the article referred to, Members of Parliament are divided into two classes:—First, representatives of the great working-class organisations, the subscriptions of which supply the necessary election funds, and the membership of which gives the necessary electoral backing to secure their return; and, secondly, persons with money and leisure, derived from an inherited or acquired competence, sufficient to enable them to woo an electorate. A third class, numerically perhaps the most important of all, might have been distinguished, the nominees of the party organisations, the election funds of which are derived from origins that are not disclosed, but are generally believed—such is the rottenness of the State of Denmark—to be discreditable in degrees varying from the corrupt sale of honours and peerages to the "legitimate" contributions of powerful sectional interests. The men who devote their lives to scientific studies and investigations, all unintentionally and almost unconsciously rearranging thereby the foundations of society against its will, do not acquire such a competence as election expenses require, and have no mass following in the electorate, who rarely hear their names. Neither are they by intellectual training and character the stuff out of which sound party men, beloved of the caucuses, are made, voting "straight" on the great party issues in return for unconsidered trifles in the way of preferment, influence, and nepotism. They are segregated, to their own and the nation's detriment, from any share in the solution of the vast and overwhelming problems which their activities in the first instance create.

A further difficulty, though one common alike to all doing any work worth doing, whether creative, constructive, or merely vocational, is that a parliamentary career involves, at least for the time being, the sacrifice of their own field of work. This, which may appear to many, at first sight, a consequence fatal to the proper representation of science in Parliament, as a matter of fact is faced daily under existing economic conditions by the scientific investigator in its acutest form. By virtue of his eminence in investigation he is selected for some desirable bread-winning position, and, though he continue by force of habit for a time to strive to retain a footing in his original domain, amid the responsibilities and professional duties his office entails, Nemesis has him, and does it much matter whether it carry him to Westminster or to a university principalship or professorship? Besides, many go willingly enough. Was it not Huxley who said that one of the besetting sins of the investigator was the craving for change and novelty, the turning from the field that has been explored to the fascination of the new? Scores sacrifice their special gifts for causes relatively trivial on the altar of duty to their own microcosm, and why not a few to the primary affairs of the nation?

The practical problem thus in its essentials is twofold: the provision of election expenses, and the provision of the electorate. With regard to the first, the suggestion has been made that the Conjoint Board of Scientific Societies should institute an election fund, as is done by the National Union of Teachers and other bodies, and as, presumably, is contemplated by the medical profession in its recent action to secure more adequate representation in Parliament. Once a line of action is decided upon, the first question can scarcely involve any insuperable difficulty. It is the second that brings us at once to the real practical problem.

In a previous article on this subject (NATURE, October 24, 1918) the issue is clearly raised as between the narrow class representation of science in its own interests in Parliament, and the need of having qualified men of science there as citizens, free to use their special knowledge and qualifications in the national interest as a whole; and the latter ideal is frankly and powerfully upheld. Expert witnesses of a party, or impartial social servants of the community, under which banner are the scientific investigators who are to be asked to sacrifice their life-work to be called upon to serve? If the first, then no one but the type of prospective candidates to whom such work would be congenial, and the scientific organisations likely to benefit materially and directly by their advocacy, will consider the matter worthy of a second thought. Science is, not yet at least, an interest, an organisation, or a profession, but transcends these aspects no less than the welfare of the nation transcends that of the coteries that represent it in Parliament.

There remains the second ideal that men of science should claim their place on the broad and old-fashioned base of impartial and disinterested social service to the nation. If it had not been for the war, to find constituencies for such candidates would doubtless have appeared very Utopian and impracticable. The nation has, however, been brought violently back to its ideals, and that of disinterested social service for the general weal, which the Government demanded of its citizens in war, will in turn be demanded by the nation of its politicians in peace. In a political contest between idealism and materialism almost any sort of idealism is likely to prevail. The wide idealism of the Labour Party has probably gained for it far more adherents than its extreme views and divided war counsels have repelled. Conditions are now fluid, as they never were before, and, when they set, as soon they must, any scheme founded merely on the peculiar standards of to-day's political expediency may find itself nipped at the root. A scheme to send men of science into Parliament to represent in the general scrimmage of interests their own special wants, in return for due allegiance to the party that arranges their election, must reckon with the fervent intention of the overwhelming majority of disinterested electors in this country to prevent in future the rigging of elections, and with the power that proportional representation, already in operation in the university constituencies, gives them to stop it absolutely.

But it is idle to wait until another election is on the country. To have the slightest chance of success, the work should begin now, an election fund should be raised, and a group of prospective scientific candidates got together under a leader of enthusiasm familiar with the inner labyrinth of the political world. With the help of men of goodwill among their own colleagues, the temper of the electorate being what it is and nearly all men of goodwill in the nation awaiting a lead, such a group might find itself in Parliament as soon as, or even before, it was ready to perform its salutary and necessary task in the grave work that lies ahead. But the claim of these candidates to election must rest on the broad and elementary ground that their life-work has given them special knowledge and insight into the scientific discoveries which in the short space of a few generations have revolutionised the whole world, and which the Mother of Parliaments will ignore and continue to run counter to only at the nation's peril.

PHYSICS: ANCIENT AND MODERN.

On the Nature of Things. By Dr. Hugh Woods. Pp. v+248. (Bristol: John Wright and Sons, Ltd., 1918.) Price 10*s.* 6*d.* net.

The New Science of the Fundamental Physics. By Dr. W. W. Strong. Pp. xi+107. (Mechanicsburg, Pa.: S.I.E.M. Co., 1918.) Price 1.25 dollars.

(1) DR. WOODS puts forward "a new scientific theory," and asks that his views "shall be carefully considered and supported if they appear true, or attacked if they seem false." He could ask nothing more difficult to grant. Judged by the canons of men of science, his views are certainly incorrect, always when they are new, and sometimes when they are not; his book suggests an essay written by somebody who attended a course of popular lectures at the Royal Institution twenty-five years ago, and afterwards lost his notes.

But, of course, Dr. Woods, though he may not know it, does not accept those canons. He believes, as his title suggests, that truth is to be found in a return to Lucretius. Now the difference between Lucretius and a modern student of science is not so much in what they believe to be true as in what they believe to be truth. Both are concerned to "explain phenomena," and to both explanation consists formally in showing that the observed facts can be deduced from some set of general principles. But if any principles were permissible, anything could be explained without the smallest trouble, for it is very easy to find a set of propositions from which any other set may be deduced. The principles must fulfil some other condition. This condition is that the principles give a certain form of intellectual satisfaction. It is here that we differ from Lucretius and Dr. Woods; the kind of explanation that appeals to us does not appeal to them. *De gustibus non est disputandum.* Of course, we say that the principles which give us the intellectual satis-

faction we desire have the advantage over any other set which has been proposed that the explanations based on them often explain facts before, and not merely after, they have been discovered. But the appreciation of that advantage requires a scientific training which Lucretius did not possess.

We do not think, then, that readers of NATURE will gain much benefit from Dr. Woods's treatise. But the existence of such books may suggest some interesting reflections. The differences which separate us from Dr. Woods appear in a lesser degree between students of different sciences, and they are likely to be accentuated by the development of what Dr. Strong (2) rightly calls the "new science" of "fundamental physics." Physicists are abandoning the mechanical explanations, which were the basis of all nineteenth-century science, in favour of those which rest on the acceptance of some formal mathematical principle; and in so doing they are undoubtedly widening the breach between themselves and others. It is not impossible that in a few years the division between physics and chemistry may be as wide as that which now divides either from the philosophy of Dr. Woods and his master.

But, while Dr. Strong's title is encouraging, we regret that we have derived even less edification from his writings than from those of Dr. Woods. Dr. Strong is a serious physicist, and knows his subject, in spite of a few minor errors. (Thus, a "magneton" is not a free pole, but a doublet, and lead is not an "isotrope," but an "isotope," of RaG.) But he has carried compression beyond the bounds of intelligibility; he does not always explain even his notation, or the meaning of his tables. Those of his chapters in which he states the accepted results of modern physics would be perfectly incomprehensible to anyone not already familiar with the subject; no man can possibly expound the subject of radioactivity in four pages. Intercalated among these chapters, apparently at random, are others in which the author expounds some new theory which establishes, by means of "radions" and "electroethons," a connection between the Great Unknown, mobile and immobile ether, the gateways of the senses, ninety-two atomic nuclei, and other familiar and unfamiliar concepts. It may be merely the author's exaggerated passion for brevity which makes these pages a source of nothing but bewilderment to us, for occasionally a suggestive idea gleams through the darkness. We would recommend Dr. Strong first to re-write the chapter, say, on the Ritzian atom, so as to make it intelligible to anyone scientifically educated, and then, having had practice in expression, to return to the statement of his original ideas. We would give him one last hint: grammar is not inconsistent with lucidity, and our language is not enriched by such inventions as "illy" and "hypotheticated."

N. R. C.

APPLIED ANATOMY.

Applied Anatomy: The Construction of the Human Body considered in relation to its Functions, Diseases, and Injuries. By Prof. Gwilym G. Davis. Fifth edition. Pp. x+630. (Philadelphia and London: J. B. Lippincott Co., 1918.) Price 30*s.* net.

THIS work is perhaps the most comprehensive treatise upon applied anatomy in the English language. Its outstanding merit is the series of 631 figures, many of them in colour, drawn by Mr. Erwin F. Faber. They are remarkable, not merely for their diagrammatic clearness and accuracy, but also for their pleasing artistic qualities.

The book is cast in a somewhat conventional mould, and gives a vast amount of detailed information of a clinical, as well as of an anatomical, nature. When one remembers how large a part radiography plays in the teaching and practice of anatomy and surgery it is surprising to find a work upon surgical anatomy without any X-ray photographs, especially when the need for assistance in their interpretation is so often experienced by the surgeon. The notes upon the arrangement of the lymphatics might with advantage have been amplified.

But the chief impression one gets from the perusal of this book is the effect of the war upon the surgeon's outlook. For it is scarcely conceivable that so conventional a treatise as this could have been produced in the year 1918 in any country which had had a prolonged experience of military surgery. In dealing with many of the anatomical problems which have daily engaged the attention of our surgeons for more than four years, this book will afford no help. For example, little attempt is made to provide precise information of the mode of distribution and the variability of nerves, such as the majority of our surgeons need for their daily work in these times. It may be urged in extenuation that this book is merely the new edition of a work of reference for civilian surgeons in a country where experience of military injuries had not extended to the home hospitals. But these reflections serve to direct attention to the fact that a book on applied anatomy, when grown to such dimensions as Prof. Davis's treatise, is less useful to the surgeon than an ordinary text-book of systematic anatomy. In the course of practice, whether military or civilian, injury or disease may affect any part of the body; a really useful work of reference, therefore, should provide full information concerning the whole anatomy—in other words, it should be a systematic treatise.

What the surgeon really wants is the information the anatomist can give him; but it is of vital importance that the latter should take a broad view of his functions, and, in writing his text-books or treatises, remember that he is teaching the structure of the living organism, and should provide the sort of information that the surgeon

and the physician need. To do this efficiently an intimate association between the work of the anatomical department and the hospital is necessary, not merely to bring the teaching of the former into closer adaptation with the needs of the clinician, but especially to provide the scientific anatomist with the opportunity of investigating such problems as Nature's experiments upon living human beings reveal.

It is essential for the progress not only of anatomy, but also of medicine in the widest sense, that this broader conception of the anatomist's functions should be expressed in practice. One effect of such co-operation of the work of the scientific laboratory with that of the hospital wards would be expressed in systematic anatomical treatises informed by the sort of knowledge the physician and surgeon really need.

Excellent as Prof. Davis's work is, it is impossible to repress the feeling that if the same amount of energy had been devoted to the task by an anatomist who was in touch with the needs of the clinician, a treatise more generally useful to the average practitioner might have been produced. In every branch of applied science what the practitioner needs as the essential equipment for successful work is a real knowledge of the pure science which he has to apply in practice.

G. ELLIOT SMITH.

FRUIT CULTURE.

Modern Fruit Growing. By W. P. Seabrook. Pp. xliii+172. (London: The Lockwood Press (Harvey H. Mason), 1918.) Price 4*s.* 6*d.* net.

AT a time when many at present in the Army and Navy are turning their thoughts to fruit culture this manual appears opportunely. The practical advice given will do much to correct the somewhat unduly optimistic ideas as to the profits to be derived from this branch of agriculture, and the careful records of capital required and its subsequent profits are a feature of prime importance.

A chapter is devoted to the various soils on which success may be obtained, and with its general tenor we are entirely in accord. We cannot, however, agree with the opinion that a thin soil on chalk is "practically hopeless," as much good fruit is grown on such land in Kent; in fact, one of the most successful growers of that rather "difficult" apple, Cox's Orange Pippin, possesses soil of this character, about a foot of "loam with flints" on the chalk downs, and in these conditions finds it one of the best-paying crops.

The author is a whole-hearted advocate of the bush-tree on the dwarfing "Paradise" stock, and we think rather under-estimates the value of the standard trees which are grown in the grass orchards, and, in conjunction with sheep-farming, form so large a part of the fruit culture in East Kent. The labour difficulties of the past few years have driven opinion rather against the dwarf plantation with its need for constant cultivation, and experienced growers are interplanting their bush-trees with standards with the view of laying the land down to grass in a few years. For the beginner, however, who must have a quick return for his outlay, the dwarf tree will be always preferred.

