THURSDAY, NOVEMBER 30, 1916.

AMERICAN BOOKS ON AGRICULTURE.

(1) *Field and Laboratory Studies of Soils.* An Elementary Manual for Students of Agriculture. By Prof. A. G. McCall. Pp. viii+77. (New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Ltd., 1915.) Price 2*s.* 6*d.* net.

(2) *The Principles of Plant Culture.* A Text-book for Beginners in Agriculture and Horticulture. By the late E. S. Goff. Revised by J. G. Moore and L. R. Jones. Eighth edition. Pp. xxiii+295. (New York: The Macmillan Company; London: Macmillan and Co., Ltd., 1916.) Price 5*s.* 6*d.* net.

(3) *The Principles of Agronomy.* A Text-book of Crop Production for High Schools and Short Courses in Agricultural Colleges. By Prof. F. S. Harris and G. Stewart. Pp. xvi+451. (New York: The Macmillan Company; London: Macmillan and Co., Ltd., 1915.) Price 6*s.* net.

(4) *The Marketing of Farm Products.* By Prof. L. D. H. Weld. Pp. xiv+483. (New York: The Macmillan Company; London: Macmillan and Co., Ltd., 1916.) Price 6*s.* 6*d.* net.

(1) THE first book on the list is a little laboratory manual for the study of soils by Prof. McCall, of the Ohio State University. The appliances needed are simple, and the exercises are all within the scope of any reasonably intelligent pupil. As usual in American books, physical properties attract considerable attention, and most of the exercises are concerned with the water relationships of soils. Only two at the end deal with lime, and none of them with the biochemical processes, such as nitrification, that play so important a part in soil fertility. But within the limits the author has set he has given an interesting course of experiments which the teacher might well use in the study of soils.

(2) This book first appeared in 1896, and has been so successful that it is now in its eighth edition; it may fairly claim, therefore, to be a standard text-book on the other side of the Atlantic; one of the revisers is professor of plant pathology and the other professor of horticulture in the University of Wisconsin. The book was originally intended for agricultural students who had had no preliminary training in botany, and it is written in a way which will appeal to them, all the illustrations being taken from agricultural or horticultural practice. Other authors, both in England and America, have shown that the method is feasible, and that the farm and garden can be made to furnish all the material and illustrations wanted for a very useful course of botany. The drawback is the great difficulty of keeping within some sort of limits, and there is a great temptation, which the authors have not been altogether able to resist, to wander into other fields. This has resulted in several rather surprising errors. On both p. 146 and p. 148 the authors refer to rain and snow as contributing useful amounts of nitrogenous substances to the soil. This view was formerly held by chemists, but has long been given up by them. Again, wood ashes are stated to be a commercial source of phosphates; surely the authors must mean potassium. There is some confusion between "potash" and "potassium" which ought to have been put right before now: "Potassium is used by plants in the form of potash, *i.e.* potassium combined with oxygen. Potash exists in the soil mainly in combination with chlorin (chlorid or muriate of potash), with sulfuric acid (sulfate of potash), or with nitric acid (nitrate of potash)." Now, apart from the fact that the statements are incorrect, most of the potassium being there as complex silicates, and little, if any, as chloride or sulphate, it is misleading to say that muriate of potash is a combination of chlorine and potash, and that potash is a combination of potassium and oxygen. Old terms like muriate of potash still survive in the fertiliser trade, and may perhaps be defended on the ground that they denote a certain trade product; but in explaining them to the student it only adds to the difficulty to use old chemical nomenclature. Much of this chapter might well have been omitted.

(3) Agronomy is a new word for the English language, introduced some years ago in America to stand for field husbandry, but already, according to the authors, it is beginning to be used rather loosely. It covers plant growth and soil management, a branch of knowledge which, as experience has shown, can be brought into a compact subject and dealt with by ordinary scientific methods. But, as has often been remarked, there is a great temptation to wander when a man is dealing with a field or garden subject, and it has become almost a convention that books on "agronomy" should include chapters on botany, geology, engineering, bacteriology, and sometimes other subjects as well. Obviously this leads to very unequal treatment, and we cannot help thinking that the time has come when the "agronomist" should think out his position a little more clearly, give a definite meaning to his name, agree to leave out chapters on other things, and confine himself to his own subject, which is already big enough. If we do this with the book before us we get an interesting account of crop production in the United States, obviously written by men who know what they are talking about. The illustrations in particular are to be commended, some of those dealing with field conditions being unusually good.

(4) The last book on the list deals with a very old subject, which, however, is only just beginning to get a literature of its own. The author acknowledges in the preface his indebtedness to the authorities of the University of Minnesota, who were sufficiently far-seeing to allot funds for a scientific investigation into the marketing of farm produce. The result is very satisfactory,

and the author has succeeded in bringing together a mass of useful information and presenting it in an interesting form to the reader. A valuable feature in so new a subject is that full references are given for all the data, and at the end there is a bibliography. E. J. R.

MATTER AND THE STRUCTURE OF THE ETHER.

The Universe and the Atom. By M. Erwin. Pp. 314. (London: Constable and Co., Ltd., 1915.) Price 8*s.* 6*d.* net.

THIS work is divided into two parts, the first being devoted to a general discussion of wave motion, and the second to a special theory as to the structure of the ether and its consequences. The theory called "the pan-cycle hypothesis" deals with "invisible composition light waves, the warp and woof of the ether structure and of all things material."

In spite of some inaccuracies, the first part contains quite an interesting account of the nature of wave motion, although the long and frequent quotations from other text-books make the style somewhat disjointed. In some places too much stress is laid on the obvious, which indeed at times is so over-elaborated as to lead to absurdities. It is worth quoting one such passage, for the deductions drawn are used later to explain the theory of the mechanical structure of the ether. "Thus if a force of 5 units is operating in one direction, and another force of 3 units is operating on the same particle in the opposite direction, we say they are equivalent to a force of $5-3=2$ units of force operating in the first direction. We mean by that the particle would move from its first position, in the direction impelled by the greater force, and behave as if it were acted on only by a force of 2 units. This is all that composition of force gives us, but it does not speak the full event. It makes 3 of the greater units of force annihilate the 3 units of force operating in the opposite direction. Now force represents energy, and energy is never destroyed" (p. 74).

The second part deals with a new theory of ether structure, the nature of electrons, atomic theories, gravitation, and other fundamental questions based on a conception of the ether organised by so-called "force rays" resulting from trains of waves proceeding in different directions through the ether and producing stationary waves. The ideas involved do not seem very helpful in throwing light on these fundamental questions, and in many cases there is a marked lack of adequate discussion of existing theories. Thus the modern attempts to explain the Balmer series is dismissed with the following short paragraph:—"This formula by Balmer was derived entirely by trial from the observed wave lengths of the first fifteen lines of the hydrogen series. It has so far been regarded as entirely an empirical formula which expresses a fact, without anyone being able to state why the relation expressed by the formula should exist" (p. 102). The recent work of Bohr and others in this field might at least have been mentioned. Even facts are sometimes misstated, as will be seen from the two following passages: "The amplitude of some rays, such as X-rays, goes down to the infinitesimal" (p. 84); and ". . . gravitation itself has its limitations, in respect of the distance through which it can effectively operate, and its power is also affected by the internal heat or temperature of the body" (p. 125). Many of the fundamental conceptions in the theory are at fault, and these insecure foundations cannot support the elaborate superstructure built upon them.

FLOTATION OF ORES.

(1) *Concentrating Ores by Flotation.* By T. J. Hoover. Pp. vi+320. Third edition. (London: *The Mining Magazine,* 1916.) Price 12*s.* 6*d.* net.

(2) *The Flotation Process.* Compiled and edited by T. A. Rickard. Pp. 364. (San Francisco: *Mining and Scientific Press,* 1916.) Price 8*s.* 6*d.* net.

THE subject treated in these two books is one of great and rapidly increasing importance. The practical application of flotation methods is only about thirteen years old, and already the quantity of ore treated by them must amount to little, if any, less than 30,000,000 tons. When it is borne in mind that a large proportion of this quantity consists of slimes and complex ores that had defied all known methods of treatment until flotation processes were introduced, the economic importance of the subject can be readily appreciated. Furthermore, as Mr. Hoover points out in his book, this method is still in some respects in its experimental stage, and its limits of applicability are being rapidly widened, so that there are very good grounds for the opinion expressed by him:—"It would seem at the present time a justifiable prophecy that flotation methods of concentration will in the not distant future very largely displace gravity methods."

(1) The mere fact that the third edition of Mr. Hoover's work has been called for within four years of the appearance of the first edition is sufficient testimony to the value attached to it by the mining profession. It has from the first been accepted, and still remains to-day the standard work on the concentration of minerals by flotation methods.

As regards this third edition now before us, this has simply been produced by reprinting the second edition just as it was, without even attempting to correct any mistakes, but merely with the addition of a new chapter, so as to bring it up to date. It is difficult to justify such a method, seeing that some of the mistakes that have been allowed to stand are really serious. Thus it comes as a severe shock to find that Mr. Hoover should not only have written, but have allowed to remain, such a wholly indefensible chemical equation as "KCy+Au=KAuCy"; or to find him stating that "the horizontal surface of a liquid at rest" may be considered "the limiting surface of a bubble of infinite radius,"

whereas it is really a portion of what is practically a sphere, with radius equal to its distance from the earth's centre, and hence quite definite.

Advantage should have been taken of a new edition to correct such mistakes, but, even as it is, Mr. Hoover's work still remains the authoritative text-book on this subject. Like all text-books dealing with a branch of technology in active development, it suffers from the fact that it falls behind the times even whilst it is passing through the press, but this is a disadvantage that the writer of such books must make up his mind to endure. His chief consolation is that it is the production of such books which contributes as much as anything else to the rapid advance of the art that leaves the written page behind.

(2) With true journalistic instinct Mr. Rickard has produced his book on "The Flotation Process" at a moment when this method is attracting a very large share of attention from the mining profession; the book cannot, however, be said to form a contribution of any real value to the literature of the subject, seeing that it is a typical example of a form of book-making that appears to be in some favour on the other side of the Atlantic, though fortunately not in this country. It consists of a series of miscellaneous articles on the subject of flotation by a number of different writers, gathered from various sources, though all have appeared already in the pages of the *Mining and Scientific Press*; these have been strung together on no particular system, forming just such a scrap-book as anyone interested in flotation might put together for himself—very useful, no doubt, to the man who had compiled it for his own purpose, far less so to anyone else, and practically useless to the student who demands a systematic presentment of the subject. The articles vary in length from a few lines to many pages, and are as unequal in value as they are in extent. The best article in the book is probably Mr. Rickard's own introductory chapter, which is itself a paper presented at a meeting of the Canadian Mining Institute.

Whilst Mr. Hoover's book can be recommended to the student who wishes to know what the various flotation processes are, how they are carried out, and what results are obtained by them, Mr. Rickard's compilation gives information on none of these points, but exhibits the different and often widely divergent opinions of a number of writers who approach the subject of flotation from very varied points of view, and most of which possess little more than an ephemeral interest. H. L.

OUR BOOKSHELF.

The Drink Problem of To-day in its Medico-Sociological Aspects. Edited by Dr. T. N. Kelynack. Pp. xii+318. (London: Methuen and Co., Ltd., 1916.) Price 7*s.* 6*d.* net.

THIS book comprises a number of essays by well-known authorities dealing with various aspects of the alcohol question. Dr. Harry Campbell discusses the biology of alcoholism, and asks, What is the nature of the peculiar attraction which alcohol exercises over mankind? He considers that the essential factor is the power to intoxicate and narcotise. Doubtless this is so for the drunkard, but as regards the moderate drinker we do not believe it: it is the flavour, and the flavour alone, and it is noteworthy that no non-alcoholic drink has yet been manufactured which reproduces to any extent the flavour of an alcoholic one. Prof. Woodhead deals with the pathology, and Dr. Claye Shaw with the psychology, of alcoholism, Mrs. Sharlieb with alcoholism in relation to women and children, Sir Thomas Oliver with alcohol and work, and the Rev. J. C. Pringle, of the Charity Organisation Society, with alcohol and poverty. In the last essay Dr. Kelynack, the editor, discusses the arrest of alcoholism, and considers that the most effective work in limiting the worst manifestations of intemperance has been accomplished by the action of the Central Control Board, and certainly the statistics of the decline of drunkenness in London since it has been at work bear this out.

The book is largely a partisan one, but, with this limitation, all the social problems connected with the consumption of alcohol seem to be covered by it. The vexed question of moderate drinking is not altogether burked, and Dr. Claye Shaw admits that in the present war the teetotalers do not appear to have come out of the ordeal better than those who have a preference for alcohol. "Moderate drinking" is an elastic term: we would lay down that the maximum daily consumption of alcoholic drink should not exceed an equivalent of two fluid ounces of absolute alcohol for a weight of ten stones, and that it should be taken in a dilution not stronger than 10 per cent. It is interesting to note that a weighty committee of the French Academy of Medicine has advocated a moderate ration of wine in the French Army on the ground that it replaces a certain amount of meat (protein) and actually diminishes the risk of alcoholism!

Results of Meteorological Observations in the Five Years 1911–1915, *also of Underground Temperatures in the Twelve Years* 1898–1910. *Made at the Radcliffe Observatory, Oxford.* Vol. li. Pp. xv+215. (Oxford: Humphrey Milford, 1916.) Price 15*s.* net.

THE first part of this volume contains daily meteorological data, for the five years 1911 to 1915, in regard to barometric pressure, temperature, wind, cloud, sunshine, rain, ozone, weather notes, and occasional phenomena, according to a plan adopted in previous years. The figures relating to wind are from two instruments of different dimensions, and a detailed comparison would be interesting, as the instruments are at very nearly the same height above ground, though not quite so nearly as the table makes them appear, since the higher one, given at 114 ft. in all the tables, is really at 116 ft. For this comparison, however, we must wait, as it cannot be made from the figures in the volume before us.

In the appendix, which forms the third section

of the volume, are two complete 35-year tables of sunshine and wind, and 26-year continuations (1890 to 1915) of eight other tables. It is rather unsatisfactory to find upon investigation that the monthly maximum and minimum temperatures thus tabulated do not, as might be reasonably expected, come from the eye-readings of the maximum and minimum thermometers, but from the thermograph registers. Discordances ranging up to rather more than five degrees suggest that the Radcliffe thermograph is no more free from error than others, and no shadow of excuse is made for thus regarding it as a standard instrument.

But the main interest of the volume is, like that of the sandwich, in the middle section, which is devoted to a complete series of twelve years' daily readings of a set of five platinum resistance thermometers sunk in the ground at depths ranging from 6 in. to 10 ft. Dr. Rambaut has successfully resisted the temptation to extend the series indefinitely, and twelve years is very likely quite long enough for this particular purpose. Full accounts are given of the difficulties encountered and the precautions adopted, and a comparison is made of the resulting permeation coefficient with those obtained at Edinburgh and Greenwich. W. W. B.

The Involuntary Nervous System. By Dr. W. H. Gaskell. Pp. ix+178. (London: Longmans, Green and Co., 1916.) Price 6*s.* net.

IT would be difficult to find anything in the literature of physiology quite comparable to this work of Gaskell's. The book is of great scientific value, and at the same time an unintended record of the distinctive qualities of a valuable section of English life and thought.

Nowhere in this volume is there the slightest chance of contact with either "superman" or "missionary," but everywhere a gentle man is busy quietly recounting the important business of a valuable lifetime, and setting his intellectual affairs in order so that they may be found clearly expressed and arranged for the advantage of knowledge. His sustained effort has been completely successful, and his son's valuable aid, which in places he takes quiet pains to put clearly on record, has enabled this posthumous publication of a small volume of outstanding value.

No student of physiology will neglect to possess a work in which the meaning of the outlying streamers of the central nervous system is defined every whit as clearly as it was undoubtedly understood by this master of the subject. Nor, probably, will many morphologists afford to be without this rare testament to the value of their science written by one whom time may well reveal to them as also "master."

The opening chapter has in an odd way—pity that this was not seen and corrected—absorbed for itself the title that should more properly have been given to the book as a whole, "History of the Involuntary Nervous System." The work is, in fact, such a history, viewed clearly most persistently elucidated, and deftly explained.

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.*]

A Further Probable Case of Sex-Limited Transmission in the Lepidoptera.

IN pursuit of my investigations of the past few years in hybridising Lepidoptera, two of the species chosen for experiments were *Oporabia dilutata* and *O. autumnata*. Both possible crosses between these two forms were made and fertile ova secured. These ova, as in the pure species, remained as such over the winter, and hatched in the spring of the following year. The larvæ fed up rapidly and well, with but little loss, and pupated in May and June.

Here, however, an abnormality stepped in; the females of the *autumnata* ♀ × *dilutata* ♂ cross emerged a few days after pupation. Dissection revealed that they lacked ovaries or possessed rudimentary ones. This, nevertheless, was not the most important feature. Instead of being distinctly intermediate between the original species, as were the males which emerged later, they were of the paternal type—*i.e.* they displayed the specific characters of *dilutata* ♀ only.

In October, accompanied by the males of the former hybrid, both sexes of the reciprocal cross *dilutata* ♀ × *autumnata* ♂ made their appearance; again the males were clearly intermediate, but the females displayed paternal characters only, being exactly of the *autumnata* type.

I had some suspicion that the matter was a case of sex-limited inheritance, but would not form any definite opinion as the result was seriously complicated by abnormal behaviour in the inheritance of the melanism which characterises all Middlesbrough races of *dilutata* and that race of *autumnata* used in the experiment. Preparations were therefore made for further trials; to nullify any possible interaction of the melanism a stock of pupæ from a local, non-melanic, birch-feeding microgene of *autumnata* was amassed. Local material of a similar form of *dilutata* not being available, ova of white *dilutata* from Enniskillen, Ireland, were obtained and reared.

Utilising these stocks, once more I made the crosses and secured precisely the same results. In both cases the hybrid females were manifestly of paternal type only.

To confirm and analyse these facts a further set of crosses, both of the hybrids (when possible) *inter se*, and back with the parents, has been made, the outcome of which will be detailed later.

Still, there can be but little doubt that these observations show that, in these two species, as in *Abraxas grossulariata*, the female passes on the typical characters of her species to her male offspring only.

J. W. H. HARRISON.

181 Abingdon Road, Middlesbrough, November 3.

Scarcity of Wasps.

THE distribution of wasps this summer would seem to have been rather local, for this village is less than two miles from Christon, where Mr. St. George Gray was plagued with wasps (see NATURE, November 16, p. 209), yet here they have been very scarce, small, and apparently starvelings, though a few full-sized queens have been caught recently. Christon lies on a sunny slope, and this village is at the foot of the north side of a hill, yet that could not account for all the difference, for we have had more wasps than enough in recent years. C. S. TAYLOR.

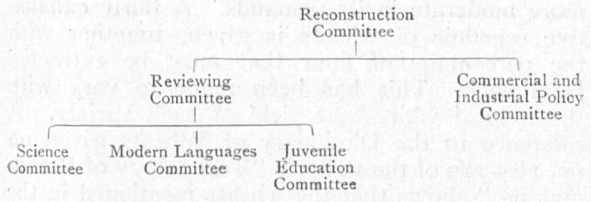
Banwell Vicarage, Somerset, November 17.

THE RECONSTRUCTION COMMITTEE AND ITS SUB-COMMITTEES.

THE Prime Minister, in March last, appointed a Committee of the Cabinet, of which he is Chairman, to consider and advise upon the problems that will arise on the conclusion of peace, and to co-ordinate the work which has already been done by various Departments of the Government in this direction. The constitution of this committee has not been announced, and possibly will not be, but four educational committees connected with it have been appointed, to deal respectively with (1) education as a whole; (2) teaching of science; (3) teaching of modern languages; (4) education of children and young persons after the war. In addition to these committees, there is a committee on commercial and industrial policy, and this also is a sub-committee of the Reconstruction Committee. No further particulars of sub-committees are available for publication.

Announcement was made in June last that any suggestions or other communications from individuals or organisations bearing upon these questions should be addressed to Mr. Vaughan Nash, C.V.O., C.B., Secretary of the Reconstruction Committee, 6A Dean's Yard, Westminster. It was stated that they would be considered and referred in suitable cases to the Department concerned, or to one of the sub-committees to which particular subjects or groups of subjects have been referred by the Reconstruction Committee.

Mr. Vaughan Nash has furnished us with copies of the terms of reference of the several committees mentioned above, and also lists of the members, except in the case of the sub-committee for the review of education, the composition of which, he informs us, is not yet available for publication. The relationship of the various committees to the Reconstruction Committee seems to be as represented in the following table:—



The terms of reference and membership of the committees are as follows:—

REVIEW OF EDUCATION SUB-COMMITTEE.—To consider the system of education as a whole; to review and formulate from that point of view proposals for developing it, particularly in directions indicated as desirable or necessary by experience gained during the war, and with special reference to:—

(*a*) Proposals prepared before the war for the development of the national system of education;

(*b*) The memoranda already submitted by the Education Departments for the consideration of the Reconstruction Committee;

(*c*) Any proposals submitted hereafter from the Departments, or from special committees, or from other responsible organisations;

and to recommend from time to time such action, whether by way of legislation or otherwise, as may be practicable.

COMMITTEE ON THE TEACHING OF SCIENCE.—To inquire into the position occupied by natural science in the educational systems of Great Britain, especially in secondary schools and universities; and to advise what measures are needed to promote its study, regard being had to the requirements of a liberal education, to the advancement of pure science, and to the interests of the trades, industries, and professions which particularly depend upon applied science.

In considering the provision of scholarships, bursaries, etc., the committee will take into account the report of the Consultative Committee of the Board of Education on this subject.

Members: Sir J. J. Thomson, O.M., F.R.S. (chairman), the Right Hon. F. D. Acland, M.P., Prof. H. B. Baker, F.R.S., Mr. Graham Balfour, Sir W. Beardmore, Bart., Sir G. H. Claughton, Bart., Mr. C. W. Crook, Miss E. R. Gwatkin, Mr. A. D. Hall, F.R.S., Sir H. Hibbert, M.P., Mr. D. H. Nagel, Mr. W. Neagle, Dr. F. G. Ogilvie, C.B., Dr. Michael Sadler, C.B., Prof. E. H. Starling, F.R.S., Mr. W. W. Vaughan, Mr. F. B. Stead, Inspector, Board of Education (secretary).

COMMITTEE ON THE TEACHING OF MODERN LANGUAGES.—To inquire into the position occupied by the study of modern languages in the educational systems of Great Britain, especially in secondary schools and universities, and to advise what measures are required to promote their study, regard being had to the requirements of a liberal education, including an appreciation of the history, literature, and civilisation of other countries, and to the interests of commerce and public service.

In considering the provision of scholarships, bursaries, etc., the committee will take into account the report of the Consultative Committee of the Board of Education on this subject.

Members: Mr. Stanley Leathes, C.B. (chairman), Mr. C. A. Montague Barlow, M.P., Mr. E. Bullough, Mr. A. C. Coffin, the Right Hon. Sir Maurice de Bunsen, G.C.M.G., G.C.V.O., Dr. H. A. L. Fisher, Miss Margaret Gilliland, Mr. H. C. Gooch, Mr. J. W. Headlam, Mr. Laurence D. Holt, Dr. Walter Leaf, Dr. George Macdonald, C.B., Mr. Albert Mansbridge, Mr. Nowell Smith, Miss M. J. Tuke, Sir James Yoxall, M.P., Mr. A. E. Twentyman, Board of Education (secretary).

BOARD OF EDUCATION COMMITTEE ON JUVENILE EDUCATION IN RELATION TO EMPLOYMENT AFTER THE WAR.—To consider what steps should be taken to make provision for the education and instruction of children and young persons after the war, regard being paid particularly to the interests of those—

(1) Who have been abnormally employed during the war;

(2) Who cannot immediately find advantageous employment;

(3) Who require special training for employment.

Members: The Right Hon. J. Herbert Lewis, M.P. (chairman), Mr. W. A. Appleton, Mr. R. A. Bray, L.C.C., Mr. F. W. Goldstone, M.P., Mr. Spurley Hey, Alderman Hinchliffe, Miss C. Martineau, Mr. J. F. P. Rawlinson, K.C., M.P., Lady Edmund Talbot, Mr. H. M. Thompson, Mr. Christopher H. Turnor, together with the following representatives of the Government Departments concerned:—Mr. A. B. Bruce, of the Board of Agriculture; Mr. E. K. Chambers, C.B., of the Board of Education; Mr. F. Lavington, of the Board of Trade; Mr. F. Pullinger, C.B., of the Board of Education: Mr. C. E. B. Russell, of the Home Office; Mr. J. Owen, Board of Education

(secretary); Mr. G. McFarlane, Board of Education (assistant secretary).

COMMERCIAL AND INDUSTRIAL POLICY COMMITTEE.—To consider the commercial and industrial policy to be adopted after the war, with special reference to the conclusions reached at the Economic Conference of the Allies, and to the following questions:—

(*a*) What industries are essential to the future safety of the nation, and what steps should be taken to maintain or establish them.

(*b*) What steps should be taken to recover home and foreign trade lost during the war, and to secure new markets.

(*c*) To what extent, and by what means, the resources of the Empire should and can be developed.

(*d*) To what extent, and by what means, the sources of supply within the Empire can be prevented from falling under foreign control.

Members: The Lord Balfour of Burleigh, K.T., G.C.M.G. (chairman), Mr. Arthur Balfour, Mr. H. Gosling, Mr. Richard Hazleton, M.P., Mr. W. A. S. Hewins, M.P., Mr. A. H. Illingworth, M.P., Sir William McCormick, Mr. A. McDowell, Sir J. P. Maclay, Bart., the Rt. Hon. Sir A. Mond, Bart., M.P., Mr. John O'Neill, Mr. Arthur Pease, Mr. R. E. Prothero, M.V.O., M.P., Sir Frederick H. Smith, Bart., Mr. G. J. Wardle, M.P., together with the following gentlemen, who are presiding over Board of Trade committees on the position of important industries after the war:—Sir H. Birchenough, K.C.M.G., Sir A. A. Booth, Bart., the Lord Faringdon, Sir Clarendon Golding Hyde, Sir Gerard A. Muntz, Bart., the Hon. Sir C. A. Parsons, K.C.B., F.R.S., the Lord Rhondda, Mr. G. Scoby-Smith; secretaries, Mr. Percy Ashley, Board of Trade, and Mr. G. C. Upcott, Treasury.

BOARD OF TRADE COMMITTEES.

In NATURE of January 6 (vol. xcvi., p. 525) particulars were given of a number of Government and other committees appointed to consider national scientific problems. In addition to these committees and the sub-committees of the Reconstruction Committee, the following have been appointed in connection with the Board of Trade "to consider the position of" the various trades in question "after the war, with special reference to international competition, and to report what measures, if any, are necessary or desirable to safeguard that position."

ELECTRICAL COMMITTEE.—The Hon. Sir Charles A. Parsons, K.C.B., F.R.S., Mr. J. Annan Bryce, M.P., Mr. T. O. Callender, Mr. J. Devonshire, Sir John Snell, Mr. P. Ashley, Prof. S. J. Chapman, Mr. B. M. Drake.

TEXTILES INDUSTRIES COMMITTEE.—Sir Henry Birchenough, K.C.M.G., Sir Frank Forbes Adam, C.I.E., Mr. J. Beattie, Mr. T. Craig-Brown, Mr. E. B. Fielden, Mr. J. W. Hill, Mr. A. H. Illingworth, M.P., Mr. J. H. Kaye, Mr. E. H. Langdon, Mr. J. W. McConnel, Mr. H. Norman Rae, Sir Fredk. H. Smith, Bart., Mr. T. C. Taylor, M.P., the Rt. Hon. Robert Thompson, M.P., Mr. C. T. Smith, Mr. Frank Warner, Mr. T. M. Ainscough (secretary).

SHIPPING AND SHIPBUILDING INDUSTRIES COMMITTEE.—Sir Alfred A. Booth, Bart., Sir Archibald Denny, Bart., Prof. W. S. Abell, Sir Edward Hain, Capt. H. B. Hooper, Mr. Summers Hunter, Sir Joseph Maclay, Bart., Mr. J. Readhead, Mr. O. Sanderson, Mr. J. Brown.

NON-FERROUS METALS COMMITTEE.—Sir Gerard Albert Muntz, Bart. (chairman), Mr. C. L. Budd, Mr. C. Cookson, Mr. C. W. Fielding, Lieut.-Col. A. J. Foster, Mr. A. W. Tait, Mr. A. H. Wiggin, J.P.

COAL TRADE COMMITTEE.—Messrs. Cory Brothers and Co., Ltd., Messrs. Mann, George, and Co., Messrs. Hull, Blyth, and Co., Messrs. William Mathwin and Son, Messrs. Mackenzie and Phylson, Ltd., Messrs. Pyman, Bell, and Co., Mr. T. E. Watson, Sir Richard Mackie, Mr. A. E. Bowen, Mr. N. Dunn, Mr. F. J. Jones, Mr. A. Nimmo, Mr. A. F. Pease, Sir Daniel M. Stevenson, Bart., Mr. R. Warham, the Rt. Hon. Lord Rhondda.

ENGINEERING COMMITTEE.—Sir Clarendon Hyde (chairman), Mr. Arthur Balfour, Mr. A. J. Hobson, Mr. W. B. Lang, Sir Hallewell Rogers, Mr. H. B. Rowell, Mr. Douglas Vickers.

IRON AND STEEL INDUSTRIES COMMITTEE.—Mr. G. Scoby Smith (chairman), Sir Hugh Bell, Bart., Mr. A. Colville, Mr. J. E. Davison, Mr. J. Gavin, Mr. J. Hodge, Mr. J. King, Mr. G. Mure Ritchie, Mr. H. Summers, Mr. B. Talbot, Mr. C. R. Woods (secretary).

GOVERNMENT CONTROL OVER FLOUR.

IN view of the shortage of wheat, steps have been taken by the Government to ensure a larger yield of flour from the same quantity of grain. The actual proportion of wheat endosperm that can be extracted as commercial flour varies with the nature of the wheat, but may be taken as approximately 70 per cent. The remainder consists of what are known in the milling trade as "offals"; these are subdivided according to the fineness of the particles into bran, pollard, and sharps or middlings. For some time millers have been more than usually careful in thoroughly separating the flour from offal, and have succeeded in lengthening their flour yield from 70 to about 71½ per cent. It was intimated in Parliament in the first place that directions were likely to be given for an increase of yield of 8½ per cent. From this it was foreshadowed that 80 per cent. war-flour would be the rule in the immediate future.

On promulgation, the Board of Trade Order as to the milling of flour was found to be much more moderate in its demands. A fairly exhaustive schedule of wheats is given, together with the percentage of flour that must be extracted from each. This has been made to vary with the natural white-flour yield of each variety. A reference to the Dictionary of Wheats given on pp. 284–289 of the writer's "Technology of Breadmaking" shows that the wheats mentioned in the schedule have collectively an average white-flour yield of 70 per cent., whereas the average now required by the Government to be extracted is 75·3 per cent. This means an average extra yield of 5·3 per cent., with a maximum of 8 per cent. in the case of "Red Western" and a minimum of 4 per cent. with "No. 3 Manitoba." The Dictionary averages quoted are those of the respective wheats for a number of years, while no doubt the figures in the Government Order are based on actual current crops. It is further enacted that after January 1, 1917, no bread or other article of food shall be manufactured from any wheaten flour of a lower amount of yield than that quoted in the schedule.

The first problem which arises is the saving in

wheat which is thereby effected. Taking the increased yield of flour at 5·3 per cent., the new regulation will result in only 93 parts of wheat being required instead of 100 in order to yield the same amount of flour and bread as hitherto produced. This is a saving in wheat requirements of 7 per cent. Against this must be placed the loss of offals production. This will be diminished in two ways: first, by the actual milling of less wheat for the same amount of flour, and, secondly, by a less percentage of offals from the quantity of wheat milled. The result will be a diminution of the output of offals by 23 per cent. Their feeding value will also be reduced by the abstraction of the most nutritive portion and its transference to the flour-sack.

It will be observed that the new regulations cover two distinct points: the first is that of length of flour yield; the second is that all the flour is to be straight-run—that is, there is to be only one even quality. It would be quite possible to prescribe the proportion of flour to be extracted and still to permit the miller to subdivide such flour into two or more qualities. If this were done, the whole of the offal would be concentrated in the lower grade. There would thus be a white flour of the present "patents" or "supers" type, and a very dark flour. Possibly there is a fear that the darker flour would be so accentuated in character as to be objectionable. There would, however, be one benefit: as a result of the higher price that could be obtained for the better quality, the lower grade could be sold very much more cheaply, and so the extremely poor would reap an advantage.

This leads us, naturally, to the question of quality of the new straight-run flour. The writer has already had the opportunity of examining and testing samples submitted by various millers. Such flours are not quite so good commercially as the 70 per cent. straight-run flour, but are better than present ordinary household grades. Compared with the latter, the new flour contains the small proportion of included offal, but this is more than balanced by the retention of the whole of the patent flour. Properly milled from sound wheats, this flour should be found suitable for the manufacture of all forms of bread and cakes, and also for general home-cooking requirements.

The question is being asked: But if 70 per cent. can be increased to 75 per cent., why not an 80 per cent., or even an 85 per cent. flour? In reply it may be well to put on record the reasons why both the makers and users of flour have gravitated to adoption of the whiter sorts. The miller finds that the freer a flour is from offal, the better it keeps. This especially holds with regard to germ, which very quickly causes deterioration in the flour. Then both the germ and the offal are powerfully diastatic in character, and flours in which they are present tend to make a much more sodden and clammy loaf than does a white flour. But a yet more serious objection is the greater bacteriological impurity of the darker flour. Acidity develops during fermentation to a much greater extent in dark than in white flours; in consequence the darker flour is much more liable to produce sour bread. Again, such organisms as *B. coli communis* are frequently present on wheat, with the result in milling that they are absent from the highest-grade flour, present in small quantity in that of medium grade, and abundant in wholemeal.

The general consensus of scientific opinion goes to show that the bread from white flour is superior in nutritive value to that from the darker kinds. This is vouched for by physicians such as the late Sir Lauder Brunton, and such physiological investigators as Rubner of Munich, Snyder of Minnesota, and Hutchison of the London Hospital. The general demand of the public is for white bread, and Hutchison sums up most pertinently the great importance which must be attached to its decision on problems of nutrition:—"In the last resort, therefore, we are driven for guidance to the results yielded by actual analysis of the diets selected by healthy persons. The value of such results must not be underestimated. Men have found out by long experience what is the best diet, better, perhaps, than science can tell them."

For these reasons any further step in the direction of an additional increase in the flour to be extracted from wheat, and consequently darker bread, should not be taken unless from absolute necessity. The resultant flour would be less nutritious, darker in colour, and more difficult to bake into a sound and satisfactory loaf. It would be less attractive and appetising; and in proportion as bread forms the principal article of diet the change would be the more keenly felt. The poorest classes would therefore be the most adversely affected of the whole of the community.

WILLIAM JAGO.

SCIENCE AND THE CIVIL SERVICE.

THE Lords Commissioners of his Majesty's Treasury have appointed a Committee to consider and report upon the existing scheme of examination for Class I. of the Home Civil Service. The terms of reference are:—

To submit for the consideration of the Lords Commissioners of his Majesty's Treasury a revised scheme such as they may judge to be best adapted for the selection of the type of officer required for that class of the Civil Service, and at the same time most advantageous to the higher education of this country; and, in framing such a scheme, to take into account, so far as possible, the various other purposes which the scheme in question has hitherto served, and to consult the India Office, the Foreign Office, and the Colonial Office as to their requirements, in so far as they differ from those of the Home Civil Service.

The members of the Committee are as follows:—

Mr. Stanley Leathes, C.B., First Civil Service Commissioner (chairman).

Sir Alfred Ewing, K.C.B., F.R.S., Vice-Chancellor of the University of Edinburgh.

Sir Henry A. Miers, F.R.S., Vice-Chancellor of the University of Manchester.

Mr. H. A. L. Fisher, Vice-Chancellor of the University of Sheffield.

Prof. W. G. Adams, Gladstone Professor of Political Theory and Institutions in the University of Oxford.

The secretary to the Committee is Mr. D. B. Mair, Civil Service Commission, Burlington Gardens, W.

The Royal Commission on the Civil Service recommended in 1914 the appointment of a committee of this kind to ascertain whether there is any substantial foundation for the view that the scheme of examination for Class I. clerkships unduly favours the curricula of the older universities and handicaps those of the newer. It was suggested that, should it be found that any change is desirable, the Committee, while maintaining the high standard necessary for the examination, should revise and rearrange the syllabus, weighing the educational value of classical learning against those of modern and scientific studies. It will be remembered that the need for change in the present system of allocating marks, by which a premium is placed upon knowledge of the Greek and Latin languages and literature, was one of the main subjects brought forward at the meeting on "The Neglect of Science" held in May last (see NATURE, May 11, p. 230).

In connection with this matter, particular interest attaches to the appeal recently addressed by the Institution of German Engineers to the Chancellor, Herr von Bethmann-Hollweg, a translation of which was published in the *Times Educational Supplement* of November 23. The appeal, which urged that steps should be taken to extend the avenues of admission to the higher posts in the German Civil Service, with especial regard to graduates completing their courses of study at the technical high schools, will be read with deep interest and not without surprise. Having regard to the important part which science in its various applications has played in the manufacturing and economic development of Germany, it might have been expected that its claims to due recognition as an essential factor in the equipment of men destined for high administrative posts in the Civil Service would long ago have been fully admitted. The many and new problems evolved by the war have demanded the services of the best intellects in various departments of life, and, in the opinion of the Institution of German Engineers, made manifest that much more than a merely legal or classical training is essential to the effective staffing of the service. It is admitted by the German Government that "the training of the higher Civil Service does not correspond with the requirements of the day," but such is the force of tradition that, despite years of debate and agitation, the reform is yet to seek alike in Germany and with us.

It is obviously not a matter of importance to us in this country whether or not the German Civil Service is thrown open to duly qualified scientific men, but it is interesting to note that a nation, whose advent to the front rank of industry and commerce is due almost entirely to its devotion to science in its various economic aspects and to the encouragement given to research and to the establishment of schools of high rank for this purpose, should shut out from its highest administrative posts the very men best calculated by their training to enhance the position it has gained. It is not only in industry and commerce, but in every department of civil life, that science is playing an increasingly important part in the well-being of the community, and therefore demands the trained scientific mind in the administrator and the knowledge and sympathy essential to the successful treatment required for the right solution of the complex problems of our time, both domestic and imperial. If it be true that Germany suffers so much from this want of recognition of her ablest intellects devoted to science and its applications, how much more must it be true of us with far greater responsibilities and where our higher Civil Service has for generations been recruited almost exclusively from a few public schools through the classical and mathematical sides of the ancient universities with which they are associated.

POSSIBLE POTASSIC FERTILISERS.

IN view of the present serious shortage of potassic fertilisers, great efforts are being made to find new sources of supply. A possible source has been indicated by Sir Thomas Mackenzie in a recent issue of the *Times*. It appears that South Island, New Zealand, possesses extensive deposits of a mica schist containing on an average 3 per cent. of potash; the material is soft—indeed, it is said to be the easiest mineral to mine in the whole world. Over great areas it lies on the surface and simply has to be picked up, while when it requires to be blasted it shatters so easily that a single charge will blow out tons at once. When brought to the mill it grinds down very easily; indeed, much of it is already broken up and already lies in a state of powder. Mr. Aston, the chemist to the New Zealand Department of Agriculture, writes enthusiastically about the deposit, stating that at Otago alone there are literally millions of tons of pure potash to the square mile; while Mr. A. D. Bell, another New Zealand chemist, goes so far as to say that these new deposits may reduce the famous Stassfurt mines, on which the world entirely depends at present, to the relative importance of a "bottle of potash on a druggist's shelf." This view, however, is controverted by Prof. Wyndham Dunstan, who states that there is not in view any deposit of potash in any country of the Empire comparable in nature, extent, or value with those of Stassfurt.

Agriculturists will want to know what is the fertilising value of the new deposit, as they have learned by experience that chemical analysis sometimes overrates minerals as fertilisers. The ordinary potassic fertilisers are the sulphate, which is very soluble and available, and contains

48·5 per cent. of K_2O, and kainit, a mixture of the chlorides and sulphites of potassium, magnesium, and sodium, containing on an average 12 per cent. of K_2O. Against these, a mica schist with only 3 per cent. of K_2O does not look very promising at first sight, and nothing but well-conducted vegetation experiments will show exactly what value the mineral does possess. Of course, if the technical chemist can find some easy way of making the sulphate or chloride, the whole aspect of the problem changes. Dr. Voelcker has experimented at Woburn since 1911 with various potassic minerals, felspars, phonolite, granite, etc., to see if any of them possessed fertilising value, but so far the experiments have been without success. There is no experimental foundation for the suggestion sometimes made that these minerals might prove useful on poor soils by the slow liberation of potash. As a matter of fact, potash is most needed by plants on light, dry soils, and in these the decomposition of a complex silicate could scarcely be expected to proceed rapidly.

NOTES.

THE death of the Rt. Hon. Charles Booth, F.R.S., in his seventy-seventh year, is a loss to the community of a munificent and judicious philanthropist, a pioneer in statistical and sociological work, a writer and speaker of force and attraction, and a sympathetic and practical economist. He published in 1889 the first volume of his series of studies of "Life and Labour of the People," a work which (as the *Times* truly says) "for nearly a generation profoundly affected public opinion on social questions." His method was to employ trained investigators, who should ascertain the precise facts about the means of living and the general conditions of labour in each part of the district under consideration, and to group the results into classes, graduated according to the resources possessed and the manner in which those resources were applied. The task occupied him seventeen years, and called for an elaborate organisation and a large expenditure of time and money. His services to statistical science were recognised by the award by the Royal Statistical Society of its gold medal in 1892, by his election to the presidency of that society from 1892 to 1894, and by the fellowship of the Royal Society. His services to the public were recognised by the coveted honour of a summons to the Privy Council, and by honorary degrees from the universities of Oxford, Cambridge, and Liverpool. He was an original member of the Sociological Society, and presided at two meetings when Prof. Geddes developed his views on civics. He advocated a scheme of universal non-contributory pensions, and when he was asked to help Sir Edward Hamilton's Committee on that subject he readily consented, and attended a meeting of that committee, giving advice which was found of great practical value.

SIR HIRAM S. MAXIM, one of our greatest inventors, died on November 24, at his home at Streatham, after a short illness. Born in 1840, in the State of Maine, he had a childhood and youth of hard work, like the majority of young Americans of that time. In his autobiography he recounts with pride how he picked up many trades and became skilful in the use of tools. Everything gave him occasion for thought and invention, and it was of his early inventions that he was proudest. Before the age of forty he invented mouse-traps, gas machines, fire sprinklers, a steam-trap, locomotive headlights, electric lights, dynamo machines, and many other things. It is by the first automatic gun—the Maxim—a gun with a single barrel which discharged more than 600 ordinary rifle shots per minute, exhibited thirty-two years ago, that he is best known to the general public. For the next twenty years his time was mainly taken up in developing automatic guns of much greater size, and these are now used by all the nations. He had a good working knowledge of physics and chemistry. He made discoveries about explosives, and seems to have been the first inventor of a smokeless gunpowder. He seems also to have been the first to see clearly the principle on which aeroplanes are worked, and he spent a great deal of money in finding out the horizontal speed required to give to inclined planes a definite amount of lifting power. His difficulty lay in the great weight of the necessary steam-engine and boiler. The later invention of the petrol engine easily made the aeroplane a real flight machine. He made his permanent home in England in 1882, and became a British subject. He was knighted in 1901. A review of his autobiography will be found in NATURE of April 22, 1915. Scientific men, engineers, and inventors used all to start as amateurs; Maxim was nearly the last of these men of great originality. It will be interesting for our successors to notice whether the more orthodox training now in vogue tends better to develop originality or to destroy it.

THE second annual report of the Medical Research Committee, National Health Insurance, has just been issued, and deals with the year ending September 30, 1916. In the introduction it is stated that the schemes for medical research in special directions, framed originally with a view to peace conditions, have for the greater part been suspended, and almost the whole of the available funds and scientific resources have been applied to the solution of medical questions of immediate national urgency in war-time. The summary of research work carried out is divided into three sections—that of the Central Research Institute, Mount Vernon Building, Hampstead, and affiliated laboratories, pre-war schemes for research, and work in connection with the war. In the department of biochemistry much work has been done on the treatment of amœbic dysentery with emetine, and as an outcome a double iodide of emetine and bismuth has been introduced by Dr. Dale, and appears to be a valuable drug in the treatment of carriers. Investigations are also in progress by Dr. Barger and Dr. Ewins on organic arsenic compounds with a view to improvement of such remedies as atoxyl and salvarsan. Dr. Leonard Hill and his staff have carried out investigations on the hygiene of munition factories, on dangerous dusts and vapours, and on poison gases. Several pre-war researches on tuberculosis have been continued, and rickets, diabetes, diseases of the heart, anaphylaxis, and the sterilisation and contamination of milk are being investigated at several centres. As regards work in connection with the war, the Army medical statistics are being compiled by the committee at their statistical department under the direction of Dr. Brownlee. The treatment of infected wounds and the study of antiseptics are being carried out by the staff of the bacteriological department under the direction of Sir Almroth Wright. Dr. Dakin devised his antiseptic solution of sodium hypochlorite, and as a result of his work on this substance and in collaboration with Prof. Cohen introduced chloroamine T (toluene sodium sulphochloroamide), a new and potent antiseptic. Typhoid, paratyphoid, and dysentery infections. trench nephritis, cerebro-spinal fever, and disorders of the soldier's heart are a few of

the other subjects dealt with. The report gives an excellent summary of the researches, and is all the more useful as full references are given to the original papers in which they appear. Lord Moulton, Sir Clifford Allbutt, and Prof. Hay retire from the committee, and their places are taken by Viscount Goschen, Dr. Chalmers, and Prof. Murray, and Major Waldorf Astor, M.P., becomes chairman.

THE death is announced from Paris of the Vicomte M. de Vogüé, a member of the French Academy, and a well-known writer and diplomat. Born in 1848, the late Vicomte served in the war of 1870, and afterwards entered the diplomatic service, and held appointments successively at Constantinople, Cairo, and Petrograd. In 1873 his "Voyage en Syrie et en Palestine," published in the *Revue des Deux Mondes*, attracted much attention. He also edited a posthumous work of the Duc de Luynes entitled "Voyage d'exploration à la Mer morte, à Petra, et sur la rive gauche du Jourdain." The Vicomte de Vogüé was the author of several historical and other volumes, and did much to awaken French interest in the intellectual life of Russia. Since the outbreak of war he had been president of the Société de Secours aux Blessés.

THE French Academy of Sciences has just lost a member by the death of M. Léauté. Born in 1847, M. Léauté left the Polytechnic School as a Government industrial engineer (*ingénieur des manufactures de l'Etat*), and eventually became Director of Telephones. After writing some early papers on pure mathematics, he devoted himself to theoretical mechanics, and wrote important papers on linkages, transmission of power by cables, and regulators of hydraulic and other machines. By means of a differential equation and an associated graph, he successfully attacked the problem of the dangerous long-period oscillations of hydraulic machinery. In announcing his death to the Academy, the president directed attention to the fact that "his work is the best reply to those who fancy that theory and practice are irreconcilable, and that 'savants' cannot render any useful service for the advance of industry, even if it is granted that they do not actually retard it."

A SMALL committee has been formed in Glasgow for the procuring of a suitable local memorial of the late Sir William Ramsay. It is proposed that the memorial shall be placed in the University buildings, perhaps in the Department of Chemistry. Ramsay was born in Glasgow, and received his education at the Academy and the University. For eight years he held, in succession, the posts of assistant in the Young Laboratory of Technical Chemistry, and tutorial assistant to the Regius professor of chemistry, the late Dr. John Ferguson. He left Glasgow in 1880 to become professor in University College, Bristol, but he always maintained close relations with the city and with the University, from which he received the honorary degree of Doctor of Laws. Lady Ramsay is a member of a well-known Glasgow family. The proposal of the Memorial Committee has received a large measure of support, and it has been thought expedient to limit the subscription to two guineas. Mr. H. B. Fyfe, B.L., of 115 St. Vincent Street, Glasgow, is acting as treasurer of the fund.

APPLICATIONS for the Government grant for scientific investigations for 1917 must be made on printed forms obtainable from the clerk to the Government Grant Committee, Royal Society, Burlington House, W., and returned to reach the offices of the society by, at latest, January 1.

TO commemorate the fiftieth birthday of Dr. Sam. Eyde, the Norwegian inventor, the sum of 100,000 kroner has been set aside by the Norwegian Hydro-Electric Nitrogen Company for the formation of a Sam. Eyde Fund to be devoted to the advancement of chemical and physical research. The fund is to be administered by the Board of the Nansen Fund.

THE death, on November 20, is announced, from wounds received on October 1, of Lieut. Corin H. B. Cooper, R.E. Mr. Cooper, after graduating in science at McGill College and University, Montreal, specialised in geology, and acted for a time as demonstrator under Profs. Adams and Bancroft at McGill University. At the outbreak of the war he was engaged on Government survey work in the oilfields of the Rocky Mountains.

WE regret to see the announcement of the death on November 23 of Mr. Charles Umney, the pharmaceutical chemist, in his seventy-fourth year. He was chairman of the Chemical Section of the London Chamber of Commerce, and we learn from the *Chemist and Druggist* that a measure of his ability and power was then afforded when he took Revenue representatives into his firm's laboratories in order to watch the experiments that he devised and carried out for the purpose of ascertaining the loss of spirit in making liquid galenicals. Upon these experiments was based the rebate on exportation of spirituous medicinal preparations under drawback. As a pharmacist pure and simple his history may be found in the records of the Pharmaceutical Society and the British Pharmaceutical Conference. For many years he was one of the society's examiners. He worked for the conference as a paper contributor, a debater, member of the committee, and in 1884 he became the treasurer, holding that office until, in 1888, he was appointed president of the body, holding the office at Newcastle-upon-Tyne in 1889 and at Leeds in 1890.

THE death of Mr. R. F. Mann, at the age of thirty-five, occurred on November 17. Mr. Mann had been an X-ray operator at the Middlesex Hospital during the last seventeen years. He was the inventor of one of the earliest forms of localisers for use in the removal of foreign bodies from the limbs. In the years when the effects of X-rays upon malignant disease were being investigated, the risks to which the operators were subject were not known, and it was during this period that he contracted X-ray dermatitis, which had a malignant termination. He underwent numerous operations during the last eight years, but bravely and loyally held to his work. Since the outbreak of war he had, in fact, added to his work by undertaking the radiographic work at the Branch Military Hospital at Clacton (Middlesex Hospital), and later in connection with the Duchess of Bedford's Military Hospital at Woburn.

THE death, by accident, at Hadley Wood railway station, is announced of Capt. W. H. Jaques, of the United States Navy, known for his scientific work in connection with ordnance engineering and the production of early submarines. Capt. Jaques was born in Pennsylvania on December 24, 1848, and graduated at the U.S. Naval Academy in 1867. He was an assistant on the U.S. Coast Survey in 1870–74; with the New York Board of Education, 1874–78; secretary of the U.S. Gun Foundry Board, 1883–85; and secretary of the Senate Commission on Ordnance and Warships, 1886–87, when he became superintendent of the gun factory at the Bethlehem works of the Carnegie Steel Co. Capt. Jaques was a member of the Institution of Civil Engineers, the Institution of Mechanical Engineers, and the Iron and Steel Institute, and an associate member of the Institution of Naval Architects. His scientific work was concerned chiefly with the manufacture of heavy ordnance,

armour, torpedoes, and solar evaporators, and he invented the double-forging process of armour and other improvements in its manufacture.

THE President of the Board of Agriculture desires to direct public attention to the urgent need that exists for the assistance of women, not already connected with agricultural industry, in the work that is required for food production on the land, and to replace agricultural labourers who have been called up for military service. Hundreds of women have already rendered valuable service in maintaining the home-grown food supply, but thousands are now needed to meet the national emergency. Educated women are especially invited to offer their services, and short courses of training can be provided for them. Application should be made to the secretaries of the Women's War Agricultural Committees in the various counties, or to the Women's National Land Service Corps, 50 Upper Baker Street, London, N.W.

THE collections of the State Natural History Museum of Sweden have for some time past been in process of transference from their old quarters in Drottninggatan, Stockholm, to the fine new building in the suburb of Frescati, where they have been rearranged in accordance with modern ideas, special attention being paid to the education of the public. At intervals during the present year the palæontological, zoological, and mineralogical collections have been made accessible. The botanical galleries have just been completed. On November 13, in the presence of the Crown Prince and other royalties and many notabilities, the whole of the public galleries were declared open by the King of Sweden, who conferred distinctions upon the director of the museum, Prof. Einar Lönnberg, the vice-director, Prof. Hjalmar Sjögren, and the architect of the museum, Mr. A. J. Anderberg.

THE first meeting of the current session of the Royal Society of Arts was held on November 15, when Dr. Dugald Clerk, the chairman of the council, delivered his inaugural address on some conditions of the stability of the British Empire. Dr. Clerk illustrated the economic strength of the United Kingdom by the growth of her trade, her capital, and her income; he indicated the relative weakness of Germany by comparative statistics of a similar character. While honouring Mr Hughes, the Premier of Australia, for his courage and his enthusiasm, he urged a broader and bolder policy. "No, the Colonies are wrong in the idea of a self-contained Commonwealth, and Britain is right in her idea of expansion in trade over every part of the world." Then turning to the fountain-head of the prosperity he anticipates, he urged with strength and conviction the necessity of two things, generous payment of labour, and generous work by labour. Both his optimism and his courage were inspiring, and it would, perhaps, have been an artistic error to have pared the imperfections from a fact or modified the meaning of a figure. But in our moments of cooler thought it is well to remember that figures showing the growth of a country's wealth must be read together with the curve of money values, that the national incomes of any two countries are dangerous insimilitudes, and that, whatever our income in war-time may be in terms of money, it is, in fact, what Mr. Flux has well called "an inflated expression in money of a reduced income in goods."

DR. ELSIE CLEWS PARSONS describes, in the November issue of *Man*, a method for the detection of crime among the Zunis. Anyone could use this method with the curious condition that he had never been bitten, a disqualification which appears in other Zuni rites. The detective, who is by profession a seer, takes a dose of a narcotic, and during the trance which follows a picture of the situation or incidents by which a missing article has been mislaid or stolen will unfold itself to him. So fully is this believed that a thief will smoke during the act of stealing so that the smoke may surround his head and prevent identification. The narcotic used is known as the Jamestown weed (*Datura meteloides*). An overdose is exceedingly dangerous, and the seer who takes it for the purpose of detection suffers for some time; his head and eyes are heavy, his nerves on edge, and though the fee charged for his services is considerable, one practitioner has retired from business, and recently declined to act in the case of a lost horse.

WHILE it has long been known that the woodcock carries its young, not merely under the spur of sudden emergency, but as a matter of everyday practice, when the feeding ground is distant from the nest, this does not appear to be the case with the snipe. At need, however, it is clear that this species will also bear its young aloft to a place of safety. A brief but vivid description of the manner in which this is done appears in the *Irish Naturalist* for October, by Mr. W. J. Nash, who saw a snipe rise from a mud-bank in a bog drain near Lissoy carrying a young one, which was set down some thirty yards off. It seemed to fly with considerable difficulty, and before it alighted the young one was dangling down, held, apparently, by the head only, and seemed to be slipping from its parent's grasp. The burden seemed to be supported by both bill and feet. Another nestling of about three days old was discovered, just dead from drowning, beside the spot from which the first had been rescued. The young birds had, it is surmised, been driven into the water by fright, caused by a dog which was hunting near the spot alone when the narrator arrived. From the evident labour of the parent in the performance of this rescue work it seems clear that such flights are but rarely undertaken, while the woodcock is an adept from long practice.

THE fifth and last of Mr. J. H. Owen's valuable series of notes on the breeding habits of the sparrow-hawk appears in the October issue of *British Birds*. These notes are the result of long and patient observations from a concealed hut, and are illustrated by some very remarkable photographