THURSDAY, OCTOBER 11, 1917.

MARSHALL'S "EXPLOSIVES."

Explosives. By A. Marshall. Second edition. Vol. ii., *Properties and Tests*. Pp. ix+411–795. (London: J. and A. Churchill, 1917.) Price 3*l*. 3*s*. net the two vols.

THIS second volume of Mr. Marshall's treatise is divided into four parts, dealing respectively with the Properties of Explosives, Special Explosives, Stability, and the Analysis of Materials. There has been some re-arrangement of the matter since the issue of the first edition; for example, coal-mining explosives are comprehensively dealt with in a special chapter, and another chapter is devoted to naval and military explosives.

There has been considerable extension of the section devoted to the power of explosives, both on the theoretical and the practical side. The French modification of the well-known Trauzl test is introduced, and the earth test, in which the explosive is buried in soil which has been undisturbed for years, and the enlargement of the cavity after firing measured and its capacity determined. Reference is made also to a test in concrete blocks.

In dealing with initiators of explosion, which began with flame and developed through the flint and steel to the use of fulminate of mercury compositions, we have the latest development for detonating high explosives referred to, namely, the use of compound detonators where fulminate provides the first step, and its action communicated first to such nitro-aromatic explosives as trotyl (trinitrotoluene) or tetryl (tetranitromethylaniline), which, in turn, bring about the detonation of the main charge. Other alternatives to the fulminates are the azides. In all these highly sensitive substances there appears to exist a state of great strain in the crystals; this is confirmed by their strong double refraction, and the larger the crystals the higher their sensitiveness to shock. While the azides are not so "brisant" as the fulminates, by combination with nitro-aromatic explosives very effective results are obtained. Azides have one advantage over fulminates besides less sensitiveness, for fulminate deteriorates on storage, especially if the temperature is high or the atmosphere damp. One per cent. of water renders fulminate useless; lead azide, on the other hand, is much more permanent, and 5 per cent. of moisture has been found to make no perceptible difference in its action. Mr. Marshall quotes extensively data on the quantities of different initiators required for various explosives.

For gelatinised nitroglycerine explosives "renforts," or "boosters," consisting of short brass tubes of a size to fit over the detonator and charged with trotyl, or other explosive of similar type, are employed. For high-explosive shell, where premature detonation must be rendered impossible, or at least most improbable, the use of a powerful sensitive detonator is out of the question, and for picric acid charges picric powder (ammonium picrate and saltpetre) is employed with a suitable detonator, whilst with the more insensitive trotyl the priming charge is sometimes the same explosive in the form of powder or loosely compressed pellets, but more usually tetryl, and we are told that this is one of the chief uses of the latter, which is now manufactured on a considerable scale. There is some repetition in this section, much the same information being given under "Ignition and Detonation" and "Fuses."

The influence of the war is naturally seen in extended space being devoted in the section on naval and military explosives to mines, torpedoes, the various types of shell, grenades, etc. Naturally, the description is only general. Illustrations of the fragmentation of high-explosive and armour-piercing shell are given from the excellent paper by Major E. P. O'Hern which appeared in the Smithsonian Report for 1914.

In the important and excellent section on stability tests the principal additions are to be found in the Abel heat test. On this standard test there have been much discussion and investigation. There can be no doubt as to its great value if due observance is taken of the conditions and procedure. In 1909 a joint committee was appointed representing the Home Office, the Admiralty, the War Office, and the trade, and a first report was issued in 1914, together with a memorandum of instructions, specification of apparatus, etc. With this report at hand, Mr. Marshall has been able to extend considerably on the test.

In the last section, on materials and their analysis, Mr. Marshall has added some useful matter relating to the important question of sampling. A further extension is found in examples of calculation for the revivification of waste acids from nitration plants, an important matter both in manufacturing and in conserving supplies. More space is devoted to the important raw material cotton, including specifications in different countries. Another material the importance of which has increased enormously is ammonium nitrate. To the examination of this body only a few lines were allocated in the first edition, but much more space is now devoted to it, although no reference is to be found to possible organic contamination, which, with the introduction of nitrate from coal carbonisation, is of great importance.

Excellent as the first edition of Mr. Marshall's work was, his second edition places the book amongst the best technical books which have been written. It is by far the most complete exposition on the subject which has appeared, and only on very minor points can the critic find fault with the subject-matter or detect small omissions. One might, however, plead for more systematic nomenclature with adherence to one name for a particular explosive throughout, with mention of alternatives in the section principally devoted to it.

THE CAR AND ITS DESIGN.

Text-book on Motor-car Engineering. By A. Graham Clark. Second edition. Vol. i., *Construction.* Pp. xix+437. (1914.) Vol. ii., *Design.* Pp. xvi+368+21. (1917.) (London: Constable and Co., Ltd.) Price 8*s.* 6*d.* net each vol.

IN these days of science applied to industry, it has become the rule for each branch of trade to have its own standard text-book. It is therefore somewhat curious, the motor industry being the highly organised and scientific business that it is, that it does not possess its own *vade mecum.* Of writers on matters motorish there are enough, although not many, perhaps, with that engineering and scientific training, together with applied knowledge of the subject, which are essential to one who would take the part of professor to the experts. No doubt that is the rub.

For this reason amongst others, we welcome the second edition of Mr. Graham Clark's book, particularly as in this edition it has grown to two volumes, and approaches more nearly the comprehensive text-book than it formerly did. This is not to say that it is likely to be hailed as the standard book of the industry—Mr. Clark knows the industry too well even to pretend that it is—but we can unhesitatingly affirm that it is the best English work on the subject.

The two volumes, aptly named, as they are, "Construction" and "Design," might with equal pertinence have been entitled "Elementary" and "Advanced." They will stand in that relation to the student, notwithstanding the author's intention that they should be readable as separate and individual publications. As is natural, perhaps, only those well acquainted with most of that with which the first volume deals will be able profitably to peruse the second. To those who already possess a fair smattering of mechanical knowledge of the motor-car, and are desirous of converting that, perhaps, superficial acquaintance into technical proficiency, vol. ii. will be invaluable. Broadly speaking, students, apprentices, and junior draughtsmen will profitably acquire and read both volumes. Senior draughtsmen, budding designers, and all those whose knowledge of the construction of a car is more than superficial will find all that they require in the second volume. There are others, too, who, while desirous of possessing a sound knowledge of the mechanism of a car and of the broad principles which underlie its construction, are unlikely ever to be so placed as to need the technical information which the second part of this work provides. They will be sufficiently equipped with vol. i.

The first volume goes right back to the beginning of the subject, so that the reader may come to it with his mind, as regards its subject, a perfect blank; he will still be able to read and digest its contents. Such a one will naturally take advantage of that special feature of its make-up which provides for the skipping of the more difficult paragraphs, marked with an asterisk, on first reading.

The principal portion of the first volume is devoted to detail descriptions of the parts of a car, indicating their position in the chassis, discussing their functions, and finally, in as simple and non-technical a manner as possible, the nature of the stresses which each will have to withstand. In this manner are dealt with in turn the various units which form the anatomy of a car. Twenty full and interesting chapters are thus utilised, including a useful and comprehensive one on lubrication and lubricants, and also a couple of especial interest just now, on petrol and other fuels which may be used in its stead. The remaining four which go to complete the book are apportioned to the steam car and the electric vehicle. An appendix comprising some official examination papers on the subject and various useful tables conclude the volume.

The reading of the second volume will be for the student a far more adventurous affair than the study of the first. The more purely technical side of the subject, hitherto kept discreetly in the background, is now openly portrayed in the full and glaring light of day. In Mr. Clark's hands, however, the prospect ceases to be an alarming one.

The arrangement of the matter is very similar to that of the previous volume. A preliminary chapter on materials of construction is followed by several on the power unit and its details. The other parts of the chassis then receive attention in turn.

A method of treatment appears to have been standardised, and each component is treated in a way which should prove particularly helpful to the student. It varies, of course, to some extent according to the nature of the part under consideration, but the difference is one of detail rather than of principle. A brief opening paragraph deals with the materials which are commonly used for the construction of the part; this is followed by an outline of the general conditions which govern the design. The nature of the stresses to which the part is subject is next explained, and this is naturally succeeded by a disclosure of the actual methods of determination of the proportions of the part. Wherever advisable the chapter is illustrated by drawings or photographs depicting selected examples of current design. Logically, the author could have referred his readers to the preceding book for these illustrations; their inclusion in the second volume has the desired effect of rendering that volume complete in itself and self-contained.

We are inclined to approve the somewhat unusual disposition of the necessary tables. These, instead of being collected together and placed at the end of the book in the form of an appendix, are inserted in the text as they are required. It might have been better if, instead of indexing them, they had been repeated at the close in the usual manner.

We cannot praise too highly the clearness of diction and simplicity of expression which prevail throughout the work. Were it not for the illustrations, we should have been at some trouble to find any cause for criticism of the work at all. The line blocks are good; they would, however, have been better in many cases if the size had been more carefully selected. On the other hand, the half-tones are, almost without exception, poor in quality, besides sharing with the line blocks the fault, in many examples, of being of unsuitable dimensions. The price limitation may have had someting to do with this marring feature, for the work is undoubtedly cheap as such publications go. A little more discrimination in regard to the scale of the drawings as reproduced, and the preparation of an entirely new set of half-tones from original photographs, would have enhanced the value of the book to a degree which would be out of all proportion to the additional expenditure involved.

OUR BOOKSHELF.

Standard Method of Testing Juvenile Mentality by the Binet-Simon Scale, with the Original Questions, Pictures, and Drawings. By N. J. Melville. With an introduction by Dr. W. Healy. Pp. xi+142. (Philadelphia and London: J. B. Lippincott Co., 1917.) Price 8*s.* 6*d.* net.

ALL who have had experience of the Binet-Simon scale, or are acquainted with the literature of the subject, must have felt the difficulties which this valuable little book is intended to counter. The use of any series of mental tests depends so much upon delicate handling in the first place, and upon intelligent interpretation in the second, that the comparison of one set of results with another, even when taken in the gross, is always suspect. The difficulty still exists although the comparison concerns the work of the same inquirer. When we come to the pronouncement on the mentality of a particular child, the chances of error are enormously increased. A physical measurement may be repeated. Accuracy demands that it should be, perhaps many times. Repetition in the case of the Binet-Simon scale is out of the question. The importance of standardising both the way it is used and the interpretation of results cannot, therefore, be exaggerated.

Mr. Melville's handbook explains the fundamental object of the scale and describes the technique of its use with great care and precision. Nothing can make such an instrument "fool-proof," though the author points out the pitfalls and warns off the incompetent. Specimen record forms as used in the Philadelphia schools are given, and three supplementary tables provide useful data for assisting final judgment.

The book is in no sense a text-book. It is essentially a guide to practice, and as such may be warmly recommended. It is well printed and strongly bound. A thumb index gives ready access to the pages dealing with the several groups of tests, and there is a good bibliography.

Papers from the Geological Department, Glasgow University. Vol. iii. 1916. (Glasgow: James Maclehose and Sons, 1917.)

THIS collection of papers, previously published in various journals, records once more the activity of the geological school in the University of Glasgow. Prof. Gregory's address on Henry Darwin Rogers, professor of natural history in the University from 1857 to 1866, brings before the present generation of geologists views on mountain-building and on the relative rapidity of certain tectonic changes which are, indeed, worthy of consideration. Prof. Gregory's valuable review of the economic mineralogy of the war-zones has been already noticed in NATURE (vol. xcix., p. 110). With Miss Jean B. Trench, the same author describes Eocene corals from New Guinea, which further support the view that the Malay region was isolated in the early Cainozoic epochs. Montipora, which is here traced back to the Eocene, is thus indicated as originating in the western Pacific, as reaching the Indian Ocean, where it still lives, after the Miocene period, and as arriving on the shores of the Red Sea in Pleistocene times. It is unknown from either Sind or Europe, and the only known fossil species are those of the Pliocene of Borneo and the raised beaches of the Gulf of Suez. Among several papers elucidating local geology, which naturally form the strong point of a collection such as this, we may note Mr. W. R. Smellie's "Igneous Rocks of Bute" (see NATURE, vol. xcvii., p. 350) and Mr. Tyrrell's careful additions to our knowledge of the petrography of Arran.

G. A. J. C.

Proceedings of the London Mathematical Society. Second series. Vol. xv. Pp. liii+454. (London: F. Hodgson, 1916.)

THE latest volume of the Proceedings of the London Mathematical Society keeps up to the usual high standard. As regards pure analysis, attention may be directed to Prof. and Mrs. W. H. Young's papers on integrals and derivates, because they deal with fundamentally new notions of the integral calculus, with which every serious mathematician will have to make himself acquainted. Mr. G. H. Hardy contributes a paper of great interest on Dirichlet's divisor problem, and there is a little gem by Mr. T. L. Wren on the two-three birational space transformation, which incidentally gives a new, and we think finally satisfactory, aspect of the double-six configuration. In applied mathematics we have a paper by Prof. Bromwich on normal co-ordinates, based on the theory of complex integrals; one by Sir J. Larmor on transition from vapour to liquid; and one by Mr. F. B. Pidduck on the motion of ions, discussed by means of an integral equation. We must content ourselves with noting these few papers out of the whole thirty. The volume will doubtless receive the full attention that it deserves.

LETTERS TO THE EDITOR.

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

The Modern Range-finder.

PROF BOYS, in his review of Prof. Cheshire's pamphlet on "The Modern Range-finder" in NATURE of September 6, has raised certain questions which may be amplified with advantage.

The application of stereoscopic principles to range-finding is due to Hector Alexander de Grousilliers, who communicated his invention to Messrs. Carl Zeiss, by whom it was elaborated and constructed. As in principle the stereoscopic range-finder is so simple and beautiful it is desirable that the name of the true inventor should be remembered.

Prof. Boys is scarcely correct in stating that the stereoscopic range-finder was proposed by a workman in the Zeiss works. De Grousilliers was a chemist and an engineer in the Continental sense, who lived at Charlottenburg. His British patent, No. 17048, was applied for on September 11, 1893. It is interesting to note that the corresponding German patent, identical in substance, and applied for on January 3, 1893, is issued in the name of Messrs. Carl Zeiss.

As Prof. Boys says, it is fascinating to sweep the scale past more or less distant buildings and see the divisions of the distance scale pass behind or in front of the different objects; but when the observations are made upon objects of known ranges and the results are analysed, the fascination is generally tempered by disappointment.

It has been said with considerable truth that a coincidence observation is a fact, whereas a stereoscopic one is an impression; the former is based upon a self-contained micrometer measurement effected by one eye, while the latter is the result of balancing the effects produced in two separate eyes.

Prof. Boys suggests that for anti-aircraft work the stereoscopic range-finder may be of advantage, owing to its speed of operation, on the assumption, presumably, that an object in any part of the field can be compared with the fixed scale and that accurate direction of the instrument upon the target within the limits of the field is therefore not required. In practice this is not the case. If any reasonable accuracy is to be obtained, the object must be brought close to the appropriate mark or on to the imaginary "plastik" line between two marks; that is to say, the instrument must be both trained and elevated with considerable accuracy. In a coincidence range-finder the image must be brought to the separating line, but it may occupy any position along the length of the line.

In a stereoscopic instrument it is necessary to compare the image with one mark, then with the neighbouring one, and, finally, to locate its position between them. Compared with coincidence, the stereoscopic observation is not more speedy, and therefore not more suitable, for anti-aircraft or similar services, where speed of operation is essential. It involves as careful direction and the accuracy attained is much inferior. Great claims as regards accuracy have been made for stereoscopic range-finders, but these have not been substantiated in practice.

With regard to the question of accuracy, the resolving power of the objective is not one of the limiting factors in the case of coincidence observations. Suppose, for example, that the image is a point circle; then the coincidence operation consists in making the separating line cut the circle approximately diametrically, and in bringing the edges of the upper semicircle into alignment with those of the lower. If now the resolving power of the objective is diminished by decreasing its diameter, the point image will be of larger diameter, but the coincidence operation will not be more difficult than before. Indeed, if the objective diameter is so small that the image is surrounded by distinct diffraction circles, the operation will be facilitated, as such lines constitute ideal coincidence objects. The accuracy depends upon the character of the edges as regards sharpness, and not upon the size of the image of the ideal point.

The coincidence observation figures quoted by Prof. Cheshire are quite ordinary. So far as the unaided eye is concerned, the only limit to resolving power that the writer is aware of is the quality of the definition of the edges of the image at the retina. On natural objects the unaided eye can resolve less than four seconds, and under good conditions of definition an accuracy of two seconds has been obtained with considerable consistency in coincidence observations, but *plus* or *minus* three to four seconds is the more usual practice. JAMES WEIR FRENCH.

Anniesland, Glasgow, September 27.

I AM obliged to Mr. French for correcting me in the matter of the origin of the stereoscopic range-finder. My statement that the idea originated with one of Zeiss's workmen was made on the basis only of my recollection of conversation with Dr. Czapski at the Paris Exhibition in 1900, and it may well be that my recollection is at fault, or possibly that I misunderstood what I was told.

When suggesting that this type of range-finder might have some advantage for anti-aircraft work, the observation I had in mind was sweeping the scale of distance slowly across the object and noticing which division came within and which beyond, and then not more than a rude guess at the proportion between. Such a process I considered would give a very quick but less accurate range than that given by a coincidence instrument, but nevertheless a very useful range in view of the rapid and erratic change of distance. The most aggravating property of the stereoscopic instrument is the transparency that it imposes, even upon buildings, for the more distant scale divisions remain in view as they pass behind them.

C. V. BOYS.

A Plea for the Fuller Utilisation of Coal.

THE important letter from Major Martin (NATURE, August 16) on the above subject involves many considerations, and I would suggest that the following points merit attention:—

(1) It seems probable that after the war there will be a demand for greater home comfort among the poorer paid classes of the community. The supply of very cheap gas for heating and cooking should improve matters greatly.

The cost would be further reduced if arrangements could be made to fit houses with surface-combustion heaters, cookers, and the like (*cf.* Prof. Bone's experiments).

At present it appears to pay many gas companies to supply ordinary gas stoves on specially favourable terms to consumers, so that there seems no reason why surface-combusters should not be supplied from various depôts in different districts. If the gas were distributed at a high pressure, it should be possible to devise some injector arrangement which would obviate the necessity for the use of compressed air, a

supply of which is necessary with the design of surface-combustion apparatus at present in use.

An article on "Coal-gas for Motor Vehicles" (*Times Engineering Supplement*, August 31) gives some figures indicating the effect of compressing coal-gas on its calorific value. It seems that a suitable pressure would probably not exceed 300 lb. per sq. in. If this is too high for use in a house, the gas could be passed through a reducing valve before entering any group of houses.

Briefly, high-pressure gas would be supplied to a group of districts with reducing valves where necessary, just as a high-tension electric supply has transformers placed where required.

(2) As the gas would be supplied in bulk, its composition in any one large district would be uniform, thus facilitating the adjustment of the flameless combusters. In fact, they could be standardised, and sent out ready for use from a central depôt for each large district. The combusters would have to be fool-proof; perhaps by arranging to have adjustments only possible by the use of special tools.

(3) It is obvious that a considerable amount of experimental work is necessary, but the benefits to the community would be so great that it appears worth while starting these experiments as soon as possible. Cheap heating combined with absence of smoke is worth trying for.

(4) It is presumed that the gas would be distributed through weldless steel tubes, so far as possible, above ground for convenience of repair, etc., and along railway tracks where possible. K. C. BROWNING.

31 Boundary Road, St. John's Wood, N.W.8, September 16.

P.S. (October 7).—A supply of high-pressure gas would be of great value to firms running a service of industrial vehicles, the gas being much cheaper than petrol, and the pressure expediting the filling of the containers.

PROF. BROWNING'S letter raises a number of practical points which deserve attention.

My former letter was mainly concerned with the conservation of a great national asset. Prof. Browning deals with the matter in the interest of the gas consumer.

(1) It is impossible to estimate the amount of coal and labour which are wasted every day in keeping up thousands of little domestic fires to boil an occasional kettle, or the saving of coal and labour which a supply of cheap gas would bring about, but they would certainly be very great.

I am sorry not to have kept in touch with Prof. Bone's later experiments, but they are undoubtedly on the right lines. The key to successful heating is radiation, and the amount of heat radiated from a surface increases very much faster than the temperature. If, therefore, the principle of surface-combustion can be applied to domestic heaters, there should be a great gain in comfort, even with a lesser consumption of gas.

It is interesting to contrast the enormous strides which have been made of late years in the efficiency of methods of lighting (both gas and electric) with the comparative stagnation in the field of domestic heating. True, the margin of waste in the latter has not been nearly so great as in the case of the former, but there is still plenty of room for economy, and Prof. Bone's experiments seem to point the way.

(2) It will be convenient to deliver the gas from the coalfields at a high residual pressure, and it will be quite feasible to distribute it at high pressure if this should be considered desirable. It is a much simpler matter to confine gas at a pressure of 220 lb. than electricity at 220 volts, and the pressure of the gas could be utilised to deliver air to the surface-combusters.

(3) A good deal of experimental work will be required to solve the practical problems involved. The enterprise of our great gas companies will doubtless be equal to the occasion.

(4) The question of rights of way will demand very careful consideration. Weldless steel tubes present many advantages, but the question of overground *v.* underground pipe lines can scarcely be settled offhand.

ARTHUR J. MARTIN.

University Hall, Carlyle Square, Chelsea, S.W.3, September 29.

The Harvest Moon.

THE harvest moon is usually stated to be the full moon nearest in date to the autumnal equinox, and to be distinguished by the peculiarity that for a few successive evenings the retardations of the times of rising are at a minimum.

Now, applying these tests to the full moons of September 1 and 30 of the present year, it will be found that they are inconsistent. The retardations at Greenwich, from August 29 to September 4, are, in minutes, 30, 22, 21, 19, 21, 22, an average of 22½ minutes; but, from September 27 to October 3, are 23, 20, 20, 22, 25, 31, an average of 23½ minutes, so that for the full moon of September 1 the retardation was slightly less than for the full moon of September 30, although the latter was much nearer the date of the equinox.

Possibly Sir George Greenhill, in his very interesting article (NATURE, September 27, p. 67), overlooked this peculiarity, due, of course, to the fact that the moon was at the first date much nearer the ascending node than at the second date. I may add that the average daily retardation in the time of rising is 50½ minutes, the average length of a lunar day being 24h. 50½m. In conclusion, I find that the interval between two successive returns of the moon to the meridian may be, in extreme cases, about twelve minutes less, and about seventeen minutes more, than the average.

C. T. WHITMELL.

Invermay, Hyde Park, Leeds, September 28.

Folk-lore and Local Names of Woodlice.

AMONST the readers of NATURE there are many, I feel sure, who are interested in the folk-lore and local names of the members of our fauna. May I appeal to such for any information bearing upon the heading of this letter?

Already nearly one hundred local names, such as bibble-bug, chisel-hog, cud-worm, palmer, lock-chester, slater, tiggy-hog, etc., have been obtained, and the districts noted in which such are in use. Celtic and Gaelic names are particularly desired.

WALTER E. COLLINGE.

The University, St. Andrews, October 4.

The Convolvulus Hawk-moth.

IN reply to Mr. C. E. Robson's letter in NATURE of September 20, I write to say that I have lately become the possessor of two specimens of *Sphinx convolvuli*. The first one was caught at Deal on September 12; it shows signs of wear, and had probably come over from the Continent. The second I took myself in Queen Elizabeth's Walk, Stoke Newington, London, N., on September 22. It was in perfect condition, and had every appearance of having just hatched out. It was resting on a wall close to some bindweed, and it seems probable that it was bred there.

J. LAKER.

8 Allerton Road, N.16, October 4.

ORGANISATION OF CHEMICAL INDUSTRY AFTER THE WAR.

AMONG the problems comprehended under that somewhat elastic term "Reconstruction," none is more important to the economic future of this nation than the organisation of its chemical industry. The position in which we stood immediately after the outbreak of hostilities revealed only too plainly with what foresight and craft Germany had organised her trade and linked up her manufactures in view of the world-wide conflict upon which she deliberately and "of malice prepense" embarked after forty years of sedulous preparation. So intimate a union as was then made manifest between the governing powers and the leaders of industry, and of chemical industry in particular, in the common effort to secure the domination of the world is without a parallel in history.

The unbridled lust of conquest which moved Germany was not wholly the outcome of an arrogant and aggressive militarism. The spirit which still pervades masses of her people shows that the origin of the war had its roots much more deeply and widely spread. We are out to crush Prussianism, by which we mean the unscrupulous policy which actuates the dynasty which has become the predominant power and directing force among the Central Powers. But Prussianism would never have obtained its present influence unless it had appealed to a more deep-seated desire than territorial aggrandisement, or a more potent influence than the spectacle of increased dynastic pomp and pride. North Germans are far from being wholly beloved throughout the Empire. Still, in spite of the existence of other crowned heads and other capitals in Germany, Berlin as effectually rules the destinies of the Empire as Paris does those of France, which has only one metropolis and nowadays no dynastic embarrassments. Nor is militarism so universally popular that, even in Prussia, it could have maintained the struggle after so many disappointments and disillusionments and such widespread misery, unless aided and strengthened by other factors.

The fact is—and we cannot recognise it too clearly—the underlying and actuating force which still moves Germany, as it has moved her from the very beginning of the struggle, of which it is the real cause, is economic; it is the desire for power as the means of securing wealth. The process of peaceful penetration was too slow: she sought by force to gain, as by a stroke, what the methods of peace would assuredly have brought her if she had had only the patience to wait. The military party are not the sole aggressors; rather they have been the tools and cat's-paws of a still larger and more powerful class, of far wider influence and much richer in material power and intellectual efficiency, and united by a definite and common impulse. The military power of Germany may, and undoubtedly will, be crushed by military methods, but the power of that aggressive element in Pan-Germanism which has its roots in economic influences can be effectually combated only by economic means—that is, by organisation and the closest co-operation.

The conditions of a lasting peace which are faintly adumbrated—we cannot say defined—by Germany's present Chancellor, and which are re-echoed, more or less vaguely, by leading spokesmen of the only one of her Allies that counts among the industrial communities of the world, clearly indicate that amongst the overwhelming wreck and ruin that the Central Powers have brought upon themselves the only salvage that is now possible is their economic life, and every effort is to be made to secure it. The rulers of Germany now realise, as General Smuts tells us, that they have lost the war: the legend of their military invincibility is a myth, and their deluded people will soon recognise that fact. Their Chancellor now, apparently, fears that the nations may enter upon an economic war, and so stamp out that phase which Germany herself imported into it. With nearly the whole of the civilised world embittered against her, he is plainly apprehensive of her future in the struggle to which her greed and selfishness have brought her. Hence all the vague talk about the "freedom of the seas," which is meaningless in the mouths of those who countenance and direct a piracy which is infinitely more abominable, as an international menace, than that waged, of old time, by Barbary corsairs or the buccaneers of the Spanish Main.

We, like the Chancellor, deprecate the world-wide economic warfare he dreads. But we would remind him that his countrymen, by means fair and foul, had already embarked upon it, even before the beginning of military hostilities, and that now, in their rage and chagrin, they threaten to continue it with a tenfold violence and persistency. We regard the Chancellor's pious platitudes as on a par with his feeble and insincere generalities about the so-called "freedom of the seas." His motive is obvious. In both cases he desires to see the strength of this country undermined, whilst reserving to Germany unrestricted power to pursue her present policy.

It behoves us, therefore, to be watchful and alert. The Minister of Reconstruction has acted wisely in appointing a committee, as announced elsewhere in this issue, to advise him on the subject of the position of the chemical trades after the war. Dr. Addison has requested the committee to conduct its deliberations with a view to the creation of some organisation which should be adequately representative of the trade as a whole, and by means of which the trade may be enabled hereafter to continue to develop its own resources and to enlist the closest co-operation of all those engaged in the chemical industry.

We welcome the appointment of the committee, although we have some doubt as to whether its composition is altogether such as will command the confidence of the chemical trades as a whole. It consists of four members connected with the Ministry of Munitions, one gentleman attached to the Ministry of Shipping, three members

of the House of Commons more or less directly interested in chemical industry, together with the ex-president of the Society of Chemical Industry, who is a leading member of the coal-gas industry.

The committee's terms of reference are purposely somewhat vague and general, and it remains to be seen how they will be interpreted. In effect, however, they would seem to be limited to the creation, or suggested creation, of an organisation to be adequately representative of chemical industry; but, of course, much turns upon the functions with which this organisation should be endowed and the powers with which it should be entrusted, and it is in defining these functions and powers that the committee will either make or mar the whole scheme.

The matter is confessedly one of great difficulty and complexity, and involves far-reaching considerations. If the committee's deliberations result in the creation of what is practically a parliament of the industry in which all sections are adequately represented by persons of influence in industrial and commercial circles, and who, by virtue of their knowledge, experience, and position, are able to secure the confidence and co-operation of the Legislature and of Government departments, Dr. Addison's action will undoubtedly result in great benefit.

We trust, therefore, that the committee, which, it must be admitted, is somewhat bureaucratic in complexion, will take a broad and statesmanlike view of the question which has been submitted to it, and will not be hide-bound by purely party and departmental considerations, or by points of fiscal policy or the shibboleths of economic doctrinaires. The present times are somewhat out of joint: the future is full of changed conditions and demands a wide and bold outlook.

In an address delivered to teachers at the Regent Street Polytechnic on October 6, Prof. W. J. Pope, of Cambridge, showed how the huge chemical industry of Germany, primarily based on the coal-tar industry, and mainly built up by the genius and skill of her men of science and technologists, some of whom had spent their *wanderjahr* in this country, had been subordinated to the national effort to secure an economic supremacy in the world. He pointed out how the true meaning of that object-lesson had still to be learned by those who direct our national policy; he might have added, also, by that much larger and not less influential class which, in the long run, manages and controls our commercial and industrial development, namely, the purely moneyed class, which, for the most part, owing to its partial and limited education, is practically ignorant of the real value and potentiality of science in a civilised community.

That such is the case is evident from the past history of the synthetic colour industry in this country, where it originated. So long as this industry was under the management and direction of business men of science, like Sir W. H. Perkin and Edward Chambers Nicholson, it flourished and might have been extended. When it was fastened upon by capitalists who subordinated the chemist to the counting-house, it gradually languished and ultimately almost died out. Those who have succeeded in keeping it alive in this country have been largely of German or Austrian extraction, for the most part themselves trained as chemists, or who have had practical knowledge of the methods and policy of the great organisations in Germany to which Prof. Pope referred. There is an uneasy feeling abroad that the Department of Scientific and Industrial Research, in its well-meant efforts to administer the million pounds with which it has been entrusted, has, in regard to the resuscitation of the synthetic colour industry in England, failed to perceive the true principles by which alone the problem can be properly solved. This aspect of the matter may well receive the attention of Dr. Addison's committee.

THE STELLENBOSCH MEETING OF THE SOUTH AFRICAN ASSOCIATION.

THE South African Association for the Advancement of Science met in annual session for the fifteenth time in what will soon be the "university town" of Stellenbosch during the first week in July, under the presidency of Prof. John Orr, of the South African School of Mines and Technology, Johannesburg. The sectional meetings were held in the buildings of the institution at present known as Victoria College, but which will become the University of Stellenbosch from April 2, 1918. On the afternoon of Monday, July 2, the visitors were officially welcomed to Stellenbosch by the Mayor, and on the evening of that day, in the Conservatorium Hall, the president took the chair and delivered his address, an abridgment of which appeared in NATURE of September 27 (p. 76).

The association met from day to day in five sections, and ninety-seven papers were submitted, including the addresses of the five sectional presidents. Outlines of some of these are sketched below.

Prof. W. N. Roseveare, of Natal University College, Maritzburg, was president of Section A, and entitled his address "Mathematical Analysis in Science." He sketched the development of the Newtonian philosophy as the basis of all the mechanics of modern civilisation, from Galileo and Newton to Clerk Maxwell's electro-magnetic theory of light and the electron theory. The old theory had left some facts unexplained, but the principle of relativity developed during recent years by Einstein and Minkowski had been put forward to explain changes in the orbit of Mercury, and had reduced gravitation from a force to a quasi-geometrical property of space-time.

Prof. M. M. Rindl, professor of chemistry at Grey University College, Bloemfontein, chose as the subject of his presidential address to Section B "Phytochemical Research." In the course of the address Prof. Rindl emphasised the fact that every year many thousands of cattle die within the Union of South Africa, and many aboriginals

accused of culpable homicide are acquitted because adequate knowledge of the poisonous principles contained in indigenous plants is lacking. He urged, as a first step, co-ordination of effort amongst those actively interested in the problem. A census of the work already accomplished and of that still to be done would be comparatively simple, but none the less essential.

Mr. J. Burtt-Davy occupied the presidential chair in Section C, which embraces the biological sciences, and he devoted his address to setting forth the need for an organised biological survey of South Africa. An economic survey of the natural resources of the country had recently been recommended to the Government by the Central Committee on Industrial Research. He pointed out the importance of a biological survey as part of that economic survey, and suggested, as means to that end, definite co-ordination of existing biological workers, together with their equipment.

The Rev. B. P. J. Marchand presided over Section D and discussed in his address certain points relating to educational matters. He expressed gratification at the encouraging movements in the direction of solving the problems connected with (*a*) industrial education; (*b*) gathering in the large number of children who are not attending school; and (*c*) educating the public on the subject of child-life protection. He announced that 40,000*l*. was about to be expended on the erection of an up-to-date technical institute in Cape Town, and expressed himself in favour of the establishment of agricultural schools under the school boards, of rural schools of industry, and of school farms of an elementary type.

Of Section E the president was the Rev. Noel Roberts, who began his address by asserting that the native population of South Africa is undoubtedly one of the country's chief assets. Yet, said he, year follows year, and nothing is done to develop so valuable an asset. Only education can convert this vast amount of latent energy into productive power, and whether we send him to school or not, the native is being educated by the example of the ruling races—often, unfortunately, by the vices and evil habits of the white man—an education which sends him downhill. Mr. Roberts discussed the hindrances in the way of turning the native into a productive member of the community, and spoke highly of the lofty attitude generally adopted by the Government department which administers native affairs, the effect of which had been to arouse in the native mind a real affection for the Government which protects and cares for them.

The necessary limitations of space forbid referring in more than a few brief words to some of the eight dozen papers submitted to the various sectional meetings.

In Section A Mr. Innes, Union Astronomer, announced the discovery of a star in the constellation Centaurus, as near to us as, or possibly nearer than, α Centauri. Prof. J. T. Morrison read a paper on problems in terrestrial physics, the immediate outcome of which was the appointment of a standing committee to promote meteorological and geophysical research in South Africa. Mr. H. Pealing, lecturer in physics at the South African College, Cape Town, discussed the effect of vegetation on the rainfall of South Africa, and incidentally mentioned that the evidence regarding the desiccation of many large tracts of South Africa is so overwhelming that few will dispute the fact. The author of the paper sought to show that the amount of summer rainfall in districts far from the coast largely depends on the character and quantity of the vegetation in the intervening country. He urged afforestation of all suitable areas and the cessation of the wholesale denudation of tree, bush, and grass land.

Dr. S. J. Shand, professor of geology at Victoria College, read a paper before Section B on the geology of Stellenbosch, in the course of which he directed attention to a powerful dislocation that had occurred along the line of Jonkers Hoek, giving rise to what may be fairly called the Jonkers Hoek fault. Dr. A. W. Rogers, director of the geological survey of the Union, produced an interesting old report, of 250 years ago, on the copper fields of Namaqualand. Mr. G. F. Britten, of the Government Chemical Laboratory, Cape Town, read a paper on *Ecklonia buccinalis* as a source of potash. The seaweed occurs in large quantities on the South African coasts, and Mr. Britten thinks it would be easy to recover its potash on a commercial scale; he urged the institution of an exhaustive marine survey in this connection. Prof. G. H. Stanley, of the South African School of Mines and Technology, Johannesburg, read before the same section a paper on the prospects and possibilities of a South African iron industry, in view of the fact that the pre-war importations of iron and steel articles into South Africa used to approximate to six and a half million pounds sterling in value annually. He pointed out that on one small range alone, near Pretoria, above four million tons of ore assaying 45 per cent. of iron or more were in view, while the wattle timber that was annually burnt to waste in Natal could furnish 40,000 tons of charcoal.

Mr. C. F. M. Swynnerton, in Section C, showed how the ancient East African forests, once probably continuous from Melsetter to Beira, had been replaced by wooded pasture land. He suggested means for reconquest by forest of the land so invaded. Prof. J. W. Bews gave a detailed account of his study of plant succession in the thorn veld around Maritzburg, and a very useful contribution was made by Mr. T. R. Sim on the geographical distribution of the Bryophyta in South Africa. Dr. T. F. Dreyer contributed to the section a paper in which he offered suggestions regarding a mechanism for the inheritance of acquired characters. Mr. J. Leighton, in view of the increased demand for paper-making materials and textiles, gave the members of the section opportunities of seeing some new materials available in connection with each of these

industries. Insect pests of various kinds and means of destroying them were dealt with in a series of papers by Mr. C. W. Mally, and Dr. P. A. van der Byl contributed a valuable monograph on a fungus which attacks the Black Ironwood tree.

Mention must not be omitted of Prof. H. B. Fantham's excellent account of the intestinal and blood organisms which the war operations in Salonika and Gallipoli had afforded special opportunities for studying.

Section D was largely taken up with educational questions. Agricultural education in South Africa was dealt with by Dr. A. I. Perold, recently principal of the Government Agricultural School at Elsenburg and now professor of œnology at Victoria College, while by way of comparison Dr. C. F. Juritz read a paper on agricultural education in Australia. Entomological education in the United States was the subject of a paper by Dr. E. S. Cogan. Mr. W. J. Horne discussed the movement towards a national system of technical education, and the Rev. Prof. J. I. Marais completed the symposium with a paper on some forgotten factors in education. Section D, too, discussed the dearth of paper-making materials, an account being given by Dr. Juritz of the grasses of the eastern coast belt of the sub-continent available for paper-making: these grasses were mainly species of Andropogon, Erianthus, and Anthistiria.

The results of mental tests applied to Zulu students at a mission station in Natal were discussed by Mr. S. G. Rich before Section E. The author urged continuance of the investigation with the view of settling the question whether the native mind ceases growth at puberty. Dr. C. T. Loram at a later stage contributed a paper dealing with the same question, which he answered in the negative, ascribing appearances to the contrary to the courses of study and methods of teaching adopted in native schools. He reiterated suggestions made at the Maritzburg meeting a year ago by the Rev. J. R. L. Kingon that part at least of the course of study should be conducted in the Kaffir vernacular. The Rev. W. A. Norton read some important papers before Section E: in one of these he urged the need and value of an academic study of native philology and ethnology, and in another he emphasised the advantages of stenography as an aid to the phonetic analysis and comparison of the Bantu languages. A very interesting paper on native ideas of cosmology was contributed by the Rev. S. S. Dornan, and equally interesting was one read by Mr. J. McLaren, who illustrated the wisdom and the wit of the Bantu people by numerous quotations of their proverbial sayings.

Prof. Orr, at the conclusion of his presidential address on the opening evening of the session, presented the South Africa medal and an award of 50*l.* to Prof. J. D. F. Gilchrist, professor of zoology at the South African College, in recognition of his researches in marine biology. There were two evening discourses of the usual popular type during the week, one by Prof. Gilchrist on the marine animals of South Africa, and the other by Mr. H. E. Wood, of the Union Observatory, on "Some Unsolved Problems of Astronomy."

Next year's meeting will be held at Johannesburg, with Dr. C. F. Juritz as president.

THE PHYSIQUE OF RECRUITS.

IN the summer of 1916 the Board of Scientific Studies was established under the ægis of the Royal Society to serve as a means of placing knowledge in the possession of scientific and technical societies at the disposal of Government departments. At the first general meeting of this board in July, 1916, the urgency of a physical survey of the nation, to discover whether or not there existed definite evidence of physical deterioration, was discussed. Emphasis was laid by various speakers on the fact that an Interdepartmental Committee had reported in 1904 that such a survey was necessary. Nothing, however, had been done. The mobilisation of a national Army had provided an opportunity, as well as a need, for such a survey.

The Board of Scientific Studies requested the Royal Anthropological Institute to report on the desirability and possibility of such a survey. The institute having reported that such a survey was both desirable and possible, the board formed an Anthropological Survey Sub-Committee to consider the manner in which such an investigation could best be carried out. This sub-committee has not yet reported to the Board of Scientific Studies, but we understand that it is seeking for the means of carrying out such a survey through the Government departments which have directly to do with the health and physique of the nation: the Recruiting Authority—now the Ministry of National Service—the Local Government Board, and the Board of Education. Representatives of these departments have joined the Anthropological Survey Sub-Committee, and it is hoped that a practical scheme may be formulated at an early date.

Meanwhile American anthropologists have stolen a march on their British colleagues. When the United States entered the war the National Research Council was at once created to serve the same purpose as our Board of Scientific Studies. Its Anthropological Committee, formed to advise in the selection, standardisation, and examination of recruits, has already issued its report and recommendations. It proposes that six of the sixteen great concentration camps should be selected for an anthropological survey—two in the Eastern, two in the Middle, and two in the Western States—and that special men, who had been trained to use exactly the same anthropometrical methods at the National Museum at Washington, should be dispatched to carry out a survey of the men in the selected camps. The points for investigation have been reduced to a minimum, namely, standing and sitting heights, three dimensions of the head, two

of the face, two of the chest, with precise records of the colour of skin, eyes, and hair. The statistical staff of the Prudential Insurance Company of America has undertaken to deal with the data collected, while the Smithsonian Institution will faciliate the publication of results.

Although the intentions of the British committee are more wide-reaching and aim at ascertaining the condition of all elements in the population, it is to be hoped that the observations taken in Britain and America will be capable of direct comparison—for, beyond doubt, the bulk of the population of the United States has a British ancestry.

PROF. CHARLES LATHAM.

BY the sudden death of Prof. Charles Latham on September 27, the University of Glasgow has lost an eminent member of its teaching staff in the department of applied science. In 1902 the late Dr. James S. Dixon, an eminent coalmaster of Glasgow, "recognising the want of a means of teaching the higher branches of the theory and practice of mining in the University, and the desire for acquiring such knowledge displayed by many young men connected with mining," gave the University 10,000*l.* for the foundation of a lectureship in the subject. In the various branches of engineering, and in naval architecture, curricula were already provided which prepared for the degree of B.Sc. in applied science. Mining was added as an alternative curriculum, and the new department was entrusted to Mr. Latham. He had been trained in the Wigan School of Mines, and had been assistant general manager of the Moss Hall Coal Co. For nine years (1893–1902) he was director of mining at University College, Nottingham. The first Dixon lecturer speedily made his department efficient, and his numerous courses of instruction attracted many pupils.

In 1907 Dr. Dixon supplemented his original endowment by 6500*l.*, and the University, with the consent of the Privy Council, transformed the lectureship into a chair. To this Mr. Latham was forthwith appointed, the electors including H.M. Inspectors of Mining and the presidents of the Scottish Mining Institute and the Coalmasters' Association. In the new chair Prof. Latham continued to devote himself to the advancement of his subject by teaching and research. He raised a considerable Equipment Fund, by means of generous contributions from the leaders of the Scottish mining industries, who had great confidence in his policy and character. Assisted by the fund, the University was enabled to equip the museum and laboratory of the department with valuable exhibits and apparatus, and Prof. Latham gave himself to the training of his pupils and assistants in the practical and experimental sides of their work, and in original investigations on mine-pumps, winding machinery, coal-cutting, inflammable gases, life-saving appliances, etc. His course was recognised by the Home Office as equivalent to two of the five years' practical training required under the Coal Mines Acts for the qualification of mine manager. By arrangement with a number of the largest collieries in Scotland, his students were enabled, during the summer months of each year of the course, to acquire experience of mining practice. Many of them now occupy responsible positions in the industry, and in technical institutions throughout the country. Prof. Latham served on numerous advisory and other committees relating to mining, and published, in the Transactions of the Mining Institute and elsewhere, memoirs of importance on his researches in the above-mentioned subjects.

NOTES.

THE Minister of Reconstruction has appointed a committee to advise him as to the procedure which should be adopted for dealing with the position of the chemical trades after the war. The committee consists of the following members:—Sir Keith W. Price (chairman), Mr. J. Anderson, Mr. J. F. Brunner, Dr. C. Carpenter, Prof. J. G. Lawn, Sir William Pearce, Mr. K. B. Quinan, and the Right Hon. J. W. Wilson. Mr. G. C. Smallwood, Ministry of Munitions, will act as secretary to the committee. The officers of Government departments are appointed with the concurrence of their respective Ministers, and the other members of the committee have been appointed at the suggestion of a representative meeting of chemical manufacturers. Dr. Addison has requested the committee to conduct its deliberations with a view to the creation of some organisation which should be adequately representative of the trade as a whole, and by means of which the trade may be enabled hereafter to continue to develop its own resources and to enlist the closest co-operation of all those engaged in the chemical industry.

ON October 6 Prof. W. J. Pope addressed a meeting of teachers at Regent Street Polytechnic on the neglect of expert knowledge of scientific subjects by the British Government. Germany, he is reported by the *Times* to have said, prepared for war by the establishment of a huge chemical industry, which was built up round the coal-tar industry, and then by exporting a large proportion of the world's requirements of coal-tar colours and pharmaceutical and photographic products. This success was achieved in spite of the fact that England once possessed the whole of the heavy chemical industry of the world. We formerly produced practically all the nitric and sulphuric acids and the greater part of the alkali used throughout the world. This industry has been taken from us as the result of Germany's foresight and exploitation of scientific ability. The coal-tar industry was established originally in this country, and until ten years ago Germany was practically dependent on us for crude coal-tar and for the simpler first products separated from coal-tar. Alluding to the establishment of the Department of Scientific and Industrial Research with an endowment of 1,000,000*l.*, Prof. Pope remarked that the question to be answered is why that experiment was not made twenty years ago, at a time when it would have been undoubtedly successful in preventing the horrors of the last three years. We have suffered in the past from the exclusively British method of making the specialist entirely subservient to the administrator, the administrator being generally chosen because he is available, because he is politically acceptable, and because he knows nothing whatever about the subject which is to be administered, and is therefore not likely to be prejudiced by any previous convictions. The process of appointing someone who knows nothing to super-

vise the work of someone who does know how to do the job seems to have been at the bottom of a great many of our misfortunes in the past. In 1915 the Government applied the same method to re-establish the coal-tar industry in this country. An organisation was established in which all the people in control were men who knew nothing of chemistry or science, and, naturally enough, the Government organisation has proved a failure. Organisation apparently was to do everything that was necessary, and consequently private effort was to a considerable extent hampered. Such prevalent, but entirely mistaken, activity arises, Prof. Pope claimed, from a lack of education. If it were generally demanded that no person should be regarded as reasonably educated who had not mastered the rudimentary principles of natural science and of scientific method, this mistaken policy in connection with the coal-tar colour question would have been impossible.

ON the invitation of the British Engineering Standards Committee, the American Institute of Electrical Engineers has sent over Mr. H. M. Hobart to represent the institute at a conference to be held with Sir Richard Glazebrook's Panel Committee on Standardisation Rules for Electrical Machinery. Mr. Hobart is the author of several standard treatises on electrical machinery, and was for many years a lecturer at Faraday House Engineering College before he returned to America about ten years ago. He is decidedly *persona grata* to the engineers in this country, and a happier or more tactful choice could not have been made. The standardisation rules of the American and English electrical engineers are in substantial agreement, and we see no reason why complete agreement should not be obtained. The Americans have had far greater experience with pressures exceeding 50,000 volts than we have had, and they are fully aware that testing apparatus with very high voltages may permanently weaken the insulation, although the apparatus may survive the test. The exact way of taking the temperature measurements of machines under load and the methods of testing the dielectric have been discussed at previous conferences. Electricians are practically unanimously in favour of the metric and decimal systems, but the standard pressure for lighting in this country seems to be anything between 220 and 240 volts. It is to be hoped that the lead which the Glasgow Corporation gave to the country many years ago, by fixing 250 as the standard voltage for lighting, will be generally adopted.

THE recent air raids have provoked much discussion as to our future air policy, and as to possible improvements in aircraft design. The question of reprisals is more a moral than a technical one, as there is no doubt of our ability to carry out effective raids on German towns. Lord Montagu of Beaulieu, in a letter to the *Times*, points out that the air-raid casualties are really small, and fewer than those due to London traffic. This is poor consolation, and should not prevent the utmost efforts to secure an effective means of defence. At a meeting "in support of an increased air service," held at the Central Hall, Westminster, on October 4, Mr. Joynson Hicks criticised the Government very severely, stating that warnings had been neglected and that progress was consequently slow. He spoke of the improvement in aircraft during the last few years, and said that in his opinion another year would see machines flying at 250 miles an hour instead of 150. He implied that the Government knows that such machines are possible, but is not preparing for them. Such a statement as the above shows a lack of knowledge of the principles governing flight. A machine must be able to land at a reasonably low speed, as well as to fly at a high speed, and the landing speed at once imposes a limit on the top speed. Thus, with a landing speed of forty miles per hour a machine of good design, weighing one ton, needs 200 horse-power to fly at 100 miles per hour, and would require 1700 horse-power to fly at 200 miles per hour. If the landing speed is raised to eighty miles per hour—a very high value in practice—90 horse-power will be required at 100 miles per hour, and 400 horse-power at 200 miles per hour. Mr. Joynson Hicks's 250-mile-an-hour machine would require 800 horse-power to fly it, even with a prohibitive landing speed of eighty miles per hour. Such a machine is obviously impracticable with present-day engines, and with any engine likely to be evolved in the near future. The engine alone would weigh one ton, which is the total weight of the machine for which the above calculation was made. Our best present-day machines are near the limit of practicability with existing engines, and every possible effort is being made to improve their performance by careful scientific attention to details of design.

DR. ADDISON, the Minister of Reconstruction, speaking on October 3 at the annual meeting of the Library Association, said that one of the features of the programme which appealed to him was the movement, which was apparently making considerable progress, for the formation of technical and commercial libraries and for the setting up of research libraries to suit the particular needs and industries of various districts. If we are to pay for the war—and it is not necessary to put the matter on a higher plane than that—we want the different trades and industries of the country to organise more and more for the production and dissemination of useful and necessary information. A working relationship between higher educational authorities and the business community is absolutely essential to our industrial welfare, and public libraries can do a valuable work by placing information useful to industry at the disposal of the community. Certain recommendations were made at the meeting. The council of the association is of opinion that it is of urgent national importance to increase the supply of scientific and technical books and periodicals, the existing supply being quite inadequate for higher research, and, in many places, insufficient for the requirements of the student and the artisan. To this end it was strongly urged (*a*) that local authorities should afford more generous support to public libraries for the provision of scientific and technical literature; (*b*) that municipal and other library authorities and institutions should co-operate in issuing union catalogues of technical books, and adopt such other co-operative methods as will make their resources available over wider areas; (*c*) that a State scientific or technical library should publish periodically a descriptive list of selected books in science and technology; (*d*) that a closer union should be arranged between State and copyright libraries on one hand, and municipal libraries on the other, so that the resources of the former may directly or indirectly be made available for scientific and technical students in the great industrial areas of the provinces; and (*e*) that funds should be provided for some State-supported library, such as the Science Library of South Kensington, or a library controlled by the Department of Scientific and Industrial Research, to purchase books required for research, and to make them available for loan to public libraries. All the recommendations were adopted unanimously.

A GENERAL discussion on pyrometers and pyrometry will be held by the Faraday Society at the Royal Society of Arts on Wednesday, November 7. Sir Robert Hadfield, president of the society, will preside over the

discussion, and deliver an introductory address. Instruments for high-temperature measurements will be exhibited by leading makers.

PROF. G. H. BRYAN has received from the Department of Scientific and Industrial Research a grant to enable him to complete the researches into some of the unsolved problems as to the effects of atmospheric and other disturbances, such as gusts, air-pockets, bomb-throwing, etc., upon aeroplanes, referred to in his "Stability in Aviation." He has been granted leave of absence for a year from the University College of North Wales, where he is professor of mathematics, and has proceeded to the University of Bristol, where he proposes to work for a time.

ANNOUNCEMENT is made that Mr. Walter Long, who has been requested by the War Cabinet to take control of all questions affecting petroleum oils and petroleum products, has appointed Prof. J. Cadman to be his technical adviser and liaison officer between the various Government departments. Prof. Cadman will also take charge of an organisation to be established for giving effect to Mr. Long's instructions, and will assume the title of Director of the Petroleum Executive. Mr. E. S. Shrapnell-Smith has been appointed economy officer to the Petroleum Executive, and he will be concerned in introducing economies both in the Services and in the civil use of petroleum and petroleum products. The headquarters of the Petroleum Executive are at 8 Northumberland Avenue, W.C.2, to which all communications should be addressed.

MELBOURNE newspapers of August 10 and 11 contain accounts of large magnetic disturbances which occurred on the afternoon of August 9 and on the forenoon of August 10, Australian time. These clearly correspond with disturbances recorded in England during the morning and late evening of August 10, Greenwich time. The earlier of the two disturbances, lasting from about 2 to 8 p.m. local time, was accompanied by bright aurora. At Melbourne there was a brilliant display of streamers for about an hour. At Ballarat the aurora, being of a ruddy tint, was mistaken for a conflagration, and the fire brigades turned out. There were also strong earth currents throughout Australia, interfering with the telegraph service, especially in Victoria and New South Wales.

THE Royal Photographic Society is holding its annual exhibition this year in the society's own house at 35 Russell Square, W.C. Admission is free for about six weeks. The autochrome process still holds its own for colour transparencies, though the few results on Paget plates leave little or nothing to be desired so far as an inspection, without the original for comparison, is concerned. The Astronomer Royal, Greenwich, has contributed recent photographs of sun-spots, nebulæ, comets, and star regions. Among other astronomical photographs taken with telescopes of very large aperture are several by Mr. J. H. Reynolds, of Birmingham. These include series of the moon, Jupiter, Brooks's comet, and the great nebula in Orion. The photomicrographs are far more numerous than usual, and vary very much in quality. An experiment by Dr. Rodman, made at the suggestion of Capt. Owen Wheeler, of using a more highly corrected lens as eyepiece (a Ross ¼-in. achromatic objective was used instead of the "ordinary ocular") distinctly discourages any further attempts in this direction. Mr. Ernest Marriage shows an extensive series to demonstrate the comparative proportion of starch in plant roots, especially in those plants that market-gardeners would wish to be rid of. He photographs sections (×5) as cut, and also after treatment with iodine, the darkening with iodine indicating starch. Photographs at ×250 show the starch granules. There are notable collections of radiographs, natural history photographs, and other matters too numerous to mention. Doubtless the photographs of the widest general interest are those contributed by the Royal Flying Corps. The exigencies of the times have caused aerial photography to advance to a perfection scarcely thought possible a few years ago. The photographs show definitely the changes in buildings, trenches, etc., during the various stages of the war.

IT is announced that the Ministry of Munitions does not regard coal-gas as coming within the category of a petrol substitute. On the question of the unrestricted use of gas, the Ministry states that it is consulting the Home Office. The motor industry has now taken up this substitute for petrol, which involves only a slight alteration to the engines of the vehicles. Gas has been used as the motive power in many char-à-bancs during the summer season, the fuel being stored in a large bag carried on the roof. The question as to how gas can be stored in motor-cars, taxi-cabs, etc., has given rise to the adoption of several plans. Open motor-cars are not adapted to the carriage of gas-bags, and the experiment of using light trailers for that purpose is being tried. In the case of taxi-cabs little difficulty will arise, and a slight alteration of the front seats on the top of motor-omnibuses is all that is necessary for the storage of bags. It is likely that gas will be adopted largely, since it can be obtained at about one-fourth the present price of petrol. Owing to the difficulty of procuring steel cylinders, compressed gas is not likely to come into use during the war; there is also the point to be considered that coal-gas stored under pressure is liable to deteriorate.

A REUTER message from Tokio, dated October 1, which appeared in the *Times* of October 4, reports the occurrence in Japan of a typhoon of unprecedented violence, which swept over Tokio on the morning of that day, lasting for four hours. The casualties caused by the visitation appear to have been deplorably numerous, and the destruction of property exceptionally great, thousands of people being rendered homeless. The typhoons of the North Pacific and China Seas are divided by the Rev. J. Algué, S.J., director of the Manila Observatory, in his "Cyclones of the Far East," into classes, according to the zones of their trajectories: those of the North Pacific, all of which keep to the west of the twenty-fourth meridian, East; and those of the China Sea, which cross this meridian. It is the former to which the typhoons that visit Japan belong. Fr. Algué then groups these conformably with the months of their occurrence; the mean inclination of their branches (1) before, (2) after they have recurred; also the mean latitude of their vertex. Reduced to three groups, December to March, inclusive, is the first; April, May, October, November, the second; June to September, inclusive, the third. The typhoon of October 1 belongs rather to the third group of trajectories than to the second, because in the case of the former the latitude of its vertex is highest of all the groups. The zone of origin of typhoons of the first group lies between the parallels of 5° N. and 12° N.; that of the second between 6° N. and 17° N.; that of the third between 8° N. and 20° N. In the Philippines a typhoon with an hourly velocity of motion exceeding twelve nautical miles is said to travel rapidly; when at fewer than from six to twelve miles an hour to move slowly, but to have a regular velocity when it progresses at that rate.

AN interview with Sir Henry Trueman Wood published in Sunday's *Observer* (October 7) brings together several interesting reminiscences of his long association

with the Royal Society of Arts, of which he was secretary from 1879 until his recent retirement. Among the distinguished representatives of applied science who were chairmen of the council from that year onwards were Sir Frederick Bramwell, Sir William Siemens, Sir J. Wolfe Barry, Sir William Preece, and Sir William White. Dr. Dugald Clerk has just retired from the chairmanship, and has been succeeded by Mr. Campbell Swinton. The society played a large part in the foundation of the Great Exhibitions of 1851 and 1862, and, through these, of that long series of international exhibitions which had such far-reaching influence on the arts, as well as on industry and trade. Sir Henry had much to do with the organisation of the Health, Inventions, and Colonial Exhibitions at South Kensington, the Paris Exhibition of 1889, and the Chicago Exhibition of 1893, for which the Government appointed the council of the Society of Arts as the British Commission. With regard to this exhibition, Sir Henry, who managed the British Section in Chicago, said:—"The amount given by our Government, though fairly liberal, was nothing compared with that which the German and French Governments gave. The Germans had never exhibited at big exhibitions before, because they had all been held in France, and after the Franco-Prussian War they would have nothing to do with them. They gave their commissioner an absolutely free hand. He told me himself he had as much money as he could do with. The result was that they made a much finer show in buildings than we could do. I do not think their actual exhibits were as good as ours, but the way in which they were shown was infinitely superior." Throughout his long association with the society, Sir Henry was always ready to assist other organisations having the application of scientific knowledge as their object. In the early days of the British Science Guild his active co-operation in many directions, and the hospitality afforded by the society as regards the use of rooms for meetings, were of the highest assistance; the aid thus given will long be gratefully remembered.

IN the issue of *Knowledge* just published (No. 582) MM. Albert and Alexandre Mary describe experiments, in continuation of the late Dr. Charlton Bastian's work, on the development of micro-organisms in carefully sterilised solutions of certain salts, *e.g.* potassium ferrocyanide and ferrous sulphate. Tubes after being charged were sealed and sterilised for ten minutes at 130° C. The tubes, after standing for a year and a half, were opened and examined, and all yielded growths of micrococci which could be cultivated in iron lactate solutions. They affirm, therefore, the correctness of Dr. Bastian's work. In the same number Dr. Butler Burke, commenting on Mr. Onslow's communication to NATURE of February 22 last on a repetition of Dr. Bastian's experiments with negative results, suggests that some kind of radiation other than sunlight, such as radioactivity, may prove to be the stimulant required to start vital processes in non-living matter, and so to cause the spontaneous generation of the living from the non-living.

MR. J. A. CUSHMAN has published (Bulletin 71, U.S. Nat. Mus., pp. 103, 52 text-figures, 39 plates, 1917) the sixth and last part of his work on the Foraminifera of the North Pacific, which deals with the single family Miliolidæ. Preceding the systematic account of the species recorded are detailed descriptions of the development of nine genera (and observations on their derivatives), beginning with Cornuspira.

IN the report of the Dove Marine Laboratory at Cullercoats for the year ending June 30 Prof. A. Meek and Miss Stone record the results of examination of about 3000 herrings caught off the Northumberland coast. These show that the year 1916 was abnormal in that the herring caught were for the most part a year older—their scales having four winter rings—than those obtained during the years 1912–15. Miss Jorgensen gives a short description of the development of the common shore sponge, *Grantia compressa*. She agrees with Prof. Dendy that the oogonia arise from collared cells. Prof. Meek contributes a brief account of the Phoronidea, making special reference to *Phoronis ovalis*, which was rediscovered recently by Dr. Harmer in a shell obtained off the Northumberland coast. Prof. Meek states his reasons for believing that *Actinotrocha branchiata* is the larva of *P. ovalis*. He reports on larval lampreys collected in the North Tyne, but although the larvæ are so common, efforts made to secure the adults have thus far failed. He directs attention to the serious nature of the pollution of the Tyne in the neighbourhood of Newcastle and the consequent destruction of descending kelts and smolts and of sea-fish which are drifted up the river, and urges that steps should be taken to render effluents innocuous before they are poured into the river.

IN his presidential address to the Quekett Microscopical Club, published in the Journal, vol. xiii., Prof. A. Dendy gave an interesting account of the development of the chessman spicule of the sponge Latrunculia, and discussed the view that the position of the whorls of outgrowths on the spicule correspond with the nodal points of a vibrating rod. The evidence suggests that the formative cells of the spicule are sensitive to vibrations and avoid the internodes, taking up their positions on the surface of the young spicule at the points of comparative rest of the vibrating rod, and thus the whorls present in the adult spicule are formed at these points by local accumulations of silica. Profs. Dendy and Nicholson have since published (see NATURE, June 14, p. 318) an account of their mathematical study of a spicule with simpler whorls, the observed positions of which correspond closely with the calculated positions of the nodes in a vibrating rod similar in form to that of the shaft of the spicule when the nodes are commencing to develop. In the same volume of the Quekett Club's Journal Mr. G. T. Harris gives the results of studies on the desmid flora of Dartmoor, based on two hundred gatherings made in July–October, 1915 and 1916. The total number of species and varieties recorded is about 400. Some of the rarer species are figured and are the subject of special notes. The richness of the desmid flora of Dartmoor lends support to the view that "the rich desmid areas correspond geographically with pre-Cambrian and older Palæozoic outcrops."

THE principal features of scientific interest in the current number (vol. xlii., parts 2 and 3) of the Journal of the Royal Horticultural Society are the reports on the experimental work at Wisley and a report of investigations relating to Paradise apple stocks, which is contributed by Mr. R. G. Hatton as the first report of the Wye College Fruit Experiment Station, East Malling. The latter is a detailed record of experimental work on this important subject which has been carried out at the station since November, 1912. Nine distinct types have been identified from English sources, whilst six other types have been obtained from German sources. The report is profusely illustrated, and reveals substantial progress towards the solution of what has long been regarded by fruit-growers as an important problem.

AGRICULTURISTS are indebted to Prof. T. B. Wood for a useful series of tables of the composition and

nutritive value of feeding-stuffs which is issued by the Cambridge University Press. The tables cover the whole range of farm feeding-stuffs, and give information as to average composition, digestible nutrients, food units, nutritive ratios, and relative values for maintenance and productive purposes, the last-named being expressed in the now familiar form of "starch equivalents." Wherever possible the averages are based upon analyses of the materials actually used by British farmers, and this feature alone renders the tables invaluable and indispensable to all concerned in the inculcation and carrying out of rational methods of feeding live stock in this country.

THE Food Production Department of the Board of Agriculture and Fisheries has issued a report (Miscellaneous Publications, No. 19) on the methods adopted in breaking up grass land during the past winter, and on the results achieved. The report is based upon the replies furnished by more than 300 farmers in fifty-five counties, to whom schedules of questions were addressed. In view of the difficulties attending the work last spring the results are considered to be very satisfactory, failure being reported in only one-fifth of the cases dealt with. Although some of the failures cannot be accounted for, most of them were due to reasons which further experience should enable farmers to avoid. Failures occurred chiefly in the south and east. In by far the greater number of cases wireworm was reported as the ostensible cause of failure, but it is suggested that in many of these cases the damage was primarily due to the drying out of the newly ploughed soil through lack of proper tillage, whilst in other cases it was almost certainly due to fritfly. There was general unanimity that the production of a firm seed-bed by pressing or heavy rolling after the plough is of prime importance for success. In a discussion of the lessons drawn from the successes and failures of 1917 much useful guidance is furnished as to time of ploughing, subsequent cultivation, and manuring in relation to land of different types. A brief *résumé* of the report is issued separately as Food Production Leaflet No. 5.

MESSRS. HONDA AND ISHIWARA describe, in a report from the Alloys Research Institute of the Tohôku University, Japan, the results of tests on the magnetic properties of manganese-antimony alloys in a field of about 500 gauss. Manganese is paramagnetic, and antimony diamagnetic, but their compounds, Mn_3Sb_2 and Mn_2Sb, are both ferromagnetic with a critical temperature at 315° C. Magnetisation at different high temperatures was also measured. This gives important data with regard to the structure of the alloys.

IN a report from the Alloys Research Institute of the Tohôku University, Japan, Messrs. Honda and Murakami publish certain data with regard to the thermomagnetic properties of the carbides found in steels. They find that iron cementite is ferromagnetic, the specific magnetisation of which ($\rho = 2{\cdot}559$) in a field of 500 gauss is 19·7. Its critical temperature is 215° C. In the free state it is almost wholly decomposed into its components by heating it sufficiently long at 900° C. The double carbide of iron and tungsten found in low tungsten steels is also ferromagnetic, and its specific magnetisation ($\rho = 1{\cdot}435$) in a field of 500 gauss is 15·5. Its critical temperature is 400° C., and in the free state it is decomposed on heating to 850° C.

THE August number of the Journal of the Franklin Institute contains a valuable outline of the publications on the subject of the submarine and its equipment which have appeared in the technical Press during the last six years. It is due to Helen R. Hosmar, and deals in order with the history of the development of the submarine, its proper function in war, the power and dimensions of the most recent submarines built in different countries, the various forms of internal-combustion engine used for propulsion on the surface, and of storage cells for use when submerged, the periscopes, and the forms of apparatus for signalling to and from submarines. A list of builders and a bibliography conclude the article, which occupies fifty-five pages of the journal. The outlines given are sufficient to give the reader a good general knowledge of the rapid advances which have taken place during the last few years, while the bibliography provides the references which enable the specialist to turn to the original sources for detailed information.

AN article in *Engineering* for October 5 contains some interesting particulars of ferro-concrete shipbuilding. It is satisfactory to learn that Lloyd's Register of Shipping has approved plans for the construction of a number of such ships up to 500 tons dead-weight capacity. A director of the Norwegian Veritas has lately given his views, unofficially. He is convinced that ferro-concrete, under normal conditions, will be used for lighters, floating docks, buoys, etc., where the weight does not play a very important part. So far as sea-going vessels are concerned, he is of opinion that the weight of ferro-concrete vessels will detract from their carrying capacity to a serious extent. The Fougner yard in Norway has already commenced work on its eighteenth ferro-concrete floating structure—a floating dock—while several vessels up to 1000 tons dead-weight have been contracted for. Sister companies of the Fougner firm are in course of formation in England and America. M. Harald Alfsen, of the Norwegian company, has from the outset been convinced that ferro-concrete boats should be built bottom uppermost, and by using only an inner shuttering, or only outer boarding, so far as the vertical sides are concerned. The vessel takes the water bottom upward, in the position in which it is cast, and is turned upright after launching. The article contains an illustrated description of the ferro-concrete ship, *Beton I.*

ONE of the completest and most conveniently arranged special catalogues of second-hand books that have recently reached us is New Series No. 81, Zoological, just issued by Messrs. John Wheldon and Co., 38 Great Queen Street, W.C.2. It is divided into two parts—classified subjects and faunas of all countries—and should appeal to all zoological readers, being very easy of reference and containing many scarce works and others not easily obtainable at the present time, being of foreign origin. We notice that Messrs. Wheldon are offering for sale a set of the *Phil. Trans.* of the Royal Society from 1665 to 1913; Proceedings of the Royal Society from 1800 to 1916; the *Ibis* from 1859 to 1915; Bulletin of the British Ornithologists' Club, vols. i. to xxxiv.; Transactions of the Linnean Society from 1791 to 1916; a complete set of the *Zoologist*; and NATURE from its commencement to 1916.

THE new announcement list of the Cambridge University Press contains the following books:—"The Theory of Electricity," G. H. Livens; "British Grasses and their Employment in Agriculture," S. F. Armstrong, illustrated; "Instinct in Man: A Contribution to the Psychology of Education," Dr. J. Drever; "Locke's Theory of Knowledge and its Historical Relations," Prof. J. Gibson; "Agriculture and the Land," G. F. Bosworth (Cambridge Industrial and Commercial Series); and a new and revised edition of

"Manuring for Higher Crop Production," Dr. E. J. Russell.

A BOOK which should be of interest and value is announced by the Chiswick Press, viz. "The Ancient Earthworks of the New Forest," described and delineated in plans founded on the 25-in.-to-one-mile Ordnance Survey, with a coloured map showing the physical features of the ancient sites of the New Forest founded on the 1-in.-to-one-mile Ordnance Survey, by H. Sumner.

MESSRS. LONGMANS AND CO. announce a new edition of Sir W. Crookes's "The Wheat Problem," containing an additional chapter on "Future Wheat Supplies," by Sir R. H. Rew, and an introduction by Lord Rhondda.

OUR ASTRONOMICAL COLUMN.

EPHEMERIS OF ENCKE'S COMET.—The following ephemeris of Encke's comet, which is due at perihelion on March 25, 1918, is given by M. Viljev :—

1917	R.A. h. m. s.	Decl. ° ′	Log r	Log Δ
Oct. 11	23 41 24	+10 17·5		0·1732
15	34 27	9 37·9		
19	27 45	8 57·2	0·3757	0·1674
23	21 24	8 16·4		
27	15 29	7 36·1		0·1670
31	10 2	6 57·0		
Nov. 4	5 12	6 19·7	0·3473	0·1709
8	23 0 53	5 44·7		
12	22 57 12	5 12·6		0·1780
16	54 13	4 43·6		
20	51 53	4 18·0	0·3145	0·1869
24	50 9	3 56·0		
28	49 0	3 37·6		0·1964
Dec. 2	48 27	3 22·9		
6	48 29	3 11·7	0·2762	0·2054
10	49 3	3 4·2		
14	50 8	3 0·3		0·2130
18	51 45	2 59·9		
22	53 50	3 2·9	0·2307	0·2188
26	56 22	3 9·2		
30	22 59 19	+3 18·6		0·2218

THE NEW STAR IN N.G.C. 6946.—A further account of the new star discovered by Ritchey in the spiral nebula N.G.C. 6946 (H. iv. 76 Cephei) has been given by Dr. Max Wolf (*Astronomische Nachrichten*, No. 4902), including a reproduction of a photograph taken with the Königstuhl reflector on August 21. The region is very rich in faint stars, but the only B.D. star in the neighbourhood is +59° 2662, magnitude 9·5, which is slightly preceding, and about 7′ north of the centre of the nebula. The nova was identified by comparison with earlier photographs of the nebula, and its estimated position, for 1917·0, was R.A. 20h. 33m. 3·1s., declination +59° 50′ 15″. The central star of the nebula follows the nova by about 4·05s., and is 105″ to the north. On August 21 the magnitude of the nova was estimated to be 13·5; on the photograph reproduced it appears to be less bright than the central star, but this is an illusion produced by the nebulosity about the latter, as in photographs taken with short exposures the nova was considerably the brighter. The nebula extends about 6′ to 7′ in the direction east and west, and the spirals exhibit a very complex knotted structure. The nova is situated near the southern end of an arm which runs obliquely from east to south of the central star. It was not possible to photograph the spectrum of the nova on account of the feeble luminosity.

WORK-HARDENED METALS.

ONE of the most interesting of the papers presented at the autumn meeting of the Institute of Metals was that by Prof. Jeffries, of the Case School of Applied Science, Cleveland, U.S.A. Hanriot came to the conclusion in 1912 that metals subjected to very high hydrostatic pressures, of the order of 10,000 kilograms per square centimetre, even though they underwent no change of shape, showed an increase of hardness (Brinell test). Although cubes of silver, copper, and aluminium showed a considerable increase of ball-hardness in these experiments, he decided that in no case were they appreciably deformed, and that the pressure was sufficient for hard-hammering the metals without deformation. Prof. Jeffries reviews this work, and has repeated the experiments. Tests were carried out by Dr. Bridgman with pure aluminium and an alloy containing 88 per cent. of aluminium and 12 per cent. of copper, in the form of cylinders 7/16 in. diameter by ½ in. long, the dimensions of which were accurately measured. The tensile strengths and scleroscope hardness values of the materials were determined with the following results :—

	Tensile stress lb. per sq. in.	Scleroscope hardness
Aluminium	14,890 ...	6·5
Aluminium-copper alloy ...	31,950 ...	24·0

Cylinders of each kind of metal were then exposed to a maximum pressure of 12,400 kg. per sq. cm. at 25° C., the transmitting liquid being petroleum ether mixed with kerosene. The pressure was maintained at the maximum for twenty minutes, and the total period of the test was about 2½ hours. The cylinders were then measured and found to be unaltered in size, and the following results were obtained in the subsequent tests :

	Tensile stress lb. per sq. in.	Scleroscope hardness
Aluminium	14,300 ...	6·5
Aluminium-copper alloy ...	27,300 ...	24·0

In the case of the alloy the threads were stripped at the stress specified, and the specimen was unbroken. Similar experiments at 40° C., using kerosene alone as the transmitting medium, gave a similar result, except for a slight increase of tenacity, and no alteration in structure was observed. These results contradict those of Hanriot, who found a 30 per cent. increase of ball-hardness in the case of aluminium under a hydrostatic pressure lower than the above. Bridgman directs attention to the fact that Hanriot used vaseline to transmit the pressure, and that this freezes hard under pressure, so that at the higher pressures the stress applied was not hydrostatic. This explanation is plausible. Prof. Jeffries concludes from these and other tests that the hardness of metals cannot be increased without permanent deformations unless such an increase in hardness is due to an allotropic change. The latter might, of course, cause either an increase or a decrease in hardness. As all Hanriot's results pointed to an increase of hardness it is probable that there was slight permanent deformation which he did not detect, and that this was the immediate cause of the increase.

In spite of the large number of researches which have been carried out, both on the purely scientific and technical aspects of the annealing of work-hardened metals and alloys, the subject still presents features which require more detailed investigation than they have yet received. The laws of annealing are considerably more complicated than the early investigators suspected. Especially does this apply to the first effects liable to be produced by heating. That in certain cases a hardening of the metal or alloy is produced, as measured by the tensile and ball-hardness

tests, must be regarded as established by the work of Charpy, Bengough and Hudson, Mathewson and Phillips and Thompson. Moreover, according to Howe, the first effect of slight heating in the case of iron may be either a softening or a hardening, depending on the intensity of the previous deformation, and in his view at least two agencies are at work in producing these results.

Prof. Carpenter and Mr. Taverner, of the Royal School of Mines, have investigated the way in which the tenacity of cold-worked aluminium of one particular degree of hardness is affected after the application of heat at various temperatures, and for periods of time very much longer than any that have been employed in any previous investigations. They find that the effect of heat at temperatures from 550°–300° C. inclusive is to cause a very rapid softening of the metal, and that *the same ultimate value of tenacity is reached in all cases*. Softening is complete in ninety-six hours, and nearly the whole of this occurs in the first hour of the test. At 250° C. the rate of softening, while still considerable, is much less rapid. Between 600 and 800 hours are required for complete softening, and here also the same ultimate value of tenacity is reached as at higher temperatures.

From 200° to 100° C. inclusive the rate of softening is slow, and as the temperature of 100° is approached, very slow. The actual sequence of changes can be classified conveniently under three heads:—(1) A comparatively rapid drop in tenacity in the first hour. (2) A tendency either to cease falling or actually to rise, such rise, in one case only, bringing the tenacity up to the original value. This period is in most cases completed in about 100 hours. (3) A relatively very slow fall of tenacity which is maintained on the whole steadily. These tests are still in progress. Assuming the present rate of loss of work-hardness to be maintained, and that the metal ultimately reaches the same tenacity as specimens tested at the higher temperatures, periods of the order of from one to three years will be required for completion. The fluctuations in the tenacity values referred to under (2) appear to be well established. Similar fluctuations in the rate of solution of hard-worked aluminium-sheet had previously been recorded by Seligman and Williams. The authors have also shown that the cold-rolled aluminium loses a considerable part of its work-hardness, in the temperature range 200° to 100° C., with scarcely any recovery of plasticity as judged by the elongation test. H. C. H. C.

BRILLIANT FIREBALL OF OCTOBER 1.

METEORS of the largest type exhibit a propensity to appear in the twilight of early evening. On Monday, October 1, at 6.37 p.m., a splendid object of this class presented itself, moving slowly along an extended flight in a south to north direction. It was observed by a large number of persons in various parts of the country, and descriptions have been received from places so wide apart as Weston-super-Mare, Somerset, and the extreme North of England.

The accounts to hand are not, as usual in such cases, in perfect agreement, but some of them are excellent, and form a good basis for determining the meteor's real path in the air. The Rev. Canon J. M. Wilson observed the meteor from Worcester, and describes its flight as from 40° E. of N., alt. 15° to 18°, to 5° E. of N., and alt. 5°. Duration about 2½ sec. for the section of path he viewed. The Rev. J. Dunn, of Weston-super-Mare, describes the fireball as very brilliant, passing just above Capella. It was visible for five seconds; the head was some ten minutes of arc in diameter, and it threw off a short, reddish trail of sparks. Mr. H. J. Woodall saw the fireball from Oldham, and says it was in a direction 9° N. of E., and falling towards N. at an angle of 30°. The Rev. Watson Stratton, writing from Goole, Yorks, gives the path as from N.N.E., nearly as high as Polaris, to a point a few degrees W. of N., and about alt. 12°. Mr. Philip Burtt was at Penrith Station, and viewed the meteor as it descended and terminated its career just to the right of the moon. It was of a rich yellow colour. Mr. T. J. Moore reports from Doncaster that the direction was from E.N.E. to N.N.W., and that about one minute after the object had passed a very loud explosion was heard.

Many other accounts from Liverpool, Grantham (Notts), and other places might be quoted. Spectators agree as to the remarkable brilliancy of the object, and state that it aroused apprehension in cases where its real nature was not understood.

I have computed the real path as follows:—

Height at appearance, 56 miles over 4 miles E. of Boston, Lincolnshire.

Height at disappearance, 19 miles over 15 miles N. of Stanhope, Durham.

Length of luminous course, 160 miles.

Velocity per second, 23 miles.

Radiant point, 320°−22° in Capricornus.

The Rev. J. Dunn's estimate of the diameter would give the dimensions as half a mile, but this included the flaming effect and glare. Probably the solid nucleus was not many inches in diameter. As to the sound heard at Doncaster, it came too quickly for it to have been a meteoric effect.

Another fireball was seen on September 23. It lit up the sky, and was directed from a radiant at about 322°−23°, and probably belonged to the same system as the more recent one of October 1. Observations of the latter are still coming in, and it may be found desirable slightly to alter the results above given. A second fireball was seen on the same night at 10.46. Its radiant appears to have been at 351°+2°, and its height seventy-six to forty-one miles.

W. F. DENNING.

THE TASK OF BRITISH AGRICULTURE.

THE speech of the President of the Board of Agriculture at Darlington on October 5 calls for the widest attention as an authoritative pronouncement on the present situation of British agriculture in relation to the need for increased food production. The exigencies of a long war have imposed upon the British farmer the duty, on one hand, of securing a greatly increased production of bread-corn and potatoes, and, on the other, of maintaining the supplies of milk and meat. The ideal placed before him by the Board of Agriculture in the first place is an increase of 3,000,000 acres under grain, potatoes, and roots, to be obtained partly from existing arable land and partly by ploughing up pasture. To secure this end the Government is prepared to help, and Mr. Prothero outlined how much has already been done in the way of guaranteed prices for corn, extension of credit facilities, supply of soldier and women labour, increased supplies and controlled prices of fertilisers, supply of horses, ploughs, and ploughmen, and further of mechanical tractors. Of the last-named 1500 are already at work, and it is hoped that by February next the number will have increased more than fourfold. A timely warning was given, however, that the tractor in its present stage of development must be regarded as the least efficient of ploughing implements, and should be used preferably for the lightest work.

On the question of the maintenance of the milk supply Mr. Prothero urged that with the reasonable

scale of prices fixed for milk and the efforts being made to secure reduced prices for feeding-stuffs and a preferential call upon supplies, the dairy farmer was being fairly treated, and should endeavour to surmount his difficulties by securing greater economy in the use of food and an increased average milk output per cow.

On the subject of beef production Mr. Prothero did not conceal his apprehension that the scale of prices fixed by the Food Controller for the winter would not only gravely imperil our meat supplies, but would even operate adversely against corn production. From his practical experience he was convinced that current prices left little margin of profit, if any, for the arable farmer, who feeds and fattens cattle for the winter market. A price of 60*s*. per cwt. live weight for stall-fed cattle puts a premium on grass as the cheapest form of cattle-feeding, and thus renders the farmer more reluctant than ever to plough up grass; it penalises stall-feeding on arable farms, and so tends to diminish the supply of manure for the needed corn crops. We are glad to see, therefore, the announcement in Wednesday's *Times* that the War Cabinet has conceded the appeal of the farmers for a revision of the scale of maximum prices fixed some months ago for home-killed beef for the Army. Under the sliding-scale of prices for live cattle, as originally announced, the price for home-killed beef fell from 74*s*. per live cwt. in September to 72*s*. in October, 67*s*. in November and December, and 60*s*. from January 1, 1918. It has now been decided that the November and December price of 67*s*. shall continue until July 1, 1918, and that the 60*s*. maximum shall then come into force for the rest of the year.

At the best, with the reduced supplies of feeding-stuffs, it will be difficult to avoid a serious shortage of meat in May and June next year. We must not be driven to slaughter more cows or veal calves; we cannot depend upon an increased import of meat; the only safeguard within our control is a reduction in our consumption of meat, and this must be pressed for more and more insistently. The eloquent appeal to farmers in the closing part of Mr. Prothero's speech will assuredly not fall on deaf ears, but it is equally necessary that the public shall realise their difficulties and extend to them the sympathy which no section of the community more rightly deserves.

CHEMICAL LABORATORY PORCELAIN.[1]

THE first attempts to make porcelain in Europe were undoubtedly in imitation of the Chinese porcelain imported into Europe by the Dutch, English, and French East India Companies about 1673.

Its beautiful whiteness, its thinness, its translucency, its close vitreous fracture, apart from, and also in conjunction with, its decoration, at once appealed to and obtained the admiration and emulation of the Europeans.

The story of the struggle in the attempt to reproduce it is not within the scope of this paper, but suffice it to say that it was accomplished in Germany by Bottcher about 1706–18, and in England by Cookworthy, of Plymouth, about 1767.

The one factory continued for the reason that not only were the products excellent, but the financial success was not the main object, while the other had to bear its own losses, and though there was considerable promise of success, the financial aspect of the undertaking was a complete failure. It is well, then, at the outset to note that we do not owe the origin of the porcelain to the Continental potters, but to the Chinese. Chinese porcelain being at that time the only translucent pottery in existence, there can be no wonder about the admiration it called forth.

It cannot be surprising, then, that the English potters were very anxious to produce such a body, and if that object could be attained, the means by which it was achieved were secondary matters, and we find that instead of continuing the manufacture of hard-paste porcelain, they produced, about the end of the eighteenth century, (1) a beautiful white earthenware which for generations secured the market of the world, and made it possible to replace almost all other pottery for domestic purposes; (2) a translucent white porcelain similar to the Chinese, by the use of other materials and methods, equally beautiful, which for more than a century has held its own amongst all other porcelain productions, and is generally known as bone china.

The ceramic productions of the world as regards their bodies or paste, apart altogether from decorative effects, vary from goods made from the coarsest to the finest clays, through almost every variety of texture, by admixture of the natural clay with other materials, such as sand, flint, barytes, felspathic rock, etc. From these materials were produced at one end of the scale the cinerary urns of our great ancestors, and, at the other end, the excellent hard-paste porcelain which we are considering to-day.

The marvellous difference in the productions of the various peoples of the world may probably be explained by the general assertion that the potters have from the very earliest times worked with the materials they had at hand. The cinerary urns of the ancient Britons were made from natural clays.

The Staffordshire potters used, at first, natural clays, found cropping up simultaneously with the coal, and afterwards improved the colour and texture of the product by the addition of, first, fireclay, then Devon and Cornish clay, and calcined flint. Messrs. Eler Bros. used the red marl of the Burslem district for their fine red ware. Bottcher, of Germany, at first made red ware from local clays, etc., and afterwards porcelain from the white clays or kaolin, and pegmatite.

The Chinese for centuries had been working with their natural materials, kaolin and petuntze, and from these produced their fine porcelain. Some of these various clays naturally required a much greater heat than others to produce hard vitreous bodies.

These varying conditions with regard to materials to the hand of the potter, when means of communication were so restricted, necessarily involved very varied methods of manufacture. The materials differing so essentially from each other naturally required very varying degrees of heat necessary to bring to maturity.

The kaolin and petuntze used by the Chinese would require a much higher temperature to mature than the clays, etc., used in other countries at the time. The exact temperature would not be found at once, and in working out the same an observant potter could not fail to notice the changes taking place in the fired material in regard to vitrification, translucency, and finally distortion at the various temperatures. Thus in all probability, without any more scientific knowledge whatever than careful observation, the fine product of that time would be produced which even now (centuries later) is the object of our research.

While the Chinese were for centuries making the most suitable material in the world for chemical laboratory ware, they had no use for such, and consequently did not make it. It was only with the advance of scientific chemical knowledge in Europe that the need was felt for the various porcelain accessories that were then called into use.

It is not surprising, therefore, that Germany and France, having continued making the Chinese type of

[1] Abridged from a paper read at the annual meeting of the Society of Chemical Industry, July 18–20, by Mr. Henry Watkin.

porcelain, should have applied themselves to this particular demand, and while the English porcelain manufacturers were busy on their own particular class of porcelains they should have almost entirely secured the trade of the world in this branch.

With the cessation of the importation of Continental porcelain into this country came the call to the English potter, and, as might have been expected, it was not every manufacturer that would listen to the call; neither was it needful that he should.

There was no very tempting offer of any lucrative opening in the new business, and a potter must be more tempted by patriotism to his country, and a desire to meet its needs, than by immediate prospective financial success.

It is almost impossible to give a definition of chemical porcelain which could generally be regarded as entirely satisfactory. When first porcelain was introduced into Europe, its translucency was sufficient to differentiate it from all other ceramic productions of that period.

We have seen that in the attempts to produce a similar porcelain in Great Britain and on the Continent other kinds of translucent pottery were discovered, which are known under other names, such as bone china, soft-paste porcelain, etc., the first of which for more than a century has held its own amongst the finest productions of the world.

It is quite clear, then, that what was once the predominant and characteristic definition of Chinese and Continental hard-paste porcelain is so no longer, and translucency alone could never be regarded as the guarantee of chemical porcelain. Translucency is only one of the properties of porcelain, and that rather of beauty than utility, as evidenced by the fact that so much of the beautiful translucent porcelain of England has been found useless for the purposes we have in our minds at the moment.

More than 150 years' experience of the manufacture of hard-paste porcelain at the State-supported Royal Factory of Berlin, the experience of which was placed at the disposal of the porcelain trade of Germany, gave it a tremendous advantage over the English manufacturer. It was therefore no light task for an English manufacturer, *minus* that experience, under entirely different conditions, with all the models and moulds to prepare, to attempt the task. Some three or four English manufacturers, however, have attempted the same with very considerable success.

While I cannot speak with any degree of confidence in relation to the manufacture or supply of other factories than our own, I think I may safely say that there is now no very serious occasion to go abroad for any of the chemical porcelain accessories needed in this country.

In spite of all the difficulties surrounding the problem, English samples were in the hands of the dealers for testing purposes in November, 1914. On January 20, 1915, deliveries were commenced. The permanent success of the venture for all the firms concerned will depend upon the behaviour in use.

Doubtless demand will be made upon our manufacturers, from time to time, for very special articles, such as the condensing worms as shown in the Royal Berlin Catalogue, p. 107, but if our Government will behave towards British potters as Continental countries have done to theirs, such articles will be made by special assistance.

We cannot refrain from expressing a sense of satisfaction that something has already been done by making a grant of 10,000*l*. to the North Staffs. Technical School, Stoke-on-Trent, for experimental work in connection with hard-paste porcelain, and extensive scientific research work in that direction is being carried out under the superintendence of Dr. Mellor.

With regard to the future of the trade, it may be well to repeat that the English potters for two years now have supplied Great Britain with nearly all that has been needed for scientific work, as also for chemical processes in connection with the war. The cry, therefore, that it cannot be done is no longer admissible.

We may not at present have succeeded in making anything superior to the German production, but I venture to say that in much less time than chemical hard-paste porcelain has been manufactured our country will be making something superior.

Much will depend on conditions prevailing after the war as to the permanent success of the undertaking. That there will be a keen fight for the trade need scarcely be said. The Germans will not very willingly relinquish their hold upon a trade they have held so long. Other countries also will compete. France, Denmark, Japan, and Russia have already commenced to supply, and the *Engineer* says:—"Like this country, America, prior to the war, depended upon Germany for porcelain articles used in chemical work, and especially for laboratory work. Since the war the German supply has ceased, and much inconvenience was caused to chemists across the Atlantic. To-day, however, we learn that American pottery manufacturers are producing porcelain equal to any produced in Germany."

The aim of the English potter in relation to this matter should be not slavishly to copy the hard-paste porcelain, but rather to follow the method pursued in the past, viz. to produce his own particular type of porcelain; but in this case it should be a porcelain suited to the particular requirements. The occasion is ripe for the introduction of something better than anything yet produced, and whatever the slight difference as to the colour and the degree of translucency, the main endeavour should be to produce a porcelain that will fulfil the requirements demanded of it.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—The Rev. T. C. Fitzpatrick, president of Queens' College, who has held the office of Vice-Chancellor during the past two years, made, in accordance with the usual custom, an address to the Senate on vacating this office on the first day of the Michaelmas term. He referred to the loss which the University had sustained during the past academic year through the death of, amongst others, Mr. Charles Smith, master of Sidney Sussex College; Prof. T. McKenny Hughes, who had held the Woodwardian professorship since 1873; Dr. W. H. Besant, the oldest living Senior Wrangler; Dr. Keith Lucas, who lost his life by an aeroplane accident; and Mr. W. E. Hartley, first assistant at the Observatory, who was killed in the explosion on H.M.S. *Vanguard*. He reported that the work of all the departments of the University had been maintained during the past year, though the number of students had again decreased. There were in residence in the Michaelmas term of 1916 444 undergraduates, as against 825 in the Michaelmas term of 1915. The number of Cambridge men on service had increased to 14,450. The list of killed now numbered 1872, of wounded and missing 2622. The honours won numbered 2855, and included eight V.C.'s, 210 D.S.O.'s, and 729 M.C.'s. Besides those serving with the forces, many members of the electoral roll were engaged on war service of various kinds.

Among the reports approved by the Senate during the year was an amended report on degrees for research, including recommendations which were not in

the first report for the establishment of degrees of Litt.B. and Sc.B., and the shortening by one year of the period required to elapse before admission to a degree conferring membership of the Senate. It was pointed out that the question of research degrees was bound up with the question of the residence of students from other universities for a limited period, and that the needs of such students called for sympathetic and generous treatment by the University.

With regard to the Previous Examination, which had been the subject during the past year of no fewer than six reports, two of them dealing with the question of compulsory Greek, now under consideration by a reconstituted Previous Examination Syndicate, the Vice-Chancellor urged that it was time that the method of exemption from this examination should be simplified, and pointed out that this simplification was rendered the more easy as the various examining bodies had recently established examinations for certificates on common lines. Various educational bodies were asking for simplification, and one and all demanded the abolition of compulsory Greek. He hoped that one way in which the University would mark the conclusion of the war would be by asking of candidates for admission only whether they had had a sufficient education, and not as to whether they could qualify in particular subjects.

The Financial Board had reported that the estimated income of the Chest for 1917 was 20,400*l*., a decrease of 60 per cent. from the pre-war income, whilst the expenditure was estimated at 36,200*l*. The board in its report had indicated how the deficiency might be met. The financial position of the University was better than had been expected, but, even if the income of the University after the war reached the pre-war standard, it would be insufficient to meet the claims for future expenditure. Returns made by the Special Boards of Studies indicated that large increases in annual and capital expenditure must be expected if the University was to meet the claims that might be made upon it as a place of teaching and research. Contributions from the colleges to the Common University Fund to raise the statutable amount of 30,000*l*. had increased from $10\frac{3}{8}$ per cent. in 1915 to $12\frac{1}{4}$ in 1917; this gave some indication of the effects of the war on the incomes of the colleges.

The new Vice-Chancellor, Dr. Shipley, master of Christ's College, was prevented by indisposition from being present at the Senate House, and was admitted at the lodge of Christ's College.

OXFORD.—The Herbert Spencer lecture will be delivered in English by Prof. Emile Boutroux on Saturday, October 20. The subject will be "The Relation between Thought and Action from the German and from the Classical Point of View."

The Rev. H. E. D. Blakiston, president of Trinity, has been appointed Vice-Chancellor for the ensuing year.

ST. ANDREWS.—Prof. D'Arcy W. Thompson, professor of natural history, University College, Dundee, has been appointed to the chair of natural history at St. Andrews, in succession to Prof. W. C. McIntosh, who has just retired.

AT University College (University of London) a course of six lectures on "Coals, Peats, and Some Oil Shales: their Origin, Structure, and Significance, Palæobotanical and Otherwise," will be given by Dr. Marie Stopes on Tuesdays from October 16 to November 21, at 3 p.m. The lectures will deal with microscopic evidence in some detail, and will be specially adapted to students of botany and geology, but are open to the general public interested in coal.

PROF. F. J. CHESHIRE, director of the Department of Technical Optics in the Imperial College of Science and Technology, South Kensington, S.W., has been appointed honorary head of the Technical Optics Department of the Northampton Polytechnic, Clerkenwell, in accordance with the schemes of the Board of Education and of the London County Council for the provision of instruction in technical optics. These schemes may now, therefore, be regarded as definitely and fully launched, and it is not too much to hope that in view of the careful consideration given to their elaboration their effect upon the training of present and future generations of optical workers will be an important factor in replacing the optical trade of this country in the leading position which it occupied until about the last quarter of the nineteenth century.

MR. T. LL. HUMBERSTONE, secretary of the committee of the Education Reform Council concerned with university education, writes with reference to the comment of our reviewer on the report of the council (NATURE, September 27, p. 61) that the section of the report dealing with universities "speaks too much from the London point of view." He urges that as the report deals only with questions of general interest, there is no peculiarly London aspect. Our reviewer points out in reply that the Universities of Oxford and Cambridge, as well as the newer provincial universities, were not strongly represented on the committee referred to, and he suggests that the statesmanlike policy to have adopted would have been to secure well-chosen representatives from these universities so as to obtain from them an adequate expression of the desirable and practicable reforms at their respective universities. Reforms at the various universities will, he believes, prove to be most salutary and productive when they arise from within, and the surest plan, even if more difficult of attainment, is to create the appropriate impetus at the universities themselves, rather than to attempt to impose changes from outside.

IN an address on organisation of business and the development of the resources of the British Empire at the opening of the School of Pharmacy of the Pharmaceutical Society, Lt.-Col. Harrison, C.M.G., expressed his opinion that one of the most important problems that civilisation has to solve is how to secure the economy and efficiency of thorough organisation of the production and distribution of commodities of all kinds. In pharmacy this organisation has been taking place but slowly, and it is essential that it should be undertaken without delay by pharmacists themselves. A curriculum of study should be made compulsory, and the scientific standard raised so that pharmacists may take the place to which they are entitled. The number of women entering pharmacy has been steadily increasing, especially since the outbreak of war, and they have been filling the places of men who have been called to the colours. While women make excellent students, they are too prone to yield to authority and are indisposed to make independent experiments on their own initiative, without which progress in science is difficult. Teachers of women students should, therefore, do their best to instil into their students the spirit of investigation and research, and to develop their faculty of criticism.

LAST week Lord Sydenham, presiding at a meeting of the Women's Indian Study Association, raised again the urgent question of the education of women in India. The results as disclosed at the census of 1911 are sufficiently deplorable. Only thirteen females per mille attain the low standard of literacy prescribed for the enumeration. Sir E. Gait, reviewing these figures, found some comfort in the consideration that the proportion of literates at the age period fifteen–twenty is

now much greater than at the higher ages. "Until recently, very little encouragement was given to females to keep up their previously acquired knowledge after marriage, and many soon forgot what they had learned at school. But the main reason no doubt is that at the present time education is spreading very rapidly amongst them, and the number which is being taught in the schools is very much larger than even a decade ago." Female education is checked by the seclusion of women in the higher classes and by the early age of marriage. The results of this prevailing ignorance are shown in the high death-rate among young women, due to want of fresh air, inefficient midwifery, hard work at the critical period of life, and neglect of girl babies due to hypergamy. As Miss Boyd, the secretary of the Women's University Settlement, Bombay, pointed out, the Indian woman in childbirth has less chance of life than a soldier on the battlefield. Lord Sydenham remarked that nothing had touched the Indian soldiers in France and Belgium more than seeing how the women helped the men in those countries. More active sympathy between English ladies in India towards their native sisters, leading to the establishment of women's clubs, zenana visiting, employment of Indian women in the medical and nursing professions, etc., is greatly to be desired. At the present time the way is open, without any violent disturbance of existing social conditions, to ameliorate the condition of women and children in our Indian Empire.

SOCIETIES AND ACADEMIES.

PARIS.

Academy of Sciences, September 24.—M. Camille Jordan in the chair.—G. **Sizes**: Practical modifications of the "law of resonance of sonorous bodies" and correction to the note on Chinese gongs.—M. **Travers**: A new separation of tin and tungsten in wolframs containing tin. The mineral is fused with sodium sulphite, the aqueous solution slightly acidified, and the impure stannous sulphide, which is free from tungsten, filtered off. The tungsten is determined in a separate sample, opening up with sodium sulphite fusion as before.—M. **Baudouin**: A new disease of *Clupea spratta*, caused by a parasitic Copepod, *Lernoeenicus sardinae*.—P. **Wintrebert**: The gastrula of *Scyllium canicula*.—L. **Lapicque**: The separation of bran and the food yield of wheat. The calorific value, and hence the food value, of bread increase with the amount of bran extracted in the process of milling, so that white bread is more nutritious than wholemeal bread. It is pointed out, however, that, taking into account the percentage of white flour obtained for a given weight of wheat, a higher nutritive value is obtained with a wholemeal bread, since white flour rejects about 28 per cent. of the wheat. The 85 per cent. extraction now practised in France appears to be beneficial.—G. A. **Le Roy**: The use of glucosates of lime in bread-making. Glucosates of lime may be employed with advantage from the points of view of taste and keeping power in the place of lime-water, for improving bread made from flour containing a high proportion of bran, such as the 85 per cent. extraction in current use.

BOOKS RECEIVED.

Histology of Medicinal Plants. By Prof. W. Mansfield. Pp. xi+305. (New York: J. Wiley and Sons, Inc.; London: Chapman and Hall, Ltd.) 13*s.* 6*d.* net.

Manual for the Essence Industry. By E. Walter. Pp. iii+427. (New York: J. Wiley and Sons, Inc.; London: Chapman and Hall, Ltd.) 18*s.* 6*d.* net.

Practical Cheesemaking. By C. W. Walker-Tisdale and W. E. Woodnutt. Pp. 182. (London: Headley Bros., Ltd.) 4*s.* 6*d.* net.

Through Lapland with Skis and Reindeer, with some Account of Ancient Lapland and the Murman Coast. By F. H. Butler. Pp. xii+286+4 maps and illustrations. (London: T. Fisher Unwin, Ltd.) 12*s.* 6*d.* net.

Mémoires de la Société de Physique et d'Histoire Naturelle de Genève. Vol. xxxviii., fasc. 6. (Genève: Georg et Cie.) 25 francs.

The Road and the Inn. By J. J. Hissey. Pp. xviii+435+32 illustrations. (London: Macmillan and Co., Ltd.) 10*s.* net.

About Winchester College. By A. K. Cook. To which is prefixed De Collegio Wintoniensi. By R. Mathew. Pp. xvii+583. (London: Macmillan and Co., Ltd.) 18*s.* net.

DIARY OF SOCIETIES.

THURSDAY, OCTOBER 11

OPTICAL SOCIETY, at 8.—The Grading of Carborundum for Optical Purposes: J. W. French.

TUESDAY, OCTOBER 16.

INSTITUTION OF PETROLEUM TECHNOLOGISTS, at 8.—Testing and Standardisation of Motor Fuel: E. L. Lomax.

WEDNESDAY, OCTOBER 17.

ROYAL MICROSCOPICAL SOCIETY, at 8.—Report on the Recent Foraminifera Dredged off the East Coast of Australia by W. B. Thornhill, H.M.S. *Dart*, Station 19 (May 14, 1895): H. Sidebottom.—Mounting and Preserving Marine Biological Specimens: F. Martin Duncan.

ENTOMOLOGICAL SOCIETY, at 8.

FRIDAY, OCTOBER 19.

INSTITUTION OF MECHANICAL ENGINEERS, at 6.—A Comparison of the Working Costs of the Principal Prime Movers: O. Wans.

CONTENTS.

Editorial and Publishing Offices:
MACMILLAN AND CO., LTD.,
ST. MARTIN'S STREET, LONDON, W.C.2.

Advertisements and business letters to be addressed to the Publishers.

Editorial Communications to the Editor.

Telegraphic Address: PHUSIS, LONDON.
Telephone Number: GERRARD 8830.