Some space is devoted to modern methods of packing which are now spreading, and it will undoubtedly be in this direction that foreign competition will be met in future, rather than the embargo on foreign imports, which the author hopes will be in some measure maintained. The list of profitable varieties given is good, but we regret that the author has included two new sorts as yet untested beyond his own grounds, a matter which may be misleading to the beginner, for whom this work is written. It would be well in a future edition to explain certain technical terms which the same reader cannot be expected to appreciate.

With these reservations the work can be thoroughly recommended.

OUR BOOKSHELF.

The Future Citizen and his Mother. By Dr. Charles Porter, with a Foreword by Sir James Crichton-Browne. Pp. xvi+144. (London: Constable and Co., Ltd., 1918.) Price 3*s.* 6*d.* net.

WITH a falling birth-rate and the loss of life occasioned by the great war, the subjects of maternity and child welfare have assumed enhanced importance, and the Chadwick Trustees were well advised to institute a series of lectures on these subjects. Needless to say, Dr. Porter has dealt with the question in an entirely satisfactory manner. In the introductory chapter attention is directed to the falling birth-rate and to the wastage of infant life that goes on. Whereas more than 1,000,000 babies should be provided every year, as a matter of fact only some 800,000 or 900,000 are forthcoming! In the next chapter the care of motherhood is considered. In the worst districts nearly nine, and in the best three or four, mothers die for every 1000 babies born, and it is important to note that maternal death-rate from child-bearing and infant mortality go hand in hand. Valuable suggestions are given for bettering this state of affairs—by the institution of maternity centres and ante-natal clinics, the circulation of instructional leaflets, etc. In the third chapter the infant and infant-mortality, and in the fourth the young child and child-mortality, are discussed at some length. In an appendix specimen leaflets relating to the matters discussed for distribution from infant consultations and by health visitors are reproduced. A number of tables and charts are included, and Sir James Crichton-Browne contributes a characteristic foreword. The book is one which should have a large circulation, and we hope that it will be widely read.

R. T. H.

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.]*

Cyclones.

MR. DEELEY'S suggestion (NATURE, January 16, p. 385) that the cyclone is caused by the high temperature of the stratosphere does not seem to me to be feasible for the following reason:—Owing to the temperature inversion, or, at least, to the cessation of the lapse of temperature with height, the boundary between the troposphere and stratosphere is, in general, perfectly definite, as definite almost as the boundary between layers of oil and water would be. If, then, any sort of sucking action—to use an incorrect but convenient expression—were exerted by the lightness of the air above the boundary, it ought to draw up the boundary itself as well as the air below it. This is exactly the reverse of what happens; the boundary bulges out downwards in the cyclone and upwards in the anticyclone.

A special case has just occurred. From January 4 to January 8 the barometer in England S.E. was exceptionally low, and observations on the upper air were obtained on January 6. The beginning of the stratosphere was found at the low height of 7·5 km.—10·7 km. is the average; the temperature of the stratosphere was 10° C. above its average for January, and the troposphere 6° below. Take the analogous case of a layer of oil floating on a layer of water; if a disc of the oil be warmed by any means it will expand outwards, and the same mass will cover a larger surface, with the result that the common horizontal boundary will rise. Conversely, if the oil be cooled, the common boundary will sink. Exactly the opposite result was found on January 6.

But if we postulate an outward radial sucking force acting horizontally on the water just below the common boundary, the water will rise from below at the centre, the common boundary will fall, and the layer of oil above will thicken, and this is just what occurs in the layers of air. I have shown elsewhere (Journal of the Scottish Meteorological Society, 1913, p. 309) that on this supposition the observed changes of temperature follow as a natural corollary, but I do not see how an outward acceleration can be applied horizontally to the layers of air near the top of the troposphere. W. H. DINES.

Benson, January 17.

WHILE the subject of cyclones is being discussed in NATURE, I should like to direct attention to a point which I have already treated in a paper read before the Royal Society of Edinburgh in January, 1916. It is there pointed out that though the core of a cyclone is colder than the core of an anticyclone or than the surrounding air, yet the air in the cyclone is lighter than that in the anticyclone. This decrease in density is due to the air being under a lower pressure. It is shown that the lower pressure in cyclones more than compensates for their lower temperature, so that though the air in cyclones is colder, yet it is lighter than the surrounding air, and tends to ascend in the troposphere as well as in the stratosphere.

JOHN AITKEN.

Ardenlea, Falkirk, January 17.

End-Products of Thorium.

IN a letter to NATURE of May 24, 1917, Prof. Soddy states that 65 per cent. of thorium-C expels first a β- and then an α-ray, transforming into an isotope of lead, and suggests that (on the analogy of radium-D) this isotope of lead may be further disintegrated. He says that he has detected the presence of thallium in thorite in amounts that sufficed for chemical as well as for spectroscopic identification, and suggests that the lead isotope referred to may be transformed into thallium owing to an α- and β-change. If thallium were an end-product of thorium, we should expect that it would be found in all thorium minerals, unless, of course, these have been sufficiently altered to account for the removal of the products. I have lately been engaged in the examination of thorianite for Prof. Joly, the chief object of the investigation being the determination of the proportion of thallium, if any, and its relation to thorium. I have not been able to detect any thallium in the mineral, and I am confident that it does not contain even 0·005 per cent. J. R. COTTER.

Iveagh Geological Laboratory,
Trinity College, Dublin, January 8.

COMMERCIAL AVIATION AND THE LARGE AEROPLANE.

THERE is now no doubt that every possible attempt will be made to utilise aviation for commercial purposes, and that one of the first questions to be settled is the choice of the best type of machine for such uses. While small machines of the "scout" type may be of considerable utility for the rapid transport of single passengers or small quantities of goods on special occasions, it seems certain that the representative type of the commercial aeroplane will be a large machine capable of carrying considerable loads.

Several very long flights have already been made with large aeroplanes, and particular mention may be made of Gen. Salmond's pioneer flight from Cairo to Delhi in December last, when a distance of 3200 miles was covered in 45 hours' actual flying-time. In view of such feats as this, it is obvious that the establishment of an effective mail service is well within the capabilities of existing aeroplanes, and merely awaits the necessary capital and organisation. If, however, the air is to be used as a medium for the transport of goods in considerable quantities, machines of much greater carrying capacity than any yet built will be required, and the question at once arises as to the limiting size of machine which can be satisfactorily designed.

Much has been written on the subject of the large aeroplane. An excellent survey of the development of the present giant machines appeared in *La Nature* for November 16 and 30 from the pen of Lieut. Lefranc; but the author did not commit himself as to future possibilities in the direction of increased size. Mr. Handley Page has been very successful in building large aeroplanes, and his latest machine may be taken as representative of the stage which has now been reached. This machine has a span of about 127 ft., and weighs 27,000 lb. when fully loaded. With sufficient fuel for a 500-mile flight it could carry

a useful load of something like 2 tons of merchandise. This in itself is very encouraging, but there is no doubt that attempts will be made to increase the carrying capacity to double or treble this amount in the near future. There is apparently no very great difficulty in doing this from the point of view of the aerodynamic design of the machine, though the provision of sufficiently light controls may give considerable trouble. It is also fairly certain that engines of greater output will soon be available. The greatest difficulty besetting the large aeroplane would seem to be the landing problem, experience having shown that the larger the machine the more difficult it is to land, especially on a bad ground or in a poor light. Moreover, the landing speed cannot be reduced without sacrifice of maximum flying speed, which is the aeroplane's greatest commercial asset. In this connection Mr. Curtiss, the well-known American builder, prophesies the more rapid development of the large seaplane, since the landing difficulties are considerably less than with the aeroplane, and the provision of suitable landing-grounds is not necessary, a large area of still water being almost always available. Mr. Curtiss is at present building a flying-boat of 126-ft. span, and considers that it will be able to accomplish the Atlantic flight during the coming summer. He gives a second reason for the more rapid development of seaplanes, stating that the advantage to be gained is greater than in the case of over-land machines, since the speed of ocean liners is so much less than that of express trains. While this reasoning may be quite correct, there is no doubt that in England the main attention will be devoted to the land machine, most of the useful European and Asiatic routes being over-land.

While considering the possibilities of the giant aeroplane in the commercial world, we must not lose sight of the rigid airship as a means for the transport of merchandise. The speed of the airship is lower than that of the aeroplane, it is true, but the airship has at present far greater capabilities as regards endurance, and might well prove the more useful machine for reaching distant points in a journey of one stage when the utmost limit of speed is not essential. It may here be mentioned that an airship nearly 700 ft. in length, and with a gas capacity of 2,750,000 cu. ft., is already under construction. Announcement was made on December 19 that this ship would have a useful capacity of about 50 tons, a range of 9000 miles, and an endurance of more than eight days. Such a ship, if successful, could be used for commercial enterprises for which any present-day aeroplane would be useless. A rigid airship of 10,000,000 cu. ft., with a useful lift of 200 tons, is said to be under consideration, but it would appear that this is too great an advance to make in a single step, and that the wiser course would be to await the experience gained on the 50-ton ship, and to advance by gentle stages to the colossus of 200 tons. One great disadvantage of the rigid airship is its inability to cope with rough weather, and it is not easy to see how this difficulty is to be overcome, as it must be overcome if such craft are to undertake continuous commercial work. A further disadvantage lies in the fact that an airship can only land in places where a large gang of men is available to handle the ship when upon the ground.

To return to the large aeroplane, it is possible that inventors will try to solve the landing difficulty by the use of the helicopter, or direct-lift principle. There does not appear to be very much hope in this direction, as will be evident when it is stated that with helicopters of reasonable diameter the horse-power required for every thousand pounds lift is in the neighbourhood of 100, while an aeroplane can fly at 60 m.p.h. with only about 22 h.p. per thousand pounds of weight. This consideration, together with the great mechanical difficulties of construction, seems completely to discredit the helicopter, at any rate for the present.

Reference may here be made to a very lucid article by Mr. Handley Page which appears in the January number of the *Fortnightly Review* under the title of "Air Transport." The author traces the gradual increase in the speed of transit of goods from the early days of history to the present time, and shows that the rate of transit is simply a question of weight per horse-power. As the weight per horse-power of the available "engines" has decreased, so has the rate of transit increased. Flying was only rendered possible at all by the development of the petrol engine, the weight of which per horse-power was very much lower than that of the best steam-engine previously available. Even at the present time improvement in the efficiency of flight is much more likely to come from improvement in the engine than from any increase in aerodynamic efficiency. Mr. Handley Page gives his opinion that, even with existing machines, it will be possible to convey passengers at threepence per mile —first-class railway fare—and letters at a penny per ounce. He considers that to realise the advantages of the high speed of aircraft, the stages flown should not be less than 400 miles each.

To summarise the foregoing notes, it would appear that aeroplanes of the largest size built, such as the latest Handley Page machine, form the best basis on which to start commercial schemes of aviation, and that the carrying of mails and limited numbers of passengers should be the first problems attacked. As experience is gained, the size of machines should be gradually increased, and greater loads carried, the difficulties of design and use of the larger machines being thus overcome by degrees. Too much emphasis cannot be laid on the danger of premature attempts to build colossal aeroplanes. To endeavour to build a machine of 50 tons gross weight at the present time would be to court almost certain failure, and to throw discredit upon the large aeroplane, whereas if a machine of this

weight is approached by a series of progressive steps in size, there is every possibility that it will ultimately prove successful. Given a steady and well-organised progress, helped forward by the technician as well as by the business man, there is fair ground for the belief that aviation will become a very important factor in the world's commerce, and lead to results which would have been impossible with the older and slower means of transit. E. F. R.

THE "TIMES" WEATHER REPORTS.

METEOROLOGY in this country has owed much to the enterprise of the Press. In the year 1876 the *Times* inaugurated the service of evening telegrams to the Meteorological Office, and for several years it bore the expense thereof, at first alone, and afterwards in conjunction with the *Standard* and the *Daily News*. It was not until 1880 that the cost of this part of our national weather service was taken over by the Government. After relinquishing its direct connection with the enterprise, the *Times* continued to stimulate public interest in meteorology by including in its pages a copy of the evening weather chart of the Meteorological Office. Upon the outbreak of war publication had to be discontinued, but the issue for January 22 was marked by the revival of this very welcome feature. We are glad also to note that the editor has seen his way to increase the scale of the map, which now occupies the width of two columns of the paper, the change making a vast difference to its effectiveness. It is also of interest to note that the isobars are marked in millibars, as well as in inches, the intervals between them being five millibars. We hope that the day may not be far distant when the blank spaces may be filled by observations. Ships' observations from the Atlantic should soon be available again by wireless, and it seems not too much to expect that these and the French reports may reach this country sufficiently early for incorporation in the map.

Just as in 1876 the *Times* inaugurated the evening weather service, so now it takes the lead in another new departure by publishing a special aviation report. This new section summarises in tabular form the observations of upper winds represented on maps in the special edition of the Daily Weather Report of the Meteorological Office, which has only recently been released from the censor's ban, and supplements it with a section on "Flying Prospects for the Day." Civilian flying and commercial aviation will be realities very shortly, and then reports such as these will have a very real practical interest for a considerably wider circle of readers than the actual aviators. We can imagine would-be passengers scanning the upper air report with an even closer interest than they have in the past bestowed on forecasts of Channel crossings, and that not merely from the point of view of their comfort or discomfort during the flight, for the velocity and direction of the wind must obviously affect the time required for a given journey, just as it did in the old days of sailing-vessels.

Another new and interesting feature of the reports is an adaptation of the forecast for southern England to the peculiar local conditions of the London area.

PITCHBLENDE ORE IN DEVON.

THE *Times* of January 18 reports the discovery of a fine lode containing pitchblende on the Kingswood estate, Buckfastleigh, South Devon, and quotes an analysis of what is stated to be a representative sample of the ore, which shows a uranium oxide content of more than 26 per cent. This is the first time that pitchblende ore has been recorded from Devon. The precise location of the lode is not stated, but Kingswood is situated upon shales of Upper Devonian age, and just outside the area to which the metamorphism caused by the Dartmoor granite has extended. North of Kingswood there are several copper lodes that course in a general east-to-west direction, underlie south, and contain mixed sulphide ores. These were the only lodes hitherto known in the district. Uranium ores where they exist in Cornwall are associated with copper.

In Cornwall the ores of uranium have long been worked at South Terras Mine, near St. Austell, and at Wheal Trenwith, St. Ives, the total output since 1884 being nearly 1500 tons. The ore has also been recorded from many other Cornish mines, notably Crow Hill, St. Austell Consols, Egloshellan, Tresavean, Wheals Gorland, Buller, Unity, and Basset, and at Tincroft, South Crofty, and Dolcoath.

At South Terras the ores associated with pitchblende are nickel, cobalt, and bismuth, and such minerals as kaolin and fluorite. Near the surface the phosphates autunite and torbernite occurred, but gave place at depth to pitchblende of two qualities—namely, "green ore" and "dark ore"—which are reported in a prospectus issued by the Radium and Uranium Syndicate, Ltd., to have contained 6·2 per cent. and 36 per cent. respectively of uranium oxide. The lodes trend north and south, but the pitchblende was confined to a leader, and mostly to the walls of the leader. In the mode of occurrence and associated minerals the lodes show a close resemblance to those worked at Joachimsthal, in Bohemia, and it is held generally that the contents of both groups have been derived from emanations given off during granite intrusions.

It may be mentioned that the principal sources of uranium oxides lie in Portugal and Bohemia, and that the ores from the former country contain on an average about 1 per cent. of UO_3. In America 1000 tons of ore recently yielded 70 tons of concentrate, which contained only 3 per cent. of U_3O_8.

Further developments at Kingswood will therefore be awaited with interest, especially in view of the statements made as to the abnormal richness of the ore in uranium oxides.

NOTES.

A RESOLUTION for the establishment of a League of Nations was passed by the Inter-Allied Conference at Paris on Saturday. It was moved by President Wilson in an eloquent speech, in the course of which he said:—"Is it not a startling circumstance, for one thing, that the great discoveries of science, that the quiet studies of men in laboratories, that the thoughtful developments which have taken place in quiet lecture-rooms, have now been turned to the destruction of civilisation? The powers of destruction have not so much multiplied as gained facility. The enemy whom we have just overcome had at his seats of learning some of the principal centres of scientific study and discovery, and he used them in order to make destruction sudden and complete; and only the watchful, continuous co-operation of men can see to it that science as well as armed men are kept within the harness of civilisation." We have on many occasions pointed out that responsibility for the use of scientific discoveries in destructive devices depends upon statesmen and democracy rather than upon the men who labour to increase natural knowledge. It is for those men to promote the higher national and international feeling of fellowship which will repudiate the doctrine of force as the main factor in the evolution of civilisation, and to encourage the development of science as the chief means of securing human progress. The invention of gunpowder and the use of it in scientific appliances freed the people from the power of the barons in the Middle Ages and altered the political organisation of Europe. Thanks to the existence of scientific workers in the Allied countries, free peoples have been able to establish their cause of righteous dealing against the arrogant military aristocracy of Germany. Political power is now in the hands of democracy, which has yet to prove that it will make noble use of the forces provided by progressive scientific knowledge.

IT is rather surprising to find from a study of captured maps and survey documents that the German Topographical Staff was far behind our own in enterprise and originality as applied to war-maps. It certainly has not justified the German reputation for thoroughness and efficiency. The Royal Geographical Society has acquired a number of captured German war-maps, and has placed them on exhibition in the society's rooms. Mr. A. R. Hinks gives some notes on these maps in the *Geographical Journal* for January (vol. liii., No. 1). It is curious to note that, despite their plans of invasion, the Germans do not seem to have provided themselves with a better map of north-east France than a photographic reproduction of the French 1/80,000. Requiring room for more detail, they enlarged this to 1/50,000 and added contours from the hachures of the original, but the result was not particularly satisfactory. Some of the contours have since proved to be wrong. The German Survey Staff does not seem to have been successful in field work under fire; good work, so far as our captures show, was done only on areas well behind the front. But more curious than the failure of the Germans to make good maps is their apparent inability to appreciate them when they fell into their hands through the fortune of war. In Lille they found all the cadastral plans of the Département du Nord, and in Albert quantities of good British maps; yet there is no evidence that they made use of any of these. In sound-ranging the enemy did not come up to our standard, and in flash-spotting he was behind us, at least until a late period of the war. In the use of air-photographs for trench-mapping he seems to have been more successful, and some of his plans of Allied trench systems were useful to our Staff. These and other considerations of a similar nature show that the German Staff was not scientifically organised, and they should be an answer to those critics who still believe that we have anything to learn from the Germans in cartography.

ANCIENT records of Mesopotamia show that the portion of it in the vicinity of Bagdad and southward to Kut-el-Amara was a very fertile region, in which artificial irrigation had been advanced to a high pitch of perfection. Indeed, a number of the old water-channels still remain, though, in most cases, the beds have become silted up during the long period of neglect under Ottoman rule. Prominent among these ancient watercourses was the Shatt-el-Hai, running southward from Kut. To the north-east of Bagdad there was a network of canals intersecting the district enclosed by the Dialah, Adhaim, and Tigris rivers. This district, once noted for its productiveness, had passed out of cultivation when its administration was taken over by the British Irrigation Department of the Expeditionary Force. The *Times* of January 20 announces the complete restoration and widening of the old Mansuriah Cut, with the construction of a solid concrete regulator or dam at the head. By the recommissioning of the channel, which is six miles in length, an area of 300,000 acres has been rendered cultivable. The canal leaves the River Dialah at a point some seventy miles north-east of Bagdad, and passes through a rocky gorge, in which the gradient is 4 ft. per mile. A little lower down a change to 1 ft. per mile is effected by means of five masonry falls. The width of 25 ft. at the entrance is increased to 50 ft. below the gorge. The opening of the Hindieh barrage on the River Euphrates is another instance of British enterprise. It has resulted in the reclamation of a further 500,000 acres for agricultural operations.

THE Registrar-General's return for the week ending January 18 shows a decided decrease in the number of deaths from influenza both in London and for the ninety-six great towns of England and Wales. In London the deaths were forty-three, which is a drop of twenty-five compared with the previous week, and 63 per cent. of the deaths occurred at ages between twenty and sixty-five years. In the ninety-six great towns the deaths were 274, compared with 380 in the preceding week. The deaths are now lower than at any time since the disease became epidemic at the commencement of last October. The *Times* correspondent at Christiania gives a report of influenza in Iceland in the issue for January 24, based on a telegram from an Icelandic merchant, who gives the first authentic account of the great ravage of "Spanish" influenza in Iceland. "When he left Iceland at the New Year about 600 persons had died in the capital, Reykjavik, and its environs out of a population of 8000."

A LARGE diamond of fine "blue-white" quality is reported as having been found in the Jagersfontein mine, Orange Free State. The weight is given as 388¼ carats, equivalent to 77·65 grams. The stone is thus much smaller than the "Excelsior" of 199·04 grams and the "Jubilee" of 130·16 grams, found in the same mine in 1893 and 1895 respectively. Another large stone of about 120 grams was found there in 1883 or 1884. The Jagersfontein diamond mine, though producing much less than the Kimberley mines, yields a higher proportion of fine quality stones. For comparison may be added the weight, 621·2 grams, of the "Cullinan" diamond, found in 1905 in the Premier mine, near Pretoria, Transvaal. This,

though the largest individual crystal, is not the largest known mass of diamond, for a piece of "carbonado" weighing 631·9 grams was found in 1895 in Bahia, Brazil. These weights are here quoted in grams to avoid any confusion between the old carat weights and the metric carat (one-fifth gram) now in use.

SIR RICKMAN J. GODLEE, Bart., has been elected president of the Birmingham and Midland Institute.

WE regret to see the announcement of the death on January 25, at fifty-one years of age, of Dr. G. S. Corstorphine, principal of the South African School of Mines and Technology, Johannesburg.

MR. F. KNAB, of the Bureau of Entomology, U.S. Department of Agriculture, who died in November last, bequeathed his library and entomological collections to the U.S. National Museum; he also left a sum of money to the Entomological Society of Washington for its publication fund.

SIR AUBREY STRAHAN, director of the Geological Survey, and Eng. Vice-Admiral G. G. Goodwin have been elected honorary members of the Institution of Petroleum Technologists, and Dr. A. E. Dunstan and Mr. W. R. Ormandy members of the council of the institution.

THE third lecture of the series arranged by the Industrial Reconstruction Council will be held in the Saddlers' Hall, Cheapside, E.C.2, on Wednesday, February 5. The chair will be taken at 4.30 by the Right Rev. the Lord Bishop of London, and a lecture entitled "The Industrial Awakening" will be delivered by Mr. Ernest J. P. Benn, chairman of the council. Applications for tickets should be made to the Secretary, I.R.C., 2 and 4 Tudor Street, E.C.4.

THE death of Sir James Sawyer on January 27, in his seventy-fifth year, is announced. Sir James was professor of pathology at Queen's College, Birmingham, from 1875 to 1878, when he became professor of materia medica and therapeutics, a chair which he resigned in 1885 on being appointed to the professorship of medicine, which post he occupied until 1891. He was the author of many papers in medical periodicals, and of a number of volumes on medical subjects, including a valuable work entitled "Contributions to Practical Medicine."

NEXT Tuesday, February 4, Prof. J. T. MacGregor-Morris will deliver the first of a course of two lectures at the Royal Institution on "Study of Electric Arcs and their Applications." On Thursday, February 6, Dr. W. Wilson will give the first of two lectures on the movements of the sun, earth, and moon, illustrated by a new astronomical model. The Friday evening discourse on February 7 will be delivered by Prof. J. G. Adami on medical research in its relationship to the war; and on February 14 by Prof. Cargill G. Knott on earthquake waves and the interior of the earth.

THE annual meetings of the Institution of Naval Architects will be held on Wednesday, April 9, and the two following days, in the hall of the Royal Society of Arts, John Street, Adelphi, W.C.2. The Right Hon. the Earl of Durham, K.G., president, will occupy the chair. A gold medal will be awarded by the council to any person not being a member or associate member of council who shall at the forthcoming meetings read a paper which, in the judgment of the council, is deemed to be of exceptional merit. The council will also offer a premium of books or instruments to the reader of any paper, with the same reservations, which, in the judgment of the council, merits this distinction.

SIR R. H. INGLIS PALGRAVE, whose death on January 25, in his ninety-second year, we regret to announce, was a distinguished authority on economics and statistics, and the author of a monumental "Dictionary of Political Economy" published in three volumes, as well as a large number of other books on related subjects. He was editor of the *Economist* from 1877 to 1883, was elected a fellow of the Royal Society in 1882, was president of the Section of Economic Science and Statistics of the British Association at the Southport meeting in 1883, and received his knighthood in 1909. The greater part of his life was devoted to the business of banking, of which, with economics, he was a profound student, and to the literature of which he made many contributions of high distinction.

BY the sudden death of Mr. Wm. Allingham on January 24 the Meteorological Office loses its principal assistant in the Marine Department. Mr. Allingham began his career at sea, but left in early life owing to an accident, and was for some time afterwards employed at the Admiralty. In 1875, at the age of twenty-five, he joined the marine branch of the Meteorological Office, and for some years prior to his death was chief assistant. Mr. Allingham was a prolific writer; he was the author of "A Manual of Marine Meteorology," and joint author of a volume on "Navigation" with Capt. Wilson-Barker, commander of H.M.S. *Worcester*. He also edited the later editions of Lecky's "Wrinkles in Practical Navigation." He was a frequent contributor to the *Liverpool Journal of Commerce*, the *Nautical Magazine*, the *Syren*, and other shipping papers. Mr. Allingham's work was of a specially technical character, and much which was unsigned has been used by the Navy and the mercantile marine.

WE have received the annual report of Livingstone College for the year 1917–18. The college provides for the training of those who intend to be foreign missionaries in the elements of medicine and surgery. Since August, 1915, the college has been utilised as a hospital for wounded soldiers, and supported by voluntary contributions. About 300*l*. is still needed in order that the hospital council may hand over its accounts to the college without a deficit. The patients are now being evacuated, and it is hoped that the college will shortly resume its ordinary work.

THE number of eggs laid by the cuckoo forms the subject of an interesting article by Mr. Edgar Chance in *British Birds* for January. The author kept careful watch on the movements of two cuckoos which were laying their eggs in the nests of meadow-pipits. Assuming that the eggs of any given cuckoo will always present the same peculiarities of coloration—and this is probably the case—he ascribes ten or eleven eggs to one of these birds, and four or five to the other. The smallness of the clutch of the second bird may be attributed, he suggests, to age and diminishing fertility. The author is inclined to believe that the hen cuckoo is able to exercise a "certain amount of control over the reproductive organs, so that the eggs are laid on dates to suit the requirements of the fosterers," and that "it is quite possible also that the number of eggs in the clutch is regulated by the numbers of suitable dupes to be found."

THE discussion on the subject of local war museums which appears in the *Museums Journal* for January shows clearly enough that the ideals of what such museums should be are still in a very crude state. The theme, indeed, is one bristling with difficulties, and calling for the most careful consideration. Unless the greatest care is exercised, such museums will

become a serious menace to existing museums, already hindered in their usefulness by lack of both space and funds. It seems to be generally agreed that local museums should confine their exhibits of objects bearing on the war to such as are of strictly local interest. But even if this course is followed, an appalling amount of duplication in the objects displayed will result, without serving any useful end whatever. Everything of debatable value, or which serves no real educational end, should be severely left alone.

REFERRING to Mr. W. R. Nash's article on the diminution of rainfall with elevation above ground in "British Rainfall, 1917," our reviewer remarked in NATURE of January 16 that the results there set forth are "rather suggestive for aircraft." Mr. Carle Salter, joint editor of "British Rainfall," writes to say that the diminution of rainfall with elevation, with which Mr. Nash deals, "represents, not a natural phenomenon, but a defect in instrumental capacity. There may be real variations in the amount of rain falling at different elevations above the ground, but, except at very great heights, the amount of variation is probably trifling in comparison with the large falling-off observed at Greenwich, amounting to 35 per cent. at 50 ft." The article was taken by our reviewer at its face value, and it does not contain the explanation now given of the differences observed.

A SPECIAL article is given in the *Times* of January 20 on "Rainfall in 1918," contributed by Dr. H. R. Mill, director of the British Rainfall Organisation. Detailed rain measurements given show the total fall at numerous stations from all parts of the British Isles; the results, however, are only tentative, and form a small part of the voluminous records from more than 5000 stations, which will eventually be given in "British Rainfall, 1918." The average fall for thirty-five years, 1875–1909, is also given, and the difference of 1918 from the average as well as the 1918 fall as a percentage of the average. The instances of excess are four times as great as those of deficiency. In Wales the excess is 13 per cent. of the average, in Ireland 11 per cent., in England N. 10 per cent., in Scotland 6 per cent., and in England S. 5 per cent. of the average fall. At present the rainfall of the British Isles as a whole, it is said, is passing through a series of alternately comparatively wet and dry years. The driest part of the country with respect to the average was in the north of England and the east of Scotland, where in some places the deficiency was as great as 18 per cent. The greatest excesses of rainfall in 1918 occurred in the west, where the average itself is always the greatest. A map of the British Isles is given showing the relative distribution of the rainfall for the year. Attention is directed to the outstanding feature of the wet September in 1918, when England and Wales had nearly two and a half times the average fall. Rainfall totals for London are given for each month of 1918 and for the year, and the falls are compared with the average for fifty years. The total for the year at Camden Square was 29·69 in., which is 118 per cent. of the average. Rain fell on 195 days, which is thirty-two days more than the normal.

THE paper on "Electrical Oscillations in Antennas and Inductance Coils," by J. M. Miller, published by the U.S. Bureau of Standards (No. 326), will be found useful by mathematical electricians, as it helps to clear up some of the difficult points in the ordinary working theory. The methods adopted at present for measuring the electrical constants of an antenna are on a very dubious footing, and so we welcome this paper. Most authors apply the theory of circuits having uniformly distributed electrical characteristics, such as telephone and transmission cables, to antennas. We have never been able to follow the reason of this practice, and so we welcome Mr. Miller's paper as a serious and partly successful attempt to find a sounder basis on which to build radio-telegraphic practice.

THE Council of British Ophthalmologists has issued the report of the committee appointed to determine standards of illumination of Snellen's test types when used in testing the vision of candidates for the public services. The committee is of opinion that artificial illumination rather than daylight should be used in order that there may be no doubt as to its adequacy. The minimum illumination should be sufficient to ensure that the brightness of the test card is not less than that of a new card with an illumination of 3 foot-candles. The card should have a small surface and be as uniformly illuminated as possible, should not be backed by a contrasting background, or have bright objects or glaring lights near it. The testing-room should be moderately illuminated. Three methods of providing the proper illumination by means of gas, oil, and electric light respectively are described in the report.

THE booklet on "Photomicrography" issued by the Wratten Division of Kodak having gone out of print, it is replaced during the paper shortage by "Notes on the Use of Wratten 'M' Filters." Although much smaller than the other, the new issue includes all the valuable tabulated matter, and, of course, the various items are brought up to date. In the table of the exposure factors for the "M" filters with Wratten "M" plates, the factors for Nernst lamps are withdrawn, and those for the recently introduced Pointolite lamp are introduced. Some new colour filters are described. One converts light from a metal filament lamp into equivalent daylight, and is also advantageously used with the Pointolite lamp and the smaller-powered half-watt lamps. Another is of a neutral tint transmitting only about 3 per cent. of the incident light, and is useful for focussing with a powerful illuminant or lengthening exposure when using low powers. Filters that may advantageously replace the usual green glass are described, and the firm hopes shortly to be able to supply a blue filter to transmit light of a dominant wave-length of 470, especially for visual use when the greatest resolving power is required.

MR. WALTER JAMIESON, of the physics department, Allan Glen's School, Glasgow, has sent us a little instrument for which he suggests the name "Ixioscope"; it is a modification of the spinthariscope of Sir William Crookes. The device consists in a roughly spherical lens made by blowing a bulb on the end of a glass tube and filling it with water. The upper half is then varnished, and while still wet is dusted over with powdered zinc blende containing a very small quantity of radium; viewing this from the bottom through the water, the scintillations due to the α particles are distorted into nebulous points and streaks, and are in constant movement. The streaks of light on the outer edge of the luminous field appear to be in rapid rotation. Mr. Jamieson states that "eight out of ten people insist that the rotation is anti-clockwise." The illusion is certainly striking at first, but a few seconds' concentration leaves one very uncertain, not only of the suggested direction, but also of any actual rotary appearance at all. The effect is probably due to the distortions produced by the imperfect lens giving rise to an apparent maximum of motion on the outer edges of the luminous disc; this suggests a spinning wheel. A worked sphere of glass coated with luminous powder in the same way shows the dancing scintillations in a normal manner, and there is no suggestion whatever of rotation.

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THE Cambridge Scientific Instrument Co., Ltd., has issued a leaflet describing typical instruments for use in power stations. By means of a large diagram the company illustrates where some of its instruments can be usefully placed in the boiler-house, dynamo station, and engineer's room. By the use of an electric distance thermometer the engineer can at once tell the temperature of the steam at the stop-valve, of the circulating water at the inlet and outlet, and also of the supply air, condenser, and oil at their inlets and outlets. This leaflet will help the engineer to understand how useful electrical distance thermometers can be. These thermometers can be placed in almost inaccessible positions, such as the base of a smoke-stack or in steam-pipes and economisers. Hence the necessity for men having to climb ladders, etc., at frequent intervals can be obviated. There will also be a great saving of labour in recording the wet- and dry-bulb temperatures in cooling-towers. The leaflet shows an illustration of a distance thermometer recorder fixed on the table in the engineer's room. In the boiler-house it also shows the company's well-known dial draught gauge and its bi-meter CO_2 recorder. As it seems certain that in the near future many huge electric power stations will be constructed in this country, there will be a great demand for all kinds of scientific measuring instruments. The usual custom of placing contractors under money penalties for failure to comply with the steam efficiency guaranteed in the specification is an excellent one. In many cases the cost of the most elaborate thermal tests is but a small fraction of the money penalty at stake. Hence the accuracy of these tests has been much improved of recent years.

MR. C. M. WHITTAKER wrote some time ago to object to some statements made by the reviewer of his "Modern Dyeing Methods" in our issue of November 7 last. Reference was made in the review to inadequacy of treatment of one section of the book, to lack of proportion in another, and to the omission of exact quantitative methods of estimating dyestuffs. It is obvious that upon these matters a reviewer is justified in expressing his opinion, even though it does not coincide with that of the author; and also that no useful scientific purpose would be served by the publication of correspondence upon the different points of view, even if space permitted of it. On one matter, however, we are glad to correct a statement in the review. Though the sections on direct cotton dyestuffs, the insoluble azo-colours, and the resorcine dyestuffs do not give lists of groups at the beginning, as in earlier sections, the examples are included elsewhere in the sections, and our reviewer regrets that he overlooked them.

THOSE interested in the mechanical handling of materials will find a great deal of useful information and applications in the *Electrician* for January 10. Among other subjects treated in this special number is that of the gravity conveyor. On this principle it is worth while to elevate the materials sufficiently at one stage of the process so that their progress thereafter is obtained automatically by gravity. Conveyors on this system have been in existence for many years—for example, in flour mills—but the application has been extended greatly during recent years. The gradient of a gravity installation varies from 2 to 5 per cent.; the latter figure is not the maximum, but it is rarely insufficient. The "humper" is used when it is desired to convey for a distance longer than that obtainable by the available head or fall, and consists of a short mechanical elevator, generally inclined at 45°, which renews the gradient and thus permits the packages to travel to the end of the runway. Roller paths, switches, curves, shoots, and other accessories are described fully in the article. Another section of the journal of interest to engineers is an article on conveyor chains, sprocket-wheels, buckets, etc. This article is fully illustrated with detail drawings. There are also very full articles on the pneumatic handling of cereals, the equipment of silo granaries, and munition-handling devices, which cannot fail to be of service to any desirous of obtaining information regarding these labour-saving appliances.

THE greatest departure in the practice of shipbuilding which has been recently introduced is the extensive adoption of the "straight-frame" system of construction. This was begun and carried out to a very large extent by Sir Eustace d'Eyncourt and Mr. Thomas Graham, who got out designs on this system in the early summer of 1917. The idea of the design is to build a ship the transverse sections of which showed straight sides and bottom intersecting at a point forming an angular bilge, but at the same time retaining the orthodox shape of the waterplanes in a fore-and-aft direction, so that the ultimate features affecting resistance would not present anything likely to demand an increase of driving power. Drawings illustrative of this system appear in an article in *Engineering* for January 17, and we learn from this article that model experiments have confirmed the contention of the designers, and that a suitable adjustment of the "chine" line at the ends would so accommodate the form to the stream-line theory that practically no extra power is required. The Government adopted the type for its "National" (better known as "N"-type) vessels. At present there are built, building, and on order throughout the world on the d'Eyncourt-Graham system vessels representing 750,000 to 1,000,000 tons of dead-weight.

Messrs. Macmillan and Co.'s new list of announcements contains many books likely to be of interest to readers of NATURE. Among them we notice "Annals of the Philosophical Club of the Royal Society," written from its minute-books by Prof. T. G. Bonney; "Botany of the Living Plant," Prof. F. O. Bower, illustrated; vol. ii. of "A Text-book of Embryology—the Non-Mammalian Vertebrates," Prof. J. Graham Kerr, illustrated; "Science and Fruit-growing," being an account of the results obtained at the Woburn Experimental Fruit Farm since its foundation in 1894, the Duke of Bedford and S. Pickering; "Dr. John Fothergill and his Friends: Chapters in Eighteenth-century Life," Dr. R. H. Fox, illustrated; and a new edition—the third—of Preston's "The Theory of Heat," revised by J. R. Cotter, illustrated. Messrs. Macmillan will also publish the following books by American authors:—"Elements of Electrical Engineering," vol. i., "Direct- and Alternating-current Machines and Systems," Prof. W. S. Franklin, and a second edition of "Infection and Resistance," Prof. H. Zinsser. *Messrs. J. M. Dent and Sons, Ltd.*, are publishing "Osiers and Willows," by W. P. Elmore, illustrated, dealing with their cultivation and use. *Messrs. P. S. King and Son, Ltd.*, have nearly ready for publication "The Silk Industry and Trade: A Study of the Economic Organisation of the Export Trade of Kashmir and Indian Silks, with Special Reference to their Utilisation in the British and French Markets," R. C. Rawlley. *Messrs. E. and S. Livingstone* (Edinburgh) will publish shortly vol. iii. of Kraepelin's "Psychiatry"—"Dementia Præcox"—translated by Dr. R. Mary Barclay, and edited by Dr. G. M. Robertson; also "Anatomy Mnemonics." The *Essex Field Club* has in preparation a volume by Miss G. Lister entitled "A Short History of the Study of Mycetozoa in Britain, with a List of the Species recorded from Essex." It will be issued in the club's series of special memoirs.

OUR ASTRONOMICAL COLUMN.

SCHORR'S COMET.—The following observations are reported from Hamburg. Positions are for equinox of 1918·0 :—

	G.M.T.	R.A.	N. Decl.
	d. h. m.	h. m. s.	° ′ ″
Dec.	21 7 48·4	3 56 56·8	13 8 14
	24 8 57·8	3 56 21·2	13 24 19
	26 6 42·8	3 56 8·3	13 34 20
	31 11 10·4	3 56 8·2	14 4 2

The magnitude was 15·0.

Continuation of ephemeris :—

	R.A.	N. Decl.	Log r	Log Δ
	h. m. s.	° ′		
Feb. 4	4 16 50	17 51	0·3370	0·2106
8	4 21 8	18 17		
12	4 25 44	18 42	0·3435	0·2408
16	4 30 36	19 6		
20	4 35 44	19 30	0·3500	0·2699
24	4 41 7	19 53		
28	4 46 43	20 15	0·3566	0·2980

On December 26 the ephemeris needed the corrections +1s., 0·0′

A CURIOUS FEATURE ON JUPITER.—On the night of January 16, at about 9 p.m., Mr. Frank Sargent, of Bristol, observed a luminous protuberance on the eastern edge of Jupiter. It was situated on the equatorial side of the north equatorial belt. He watched it for some time, and it was visible as a white spot well within the limb of Jupiter, but grew fainter as it advanced further on the disc. Clouds interfered and prevented a transit being taken, but on the following night Mr. Sargent re-detected the object, and it was on the central meridian at about 6.46, though so faint as to be scarcely perceptible. He saw it projecting from the western limb at about 9.5 p.m., when it was quite bright and very easily distinguishable. Luminous projections of this kind are often visible on Mars, and are effects of irradiation, but, in the case of Jupiter, where the atmosphere is considerably denser, the conditions are very different, and it seems probable that the feature observed on Jupiter may have been a real prominence, or it would have been obliterated amid the dense vapours on the limb of the planet.

THE PARIS-WASHINGTON LONGITUDE.—Vol. ix. of the Publications of U.S. Naval Observatory contains the details of the determination of this longitude by wireless telegraphy in 1913 and 1914. The transit instruments used were of 3-in. aperture, with travelling wires driven by electric motors. Every transit was observed with the telescope in both positions, thus eliminating collimation and pivot errors. There were two transit instruments at each station—one for a French, the other for an American observer. The observers interchanged stations when half the observations were obtained. The level error was ascertained by striding levels, the azimuth by meridian marks combined with polar stars. High stars, on both sides of the zenith, were used for clock error, thus minimising the effect of an erroneous azimuth.

The wireless signals were sent from Radio (Virginia) and the Eiffel Tower. The power at Radio was 70 kilowatts, and the wave-length 2500 metres. A rhythmic series of signals was sent, controlled by a pendulum, the period of which was 0·99s. M.T. Coincidences of beats between the Radio signals and the ticks of a mean-time chronometer were noted, a similar comparison being made for the signals of the sidereal clocks, the errors of which were obtained from the transit observations.

The double-transmission time over the distance of 3840 miles is 0·0429s. by the American observers, and 0·0424s. by the French. The deduced speed is 180,000 ± 12,000 miles p.s., practically that of light.

The final result for Washington-Paris is 5h. 17m. 36·653s. ± 0·003 1s. The result for period ii. is, however, 0·06s. greater than that for period i.

The seconds of the longitude as given by cable exchanges in 1866, 1870, 1872, and 1892 were 36·56s., 36·73s., 36·69s., and 36·70s. respectively. The mean is 36·67s., very near the new determination. The longitudes of several other American observatories were deduced by the same wireless signals. The results are appended to the report.

THE ELECTROLYTIC DISSOCIATION THEORY.

AMONG scientific gatherings the general discussions of the Faraday Society have come to occupy a very high place on account of their representative character and practical value. The latest of these discussions, on the present position of the theory of ionisation, held on January 21, was favoured by an interesting contribution from Prof. Arrhenius himself, the last sentence of which is as follows :—"On the whole, it may be said that the dissociation theory corresponds as well with experience as may be expected in the present state of our knowledge." Nowadays few will quarrel with this dictum.

Although the discussion reflected the general opinion that the dissociation theory of solution is the only one worth serious consideration, it also showed that there are still many unsolved problems in connection with solutions. Among these the following deserve special mention :—(1) The question of hydration or, more generally, "solvation" of the ions; (2) the problem of strong electrolytes—that is, the fact that the ionic equilibrium in strong electrolytes does not follow the law of mass-action, which applies so accurately to weak electrolytes (*e.g.* organic acids); and (3) the question of the chemical activity of ions and non-ionised molecules.

Most chemists now consider that ions in solution are associated with the solvent to a greater or less extent. Some go further, and adopt the view first put forward tentatively by van der Waals in 1891 that association with the solvent is the determining cause of ionisation, and that the required energy comes from the heat of hydration of the ions. Although this suggestion is at first sight a plausible one, it is still unsupported by any convincing evidence, and, in any case, is not likely to furnish a full explanation of the mechanism of ionisation.

Further, the many attempts made to determine the degree of hydration of the ions have so far not been very successful. Mr. W. R. Bousfield, who contributed two papers to the discussion, has calculated the degree of hydration of certain ions on the assumption that an ion (with associated water molecules) can be treated as a small sphere moving through the solvent, and that the radius of the complex can be calculated by means of the well-known formula of Stokes. Dr. H. Sand now finds that the application of Stokes's formula in the manner adopted by Mr. Bousfield gives a value for the volume of the hydroxyl ion about one-thirtieth of that obtained by other methods, and he draws the important conclusion that Stokes's formula cannot be applied to particles of molecular magnitude.

The discussion of the problem of strong electrolytes proved of special interest on account of the recent work of Messrs. Washburn and Weiland in America on the dissociation of potassium chloride in very dilute solution (0·00001–0·001 molar). This was rendered

possible by the use as solvent of "ultra-pure" water with a specific conductivity of $0{\cdot}05-0{\cdot}07\times10^{-6}$ reciprocal ohm. The uncertainty attached to measurements in high dilution owing to impurities in the solvent is thus practically eliminated, as the water correction for 0·00007 and 0·00002 molar solutions is only 0·7 per cent. and 2·5 per cent, respectively. From their results Washburn and Weiland draw the important conclusion that the law of mass-action applies between the concentrations 0·00002 and 0·00007 molar, the constant, k, of the dilution formula, $\alpha^2c/(1-\alpha)=k$, having the value 0·02 at 18°; between 0·00007 molar and 0·001 molar k increases regularly up to a value of 0·052 at the latter concentration. Although it is true that the concentration of the undissociated part, $1-\alpha$, is very small in these high dilutions, yet the accuracy of the measurements is such that the applicability of the dilution law up to 0·00007 molar may be regarded as established. Prof. Arrhenius and others had previously expressed the opinion that the law of mass-action is valid for strong electrolytes in sufficiently dilute solution, but this conclusion was open to doubt on account of the uncertainty in the correction for the conductivity of the solvent. At the meeting considerable difference of opinion was expressed on the question as to whether the validity of the mass law for strong electrolytes in sufficiently dilute solution can be proved by thermo-dynamical reasoning.

The results just described would appear to throw some light on the cause of the deviation of strong electrolytes from the mass law. The fact that the deviation appears in such high dilutions is difficult to reconcile with any explanation based on association between solvent and solute, as this would involve hydration values so great as to be in the highest degree improbable.

Walden and others ascribe the deviation to increased ionising power of the solvent owing to the presence of the electrolyte, and also to the effect of the electrolyte in increasing the ionisation of the solvent. Dr. J. W. McBain and Mr. F. C. Coleman showed in a paper published some years ago that there is no definite evidence of the supposed effect of salts in increasing the ionising power of water, and they show in a contribution to the present discussion, on the basis of migration experiments, that salts do not increase the ionisation of water. The latter conclusion is supported by the fact that the same value is obtained for the dissociation constant of water as determined by different methods, salts being present in some cases, but not in others.

The consideration of the above and other suggested explanations shows that the problem of strong electrolytes is not yet solved, but much may be hoped from the continuation of investigations, such as those of Washburn, with highly purified solvents. The question of inter-ionic forces also deserves careful study, and in this connection a theoretical contribution to the discussion by Dr. S. R. Milner will be read with interest.

Mr. Ghosh (Trans. Chem. Soc., 1918) has recently put forward the view that salts are completely ionised in solution, and that the apparent increase of the molecular conductivity with dilution is due to the operation of electrical forces. On this basis he obtains a formula which permits of the calculation, from known data and a knowledge of the dielectric constant of the solvent, of the ionisation of a salt at a particular dilution and temperature. Dr. J. R. Partington, in an interesting contribution to the discussion, has critically examined Mr. Ghosh's theory, and draws the conclusion that his fundamental assumption, that only electrical forces are operative in the solution, is disproved.

The view formerly held by many supporters of the ionisation theory that only the ions of an electrolyte can react has now been abandoned, since it has been shown independently by Dr. Senter and by Prof. Acree that both ions and undissociated molecules are chemically active. Another aspect of the same subject which has received much attention in recent years is the suggestion that the catalytic activity of strong acids is due partly to H′ ions and partly to the undissociated molecules of the acid. If it be accepted that the catalytic effect of acids is a chemical action, this is simply a special case of the chemical activity of non-ionised molecules and their ions. A plausible explanation is thus afforded of the well-known fact that neutral salts accelerate the catalytic activity of strong acids.

Prof. Arrhenius considers the latter question in his contribution to the discussion, but favours an explanation of the accelerating effect of foreign substances based on the assumption that these substances increase the osmotic pressure of the reacting substances, and that the chemical reactivity of the latter is proportional to their respective osmotic pressures. The available experimental data do not allow this interesting suggestion to be tested adequately. G. S.

THE INHERITANCE OF MILK AND FAT PRODUCTION IN CATTLE.

AT the Maine Agricultural Experiment Station Mr. John W. Gowen has made a genetic study of the first-generation crosses of prominent dairy breeds of cattle and beef-bred Aberdeen-Angus. This work, the results of which are published in the *Journal of Agricultural Research* (vol. xv., October, 1918, pp. 1–57, 6 plates), was undertaken as a link in the chain of evidence necessary to the final solution of the problems which are connected with the inheritance of milk production and butter-fat production. A cross-bred herd is being formed at the experiment station so as to provide as much material as possible for the analysis of the laws of heredity concerned with the productivity referred to, and this herd has now gone into its second generation.

An indication may be given of some of the important results already reached by Mr. Gowen:—

(1) Black body colour is dominant to the other colour in the first generation. In the second generation an orange-coated bull and a dark Jersey dun-coated heifer were segregated out.

(2) White marking of the body, taken as a whole, appears as a dominant. Study of individual white areas, however, indicates that this is due to white in the inguinal region only, for this alone appears as such a dominant. White spots on the face, neck, shoulders, rump, flanks, and legs are generally suppressed in the offspring when the white-spotted individuals are mated to solid colour.

(3) Pigmented muzzle is dominant to one not so pigmented.

(4) A pigmented tongue is dominant to a non-pigmented one—a confirmation of a previous result.

(5) A black switch appears to cause the suppression of the other switch colours in the offspring.

(6) Some exceptions were found to the previously accepted hypothesis of simple dominance of polledness over the horned condition, and it is suggested that a hormone secreted by the testes may have some influence on the presence or absence of horns. Should this prove true, it would establish an interesting parallel between cattle and sheep, for in the latter a sex hormone is known to affect the development of the horns.

(7) The qualities of beef production are shown to be divisible into four general regions of the body:

head, forequarters, barrel, and hindquarters. When either parent is of Aberdeen-Angus breed the offspring show the characteristic type of head and heavy, deep-fleshed forequarters. The body and hindquarters appear intermediate, but resemble most the dairy parents. From his results so far the author concludes that for the improvement of the beef qualities of dairy breeds the first-generation crosses show an increased value of the beef qualities in the forequarters without materially influencing the hindquarters.

(8) A few data are supplied as to the production of milk and butter-fat by some of the cross-breds. The results indicate that milk and fat production behave separately in inheritance. High milk production is dominant to low, but, unfortunately, a high fat percentage in the milk is recessive to a low fat percentage. The author supplies a useful bibliography and numerous illustrations.

SOME DEVELOPMENTS IN INDUSTRY DURING THE WAR.[1]

Mica.—The electrical industry has proved to be a great war industry. It is bound to become an even greater peace industry. Previous to the war Germany had established a predominant position in this industry, but this would not have been possible without the supplies of mica brought from India and other parts of the British Empire.

Mica is absolutely essential to the electrical industry, and the position of the British Empire in regard to mica supplies was, and is, far and away the strongest of any country in the world. India produces 50 per cent. of the world's supply of mica, and Canada 15 per cent. Germany within her own Empire obtained 10 per cent. of the world's supply, this being found in German East Africa. But, in spite of the overwhelming national advantages of our position at the outbreak of war, the mica market of the world was at the point of being transferred from London to Hamburg, thanks to the skill with which Germany had obtained a large measure of control of the Indian mines and the success with which she had captured the electrical industry. The Indian mica was either exported direct to Germany (she took 47,000 cwt. in 1913) or re-exported from this country to Germany, 50 per cent. of our total imports from India in that year being so re-exported.

The Indian mica can at present be exported to London only, and the mica in German East Africa is now being worked for, and obtained by, the Ministry of Munitions. Thanks to these measures, and to the necessities of war, the British electrical industry has taken the place previously held by Germany and Austria, and is now the first in the world.

The demands for mica for the electrical industry are bound to increase, and the expected developments of commercial aircraft, wireless telegraphy, and motor traction make it essential that the Empire's supplies of this vital raw material should be safeguarded. The electrical industry is bound to be of such importance to the future industrial development of this country that we cannot afford to take risks with the valuable raw material of mica, with which the Empire has been so bountifully endowed.

Tungsten.—Tungsten is essential to the manufacture of high-speed steel, and high-speed steel is a vital war material. Tungsten is also used in the manufacture of metallic filaments for electric lamps, in certain appliances for wireless and other electric uses, where to some extent it has taken the place of platinum, but its principal use is in the production of high-speed steel. Before the war the British Empire produced 40 per cent. of the wolfram-ore from which tungsten is made, but so successfully had Germany captured the trade that no British manufacturer was able to establish the industry in this country. Germany owed her great superiority in munitions production in the earlier stages of the war to the success with which she had captured the industry of tungsten production. All that has been changed. We are now able to produce all the high-speed steel needed for our own industries and to export at a reasonable price to our Allies. British manufacturers are now in a position to deal with all the British Empire production of ore, and could, if necessary, convert the whole world's output into tungsten metal or ferro-tungsten.

Ferro-chrome.—Ferro-chrome also is an essential material in the production of certain classes of steel. Alloyed with steel it acts as a toughener, and is used as chrome-steel for armour-piercing shells, in armour-plate, and for the wearing parts of aeroplane engines and gears in motor vehicles. For peace purposes it will be largely employed for such various purposes as motor parts, stainless cutlery, and rustless steel.

Before the war the United Kingdom production was practically negligible. We have now established at Newcastle-upon-Tyne a plant sufficient to meet our requirements for many years to come. Previously we imported our supplies from Norway, where it was produced by hydro-electric power. At Newcastle the power is obtained from the waste gases from coke-ovens, and the industry will be in the unique position of competing successfully with the cheap water-power of Scandinavia.

Spelter.—Spelter (or zinc, to give it its correct name) occupies the third place in point of importance amongst non-ferrous base metal. The world's consumption in 1913 was 1,012,000 tons, as compared with copper 1,044,000 tons and lead 1,196,000 tons. It is an essential material in industry in the making of a large number of domestic articles and in building construction. Its main uses are for galvanising or coating iron and steel to prevent rusting, and for mixing with other metals to form brass, gun-metals, and other alloys. It is also rolled into sheets for roofing and electrical purposes. The oxide of zinc forms, next to white lead, the most important pigment. It is an indispensable compound of manufactured rubber, and is extensively used for medicinal purposes.

The British Empire is fortunate in possessing in Australia practically unlimited supplies of zinc ore (concentrates), these being amongst the largest in the world. For reasons which it is not my present duty to examine, Germany obtained control of these important ore supplies. She imported from Australia a large portion of her supplies of zinc ore, and on these was able to extend her important zinc industries.

Our own position previous to the war was that we used annually 240,000 tons of spelter in various forms, of which 77 per cent. was imported—practically all from Germany, Belgium, and Holland—Germany being the largest exporter to this country, sending us in 1913 1,500,000*l.* worth of spelter, besides smaller values of sheet-zinc, zinc oxide, and lithopone.

On the outbreak of war these supplies ceased, and we were faced at the same time with a tremendously increased demand for spelter to be used in the making of brass for fuses, cartridge-metal, and so on. Our immediate needs were principally met by imports from North America. The price bounded up from 23*l.* per ton to 120*l.* per ton. This figure led the U.S.A.

[1] From an address to the Industrial Reconstruction Council on Friday, November 29, 1918, by Mr. F. G. Kellaway, M.P., Parliamentary Secretary to the Ministry of Munitions.

smelters to erect new works, and by the middle of 1917 the price had come down to 50*l*.

The need for war purposes was thus met, but it was obviously dangerous to have to depend on outside sources to so great an extent for what was an essential material for war as well as for peace. The first step taken was to divert the stream of zinc concentrates which had flowed from Australia to Germany, and make them flow from Australia to this country. That has been done. These essential raw materials have been diverted—permanently, I believe—to this country. The raw material having been secured, steps were taken to increase the plant available for smelting the ore into metal and for the manufacture of zinc sheets, and the zinc smelters in this country were got together and arrangements made whereby their plants were doubled, and in some cases trebled. Unfortunately, before these extensions were completed the shipping position from Australia became so serious that all shipments of zinc ore from that quarter had to cease.

But that difficulty should soon disappear, and with the ore coming in freely, and labour and coal available for working the increased plants, the home production of spelter should reach 140,000 tons per annum, as against 32,000 tons before the war. The production of zinc oxide has also been encouraged, and on a war basis we are self-supporting, and there is no reason why we should not be self-supporting on a peace basis.

Potash.—Potash is essential for fertilisers and in certain industries, particularly dyes, drugs, and glass production. There are no known natural deposits in this country. Germany possesses large natural deposits, and we depended for our pre-war supplies of 30,000 tons per annum entirely on potash brought in from the Stassfurt mines. The war put an end to this source of supply, and it became necessary to find alternative sources. Investigation revealed the fact that 50,000 tons of potash were going to waste every year in the dust or fume from blast-furnace gases. The problem of collecting these dusts was a difficult one. The only known method was the Halberg-Beth system—a German invention. This was complicated, and required a large amount of steel and labour. The design has been modified to ensure greater trustworthiness, lower capital cost, and a small quantity of steel. Plants in hand and those in course of erection without these modifications should produce 18,000 tons of potash per annum. In addition, the Ministry has initiated an entirely new method of gas-cleaning for the collection of potash-bearing dust from blast-furnace gases. Two large-sized plants are being erected at two blast-furnace works which should produce about 1600 tons per annum. It is confidently hoped that, when these are working, similar plants will be extensively installed, and a considerable increase in potash production obtained.

Magnetos.—Modern warfare, and a great part of modern transport and of modern industry, depend on the magneto. In the air it is an essential source of power and movement. The position of this country in 1914 in regard to the production of magnetos was very grave. Only one firm—Messrs. Thomson-Bennett Magnetos, Ltd., of Birmingham—was producing magnetos. Its output for 1913–14 was 1140 magnetos of a simple type. The Admiralty and the War Office endeavoured to meet our war requirements by importation, but by July, 1915, it had become evident that if we continued to depend on imported magnetos our war effort would be terribly hampered. The Admiralty then undertook to foster the supply of home-produced magnetos for all the fighting Services, and continued this work until it was taken over by the Ministry of Munitions in April, 1917.

The problems to be overcome were many and difficult. Suitable magnets were not obtainable in the British Isles, or the necessary hard rubber insulating material, or fine copper-enamelled wire, or oiled silk or paper for insulation. For the best quality enamelled wire we have still to depend to some extent on the U.S.A., and for oiled silk on Japanese fabric. But the progress made in providing these four essential materials at home has been wonderful. If we are not yet entirely self-supporting, we soon should be.

Instead of one firm producing only 1140 magnetos in a year, as was the case in 1914, we now have some fourteen firms producing 128,637 magnetos in a year. The monthly output at the beginning of the war was 100, the output for October last 18,000, that being the largest figure yet reached. It is not only that we are producing in quantity, which makes us independent of outside sources; the quality of the British magneto is also the highest in the world. It is lighter in weight and more trustworthy in service than the Bosch magnetos manufactured before the war, or than the latest examples found in captured German aeroplanes.

Ignition Plugs.—The ignition plug ranks with the magneto in importance, and it presented similar difficulties. The pre-war output of this country was insignificant. There were three firms manufacturing, and their total output for all purposes during 1914 was not more than 5000. To-day five firms in the country are producing mica plugs, and their output for the year ending October 31 last was 2,148,726. The October output was 303,449, as compared with a monthly output of 420 in 1914. It is gratifying to be able to state that the French, Italian, and American Services endeavoured to obtain British plugs. But there is room for further improvement in the design of mica sparking plugs for aircraft work. I think we can safely rely on our manufacturers not to rest and be thankful, but to make the British plug not only the best in the world—it is that already—but the best that science and mechanical skill can make.

Glass Industry.—This country very nearly lost the war owing to the fact that it was almost entirely dependent on Germany and Austria for scientific and optical glass, and to the backwardness of our glass industry taken as a whole. There were a few refreshing exceptions—firms which had kept the flag flying—but generally it is true to say that we were dependent on Germany and Austria for supplies essential to success in war and for a wide range of peace purposes.

Optical and Scientific Instruments.—Prior to the war the optical and scientific instrument industry in this country was in a lamentable condition, the trade having practically degenerated into a collection of middlemen who mainly sold instruments completely manufactured in foreign countries or bought in foreign parts and assembled them in this country. All that has been swept away by the bitter necessities of war. Our output has increased at least twenty times, and we are now self-supporting. Our pre-war output of optical glass amounted to about 10 per cent. of our peace requirements, the balance coming principally as to 60 per cent. from Germany and Austria and 30 per cent. from France. Our output has developed to such an extent that it is now in excess of that which can be absorbed by this country even under the most favourable conditions in peace-time, and we must look to the development of foreign markets, which previously were the monopoly of Zeiss, of Jena, for disposing of the balance of our home-produced supplies.

Dial-sights.—It is a humiliating admission to have to make, but it is a fact that at the outbreak of war a considerable part of our artillery was equipped with gun-sights exclusively manufactured in Germany. The

sight is known as Dial-sight No. 7, and was patented by C. P. Goerz, of Berlin, both in Germany and this country. At the outbreak of war the War Office had already approached the British manufacturers—Messrs. Ross, of Clapham Common, and Messrs. Beck, of Kentish Town—but the position as regards these sights was exceedingly serious when the Ministry of Munitions was formed. The total deliveries to October, 1915, were 1362; the total deliveries to date entirely from home manufacturers are 21,000. The two firms I have mentioned were recently producing 250 per week. The sight is a beautiful and delicate piece of work, and its production in such numbers, and in a perfection which Germany never exceeded, is a triumph for British skill. It is, at any rate, a comfort to know that we no longer have to depend on potential enemies for the sighting of our magnificent artillery.

Scientific Glassware.—This can be divided into furnace-made and lamp-blown. Almost without exception, the furnace-made scientific glassware used in this country was, prior to the war, obtained from Germany and Austria. As regards lamp-blown scientific glassware, there existed a few small firms capable of executing repairs and making a limited number of articles of special design. Beyond this our requirements were met by supplies which originated in Austria and Germany. To show the developments made during the war, it is sufficient to state that, starting at practically nothing, the turnover of the scientific glassware industry is now equal to more than 600,000*l.* per annum. Within a short period, by careful and judicious treatment, this country should be independent of outside supplies.

Illuminating Glassware.—Prior to the war the whole of the glasses for miners' safety-lamps and oil-lamp chimneys were obtained from abroad, mainly from Germany and Austria. Seventy-five per cent. of the glass bulbs, tubing, and rod for electric lamps also came from Germany and Austria. Our dependence on Germany and Austria for the glass for our miners' safety-lamps very nearly landed us in disaster. The position was so serious that the Home Office was forced to relax the very stringent conditions which up to that time had been insisted upon with regard to the quality and dimensions of glasses for miners' safety-lamps. It was a serious thing to do, but there was no alternative, as it was impossible to obtain supplies of the necessary quality. The Home Office came to the Ministry of Munitions for assistance, and, notwithstanding the extraordinary difficulties met with, we are now producing sufficient supplies of the right quality.

As regards oil-lamp chimneys, before the war practically none were made in this country. The position has been greatly improved, but there is room for further improvements.

Then take the position of glass used in the manufacture of electric lamps. Before the war our output of bulbs for this purpose was approximately twelve millions per annum, and three out of every four of the electric light bulbs in use in this country were imported, principally from Germany and Austria. We are now manufacturing sufficient to meet our essential needs.

Then we come to the glass for domestic use, bottles and jars used as containers for foodstuffs and for preserving. Our production in 1914 for vacuum fruit jars alone was 22,317 dozen. In 1918 it was 83,333 dozen. We are now quite self-supporting.

Much more remains to be done by the provision of more efficient works and furnaces, the installation of the most modern machinery, the development of potash production, the training of labour, scientific research, and Government organisation.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—The Francis Maitland Balfour studentship for research in biology, value 200*l.* a year for three years, has again been awarded to Mr. F. A. Potts, fellow of Trinity Hall, who was elected to it in 1913.

A GIFT of 20,000*l.* to the University of Chicago for the erection of an administration building is announced in *Science* from Mr. Andrew MacLeish, vice-president of the board of trustees of the University.

WE learn from the *British Medical Journal* that the medical university at Peking now being erected by the Rockefeller Foundation at a cost of 1,200,000*l.* will be opened not later than next October. Another medical university will be built at Shanghai.

A COURSE of six public lectures on "Physiology and National Needs," arranged in conjunction with the Imperial Studies Committee of the University of London, will be delivered at King's College, Strand, W.C. The lectures will be given on Wednesdays at 5.30 p.m. The first lecture will be by Prof. W. D. Halliburton on February 5 on "Physiology and the Food Problem," and succeedings lecturers will be Dr. M. S. Pembrey, Prof. F. G. Hopkins, Prof. A. Harden, Prof. D. Noel Paton, and Prof. A. Dendy.

ON January 2 last the joint session of the Headmasters' Conference and the Incorporated Association of Headmasters passed a series of resolutions which, if carried into effect, will go far to improve the position of science teaching in our schools, especially in the public and the preparatory schools. One of these ran as follows:—"That mathematics and natural science should be necessary subjects in the entrance scholarship examinations of public schools, in the First School Examination, and in the examinations for entrance in the Navy and the Army, provided that good work in other subjects should compensate for comparative weakness in mathematics and natural science, and *vice versa*." Unfortunately, an incomplete version of this resolution was published in the Press, including our issue of January 9 (p. 379), the words "and *vice versa*" being omitted. We are glad to be able to remove the disappointment of those who read the inaccurate reports.

AT the general meeting of the Association of Science Teachers, held on January 6 at University College, London, Prof. F. W. Oliver opened the conference on "The Relations between the School and the University in Regard to Science Teaching." He pointed out that, as a consequence of the improvement in the science teaching of schools, the Intermediate Examination is becoming the standard for many of them, and that this results in a repetition of work at the university, as the colleges do not realise that students are better equipped than formerly. In order to bring about greater co-operation between the schools and universities, the teachers in both should have opportunities for meeting for the exchange of views on methods, curricula, etc. Prof. Oliver also suggested that the universities should provide special courses for school teachers to enable them to keep abreast of the advances made in the various branches of science. Prof. Weiss (Manchester) referred to the difficulty of co-ordinating the higher work in schools with the first year's course at the university, and suggested that, instead of specialising in one or two branches, the schools should aim at a more level standard in the general science teaching. If the general level of the school work were raised, the university would be able to remodel the first year's

course and to arrive at a higher standard in the Final Examination. Prof. Weiss also expressed the hope that the conditions of the science teachers in schools might be so ameliorated that many of them might engage in original investigations, which would vivify their teaching and enable them to instil a really scientific attitude of mind in their pupils. The meeting passed a resolution that a consultative council of university and school teachers should be appointed to discuss the scope and method of the higher work in schools and its relation to the work of universities.

A SUCCESSFUL conference on the report of the Government Committee on Modern Languages was held at the County Hall of the L.C.C. on Wednesday, January 22. The proceedings were opened by Sir Cyril Cobb, M.P., who said the report had made the question of modern languages a popular one. Mr. Stanley Leathes, chairman of the Government Committee, followed. He dwelt on our ignorance of and indifference to the subject in the past, and insisted on English being the most important language of all, French being next in importance. The position of German would be decided by the importance of Germany. The esteem of the public could alone give modern languages their rightful place in education. Languages should be learnt, not for themselves, but for what they contained. It was not worth while to learn a language badly. Better to learn one language well than two badly. Mr. Gooch dilated on the existing provision for modern languages in London. Lord Crewe, who was responsible for the creation of the committee, insisted on the need for studying the history and institutions of the foreign country as well as the language and literature. Sir Hubert Hamling spoke all too briefly on the value of well-trained linguists to the commerce and banking of to-day. Principal Burrows, of King's College, told of the intensive courses in modern languages recently started by the college. Miss Tuke spoke of the women's interest in the matter. Sir Lulham Pound described the work of the City of London College. Miss Purdie, headmistress of Maida Vale High School, pointed out numerous deficiencies in the existing system. Mr. Fuller dwelt on the gap between the school and the university, which should be bridged by scholarships. Mr. Hedges spoke of the work of the evening institutes, and after a short discussion the proceedings closed with a vote of thanks to the chairman, the question of the future continuance of the debate being left open.

SOCIETIES AND ACADEMIES.

LONDON.

Geological Society, January 8.—Mr. G. W. Lamplugh, president, in the chair.—Prof. P. F. **Kendall**: "Wash-outs" in coal-seams and the effects of contemporary earthquakes. Two types of interruptions are differentiated in coal-seams which have been confused under the general terms of "wash-outs," "wants," "nips," or "dumb-faults." One type may be due to erosion by contemporary streams which coursed through the alluvial area where the coal material was accumulating. A number of examples of this type in the Midland coalfield are described. Split seams of the type in which the seam rejoins are kindred phenomena, but in these cases the erosion was always contemporary. Great diversity in the phenomena of splits and wash-outs arises from the differences in the ratios of shrinkage during consolidation of the various constituents. Cannel acts as a substance of little compressibility. Other disturbances of the coal-seams, miscalled "wash-outs," are referred to earthquakes. Some of the effects of earthquakes in Coal Measure times might be expected to be of a magnitude greater than the effects of recent earthquakes. An abnormality in coal-seams consists in the intrusion into the coal of sedimentary material or the encroachment of masses of amorphous sandstone as "rock-rolls," probably due to the invasion of sands rendered mobile by excess of water, and perhaps of gas, and moving under the impulse of waves of elastic compression produced by earthquakes. In the roofs of many coal-seams and projecting slightly into the coal are curious conical masses of sandstone, familiar to the miners as "drops." They are wrinkled on the surface, and often have a flange on two sides, showing that they were produced on the site of a crack. They are ranged in long rows. These are interpreted as casts of the funnel-shaped orifices through which the sands surcharged with water have been expelled. Fissures filled with sand or other materials, the "sandstone dykes" of American writers, are not so common in the Midland coalfield as in some other coalfields. They show contortion where passing through the seam, proving that the coal substance had not undergone its full compression at the time when the fissure was produced. A large number of examples of each type of phenomenon, drawn from the examination of more than thirty mines in the coalfield, are discussed.—Dr. A. **Gilligan**: Sandstone dykes or rock-riders in the Cumberland coalfield. These sandstone dykes have been encountered in pits distributed all over the coalfield, but those examined were met with in the workings of the Bannock Band and Main Band seams at Ladysmith Pit. The dykes pass through the Bannock Band and Main Band seams and the intervening measures. They run parallel one to the other in a direction N.N.W. and S.S.E. The inclination of the same dyke is not constant, but the greatest deviation from the vertical was 10° south-westwards. The average width of the dykes was from 2 in. to 4 in., but sometimes they increase to 10 in. or dwindle down to mere films. Splitting of the dykes was seen. The contact of the coal and dyke substance was sharply defined, the coal preserving all its normal features even when adhering to the sandstone. The probable conditions which obtained at the time of the formation of the fissures and their infilling were as follows:—The coal seams through which the dykes pass had been compressed to their present thickness, while they and the associated measures were sufficiently consolidated to take a more or less clean fracture. The sea in which the deltaic material of the Whitehaven sandstone was accumulating covered the area. Fractures were produced by earthquake disturbances set up by movement along one of the N.N.W. and S.S.E. faults, and the sediment on the sea-floor ran in and sealed them up.

PARIS.

Academy of Sciences, January 6.—M. L. Guignard in the chair.—G. **Bigourdan**: A project for the reform of the present civil calendar (Julian, Gregorian). Five principal faults of the Gregorian calendar are enumerated, the last of which, that the dates of the month have no single concordance with the corresponding days of the week, is regarded as the most inconvenient. Statistics made on a weekly basis, such as those of railways, are not easily adjusted to the months or the year. It is proposed to form each quarter of a first month of thirty-one days, followed by two months of thirty days; in the last quarter of the year the last month would always have thirty-one days, in leap years the extra day would be added by making the last month of the third quarter have thirty-one days. The three first quarters would thus have exactly thirteen weeks, so

that in each quarter the same days of the week would fall on the same dates of the corresponding months. A tabular comparison of the present and proposed calendar is given, and possible objections are met.—L. E. **Bertin**: The possible creation of a means of Franco-Belgian maritime communication between Antwerp and Marseilles.—Y. **Delage**: Suggestion on the nature and causes of segregative heredity (Mendelian characters) and of aggregative heredity (non-Mendelian characters). Commenting on the Mendelian theory as at present developed, the author points out that to reconcile the principles of the theory with observed facts a constant stream of fresh subsidiary hypotheses is needed. As an alternative to the Mendelian theory the following is proposed: The hereditary mode is a function of the degree of heterogeneity of the parental chromatines.—C. **Guichard**: A series of surfaces of constant total curvature such that their lines of curvature form a network of the type pA', $-(p+1)B'$.—G. A. **Boulenger**: Is evolution reversible? Considerations on certain fishes. The law of Dollo, that there is no known case demonstrating in an irrefutable manner the return of a modified organ to its primitive condition, is called in question. After reference to the work of W. D. Matthew and of L. Errara, examples are given in which there is an undoubted return to a primitive form of teeth. These occur in some African fishes belonging to the family of Cichlides (sometimes called Chromides).—H. **Duport**: Partial differential equations.—J. **Drach**: Determination of the cases of reduction of the differential equation $d^2y/dx^2=[\phi(x)+h]y$.—C. **Rabut**: A new canonical form of reinforced massifs.—Ch. **Frémont**: The premature rupture of pieces of steel submitted to repeated stresses.—R. **Dubrissay**, **Tripier**, and **Toquet**: A physico-chemical method of estimating alkaline carbonates in the presence of free alkaline bases. Application to the analysis of flue-gas. The method is based on the fact that whilst the hydroxides of the alkali metals increase the coefficient of reciprocal miscibility of water and phenol, the alkaline carbonates act in the opposite sense.—F. **Bourion** and A. **Sénéchal**: The evolution and oxidation of chromic hydrate in alkaline solution.—P. **Bugnon**: A new method of selective coloration of lignified plant membranes. The dye suggested is Lichtgrün F.S. (the sodium salt of diethyldibenzyldiamidotriphenylcarbinol trisulphonic acid), details of the technique being given. Important advantages are claimed for this stain.—M. **Denis**: Some thalla of Aneura deprived of chlorophyll.—J. **Amar**: The origin and consequences of feminine emotivity.—G. **Sanarelli**: The pathogeny of cholera. The natural defence of the peritoneum against the cholera vibrions.

January 13.—M. Léon Guignard in the chair.—G. **Lippmann**: The properties of electric circuits deprived of resistance. The researches of H. K. Onnes have shown that at the temperature of boiling helium the resistance suddenly diminishes practically to zero. Some mathematical consequences are worked out and applied to explain the results of some of the experiments of H. K. Onnes.—G. A. **Boulenger**: A case of ontogenic evolution in an African lizard, *Eremias lugubris*.—J. **Chazy**: Remark on the problems of two and three bodies.—H. **Bourget**: The algebraical development of the principal part of the perturbation function following the method of Cauchy.—R. **Baillaud**: A modification of the prism astrolabe designed to measure variations of latitude.—M. **Swyngedauw**: The influence of the sheath on the effective resistance and reactance of an armoured cable for the 3 harmonics. The effective line resistance and reactance for the harmonic 3 must be determined on the cable in use.—F. **Bourion** and A. **Sénéchal**: The evolution and magnetic properties of chromium hydrate in alkaline solution.—F. **Grandjean**: Calculation of the extraordinary rays for certain structures of anisotropic liquids.—P. **Pruvost**: The existence of Coal Measures at great depth at Merville (Nord). At a depth of 247 metres a black, bituminous schist was encountered, containing 32 per cent. of volatile matter. The boring passes through 31 metres of the lower Coal Measures.—S. **Stefanescu**: The phylogeny of *Elephas africanus*. From a study of the teeth the conclusion is drawn that the ancestors of *E. africanus* have come directly from the bunolophodont mastodons.—H. **Hubert**: The superposition of the air currents above the peninsula of Cape Vert (Senegal).—E. **Mesnard**: The origin and the grouping of meteorological phenomena.—E. **Mathias**: Rain in France: the parasite phenomenon.—C. **Somigliana**: The theory of seismic waves. A development and discussion of Rayleigh's theory of waves.—L. **Eblé**: Vibrations of the soil caused by explosions.—Ch. **Dufour**: Values of the magnetic elements at the Observatory of Val-Joyeux on January 1 last.—J. **Pavillard**: The female flower of Ruscus.—L. **Daniel**: Experimental cultures by the sea-shore.—L. **Lapicque** and E. **Barbé**: The chlorine index as a comparative measure of the richness of soils in humus. Soils remove active chlorine from sodium hypochlorite solutions in amounts which vary probably in the order of the richness of the soil in humus.—D. **Berthelot** and R. **Trannoy**: The absorbing power of dry or moist earth for gaseous chlorine. These experiments had their origin in an attempt to utilise earth as a protection against poisonous gases in the field. Details are given of the results obtained with six soils, both dry and moist.—R. **Dollfus**: Continuity of the line of germinal cells in the Trematods Digenea.—J. **Pantel**: Calcium in the normal physiology of the Phasmides.—M. **Baudouin**: The flattening of the upper part of the body of the humerus in children of the Polished Stone period.

CAPE TOWN.

Royal Society of South Africa, October 30, 1918.—Dr. J. D. F. Gilchrist, president, in the chair.—T. J. **Mackie**: Hæmolysis by serum in combination with certain benzol bodies. It has been shown that while serum-complement acts as hæmolysin in the presence of a specific immune body, and also along with colloidal silicic acid, serum is also capable of producing lysis of red-blood corpuscles which have been treated with certain benzol bodies. The paper records the result of experiments carried out with brilliant green.—J. R. **Sutton**: A possible lunar influence upon the velocity of the wind at Kimberley. The object of this paper is to discuss the question whether there is a lunar term in the velocity of the wind at Kimberley. The results of hourly observations made during 180 lunations reveal only one definite maximum and minimum of velocity in the lunar curve, the former falling about three hours before lunar midnight, the latter just before lunar noon, the range being 0·20 mile an hour. When the moon is in south declination the maximum of velocity is near lunar noon and the minimum near lunar midnight, the opposite being the case when the moon is north, the respective ranges of velocity being 0·32 and 0·55 mile an hour, which are greater than one would have expected to find.—Miss Ethel M. **Doidge**: South African Perisporiaceæ. V.: Notes on an interesting collection from Natal. A number of leaf-fungi are described from Natal, chiefly belonging to the genus Meliola, and including hitherto undescribed species.—A. **Young**: Fusion of Karroo grits in contact with dolerite intrusions. Certain unusual contact alterations occurring in the Heilbron district were described.

Dolerite intrusions have apparently fused the Karroo sandstone or grit to a dark glass resembling pitchstone. The contacts are sharply defined, and the vitrification extends to a distance of several yards from the actual contact plane. The results of a detailed petrological examination of the dolerite, the glass, and the sandstone were described. The dolerite presents no abnormal features. The sandstone contains much soda felspar. The glass on analysis yields about 7 per cent. of soda and about 5 per cent. of combined water. The glass might thus be called a pitchstone. Microscopic examination of the glass shows the presence of microlites of cordierite, magnetite, and also a fibrous mineral with physical properties suggestive of an amphibole. These microlites seem to be practically identical with those described by Harker and Clough as occurring under somewhat similar circumstances in the island of Soay, near Skye.—J. S. v. d. **Lingen** and A. R. E. **Walker**: (1) Hyalite. The points of resemblance between hyalite and liquid spherulites are noted. The truth of the statement that liquid spherulites and, under certain conditions, hyalite give uniaxial figures when examined in convergent polarised light is questioned. (2) Anatase. The authors exhibited a Laue radiograph of anatase, which shows that, according to the usual interpretation of such a photograph, the mineral possesses full tetragonal symmetry. Herbert Smith and W. von Bonde have, independently, suggested that possibly it did not possess the full degree of symmetry usually assigned to it; in both cases this suggestion was based on a study of the external crystal form of the mineral.—A. R. E. **Walker**: (1) Radio-active and other minerals associated with fossil wood from the Beaufort series. A description is given of torbernite and a mineral allied to uranocircite occurring, associated with calcite and barytes, encrusting and impregnating fossil wood from beds of Lower Beaufort age on the farm Quaggasfontein. (2) Tantalite crystals from Namaqualand. A description is given of a number of crystals obtained from a tantalite prospect at Jakals Water, Namaqualand. The collection represents specimens which, solely because they possessed crystal faces, were set aside during the sorting of tantalite from *débris* obtained by blasting. Apparently two distinct varieties of tantalite are represented, which, whilst exhibiting a general similarity of crystal form, consistently differ from each other in certain crystallographic details, in specific gravity and other physical characters, and, presumably, in chemical composition.—J. **Moir**: Colour and chemical constitution. Part v.: The yellowness of certain phthaleins when acid. Phenolsulphonephthalein, on account of its high ionisation, does not form a colourless ring-lactone like phenolphthalein, but remains yellow when acidified; it is really the orthosulphonic acid of benzaurine (which shows similar colour changes). Benzaurine parasulphonic acid and benzaurine-carboxylic methyl-ester ("phenolphthalein methyl-ester") have now been made and found to possess the same property of yellowness in acid solution, lactone-formation being excluded in both cases. The latter substance is coloured pink by bicarbonates, and not bleached by excess alkali. Part vi.: The ultra-violet spectra of the phthaleins. A discussion of Howe and Gibson's discovery of violet and ultra-violet absorption-bands in alkaline phthaleins. These have frequencies which are 1½ times and twice those of the visible band. It follows that the fundamental vibration of alkaline phenolphthalein is still unobserved, being in the infra-red at λ 11,090 (frequency 9·02) on the usual scale. The visible band in the green is its first harmonic, and the other two are its second and third. Part vii.: Inorganic phenomena in connection with cobalt, nickel, manganese, and uranium. Part viii.: Fluorescence and its laws. On comparison of the spectra of dissolved (ionised) salts of these metals with those of the salts in the solid state, "loading" effects are observed similar to those shown by the phthaleins. The formation of blue cobalt compounds is ascribed to considerable increase of molecular weight due to combination with environing molecules. In the case of cobalt halides the wave-lengths appear to be proportional to the eighth root of the molecular weight, and in uranyl compounds they are proportional to the sixth root. The coincidence of these numbers with the periodic place of the element is noted.

CALCUTTA.

Asiatic Society of Bengal, December 4, 1918.—J. **Hornell**: The origin and ethnological significance of Indian boat designs. The principal types of existing small craft comprise:—(1) The catamaran or raft form; (2) the basket-boat or coracle; (3) the dug-out canoe; (4) the outrigger design in two forms, either with (*a*) the float boomed out or (*b*) a transversely placed balance-board amidships; (5) lateen-rigged boats, with grab bows; (6) high-sterned river craft with quarter rudder-paddles or with balanced rudders; and (7) square-rigged river boats with double masts of **A**-form. The catamaran appears to be of indigenous origin, as nowhere else does it show such elaboration as in India; its most primitive form is seen in reed rafts and in plantain stems skewered together. The Indian basket-boat is identical with that used in Mesopotamia, while river craft using quarter steering oars (Ganges) and those with mast triangles (Burma) are distinctively Egyptian in origin. Lateen-rigged craft with overhanging bows are found only on the West Coast of India; they appear to be of Arab origin, representing probably the evolution of the boat form used by the Sabæans of S.W. Arabia in the earliest stage of traffic between Arabia and India. The outrigger design is much more widely spread on Indian coasts than is commonly known. The main conclusions are as follows:—(*a*) That the pre-Dravidian population of, at least, coastal India was largely of Polynesian stock, these fisherfolk using, like the peoples of Malaysia and Polynesia of the present day, outrigger canoes and balance-board proas. (*b*) That the true Dravidians, who appear to be a branch of the Mediterranean race, learned or invented the use of the circular coracle while living in Mesopotamia, and on arrival in India, *via* Baluchistan, introduced the boat forms of the Nile and the Tigris, the former on the great perennial rivers, the latter on those that carry little water in the dry season. Cranial measurements of the various castes in the extreme south of India reveal an unexpectedly strong brachycephalic element in the lower caste population. Various other facts are enumerated pointing to the validity of the author's main hypothesis of a strong Polynesian element in the Indian coastal population.—E. **Vredenburg**: (1) The occurrence of *Cypraea piriformis*, Gray, in the Mergui Archipelago. Amongst the mollusca from the Mergui Archipelago collected by Dr. J. Anderson this shell was referred by von Martens in 1888 to the Australian species *C. xanthodon*. On cleaning the shell it was found to be a perfect specimen of the extremely rare species *C. piriformis*, hitherto only known from Ceylon and North Australia. (2) Two albino varieties of *Cypraea erosa*, Linnæus. The specimens described are from the zoological collections in the Indian Museum. The variety which it is proposed to name *kavlinica*, from New Britain, is almost all white, and a second variety named *purissima*, probably from Queensland, is entirely of a pure snow-white, closely simulating the appearance of *C. eburnea*, Barnes, the only other known instance

of an entirely white shell amongst the Cypræidæ. (3) The specific identity of the West Indian *Cypraea henikeri*, Sowerby, and of the East Indian *C. murisimilis*, Martin, with the description of a new species or variety, *C. blandiana*, and remarks on some related forms. A collection of Lower Miocene fossils from San Domingo, presented to the Geological Survey of India by Prof. Gabb in 1874, contains a fine specimen of *C. henikeri*, Sowerby, the study of which has established its specific identity with *C. murisimilis*, Martin, from the Lower Miocene and Vindobonian of Java. This shell is usually characterised by dorsal protuberances similar to those observed in the closely related living species, *C. mus*, Linn. Associated with *C. henikeri* at San Domingo is a hitherto unrecorded fossil, here described under the name of *C. blandiana* as a variety of *C. henikeri* or as a closely related species.

BOOKS RECEIVED.

Pharmacy, Theoretical and Practical, including Arithmetic of Pharmacy. By Prof. E. A. Ruddiman. Pp. vi+267. (New York: J. Wiley and Sons, Inc.; London: Chapman and Hall, Ltd.) 8*s*. 6*d*. net.

The Examination of Milk for Public Health Purposes. By J. Race. Pp. vi+224. (New York: J. Wiley and Sons, Inc.; London: Chapman and Hall, Ltd.) 8*s*. 6*d*. net.

L'Insidia Sottomarina e Come fu Debellata con Notizie sul Recupero delle Navi Affondate. By E. Bravetta. Pp. vii+461. (Milano: U. Hoepli.)

Faith in Fetters. By the Rev. T. R. R. Stebbing. Pp. 223. (London: T. Fisher Unwin, Ltd.) 6*s*. net.

Rudiments of Handicraft. By W. A. S. Benson. Pp. 40. (London: J. Murray.) 1*s*. net.

Solid Geometry, including the Mensuration of Surfaces and Solids. By Prof. R. S. Heath. Fourth edition. Pp. 123. (London: Rivingtons.) 4*s*.

A Star Atlas and Telescopic Handbook (Epoch 1920) for Students and Amateurs. By A. P. Norton. Pp. 25+maps 16. (London and Edinburgh: Gall and Inglis.)

Anuario del Observatorio de Madrid para 1919. Pp. 741. (Madrid: Imprenta de la Casa Editorial Bailly-Baillière, 1918.)

The Earth's Axes and Triangulation. By J. de Graaff Hunter. (Survey of India. Professional Paper No. 16.) Pp. viii+219+charts vi. (Dehra Dun: Office of the Trigonometrical Survey, 1918.) 5*s*. 4*d*.

Scientific Reports of the Agricultural Research Institute, Pusa. (Including the Report of the Imperial Cotton Specialist, 1917–18.) Pp. iv+144+xx plates. (Calcutta: Superintendent Government Printing, India, 1918.) 2*s*.

DIARY OF SOCIETIES.

THURSDAY, JANUARY 30.

ROYAL INSTITUTION, at 3.—Prof. J. N. Collie: Chemical Studies of Oriental Porcelain.

ROYAL SOCIETY, at 4.30.—Prof. J. C. McLennan and R. J. Lang: An Investigation of Extreme Ultra-violet Spectra with a Vacuum Grating Spectrograph.—Prof. J. C. McLennan and J. F. T. Young: The Absorption Spectra and the Ionisation Potentials of Calcium, Strontium, and Barium.—Prof. J. C. McLennan, D. S. Ainslie, and D. S. Fuller: Vacuum Arc Spectra of various Elements in the Extreme Ultra-violet.—R. C. Dearle: Emission and Absorption in the Infra-red Spectra of Mercury, Zinc, and Cadmium.—E. Wilson: The Measurement of Magnetic Susceptibilities of Low Order.—Dr. F. Horton and Ann C. Davies: An Experimental Determination of the Ionisation Potential for Electrons in Helium.

FRIDAY, JANUARY 31.

ROYAL INSTITUTION, at 5.30.—Prof. H. H. Turner: Giant Suns.

MONDAY, FEBRUARY 3.

VICTORIA INSTITUTE, at 4.30.—Rev. H. J. R. Marston: The Philosophy of Bishop Butler.

SOCIETY OF ENGINEERS, at 5.30.—W. N. Twelvetrees: Presidential Address: Review of the Development of British Concrete Shipbuilding.

ARISTOTELIAN SOCIETY, at 8.—Prof. Wildon Carr: Philosophy as Monadology.

TUESDAY, FEBRUARY 4.

ROYAL INSTITUTION at 3.—Prof. J. T. MacGregor-Morris: Study of Electric Arcs and their Applications.

ZOOLOGICAL SOCIETY, at 5.30.—Sir Douglas Mawson: Australasian, Antarctic, and Subantarctic Life.—R. I. Pocock: The External Characters of the Existing Chevrotains.

RÖNTGEN SOCIETY, at 8.15.—Dr. F. Hernaman-Johnson: Protection in Diagnostic Work; a Consideration of the Effects of Scattered Rays and Secondary Rays.—Dr. W. Makower: A Langmuir Exhaust Pump.

WEDNESDAY, FEBRUARY 5.

ROYAL SOCIETY OF ARTS, at 4.30.—Ed. C. de Segundo: The Removal of the Residual Fibres from Cotton-seed and their Value for Non-textile Purposes.

GEOLOGICAL SOCIETY, at 5.30.—Dr. A. L. Du Toit: The Geology of the Marble Delta, Natal.

SOCIETY OF PUBLIC ANALYSTS, at 8.—Annual General Meeting.—D. Pullman: Recovery of Nessler Reagent.—John Allan: Technique of Iodine Determinations: with a Note on a New Machine for Subdividing Oleaginous Seeds.

THURSDAY, FEBRUARY 6.

ROYAL INSTITUTION, at 3.—Dr. W. Wilson: The Movements of the Sun, Earth, and Moon.

ROYAL SOCIETY, at 4.30.—*Probable Papers*: A. Mallock: The Elasticity of Metals as Affected by Temperature.—W. L. Cowley and H. Levy: Vibration and Strength of Struts and Continuous Beams under End Thrusts.—A. Dey: A New Method for the Absolute Determination of Frequency (with a prefatory note by C. V. Raman).

LINNEAN SOCIETY, at 5.—N. E. Brown: (1) Old and New Species of Mesembryanthemum, with Critical Remarks. (2) A New Species of Lobostemon in the Linnean Herbarium.—Dr. J. R. Leeson: Exhibition of Mycetozoa from Epping Forest.

CHEMICAL SOCIETY, at 8.—G. N. White: A Note on the Action of Chloroform on certain Aryl Mercaptans in Presence of Caustic Soda.—J. T. Hewitt and W. J. Jones: (1) The Estimation of the Methoxyl Group. (2) The Estimation of Methyl Alcohol in Wood Distillates and their Concentrates.—P. F. Frankland, F. Challenger, and N. A. Nicholls: The Preparation of Monomethylamine from Chloropicrin.—W. C. McC. Lewis: Studies in Catalysis, Part x. Preliminary Note upon the Applicability of the Radiation Hypothesis to Heterogeneous Reactions.

FRIDAY, FEBRUARY 7.

ROYAL INSTITUTION, at 5.30.—Prof. J. G. Adami: Medical Research in its Relationship to the War.

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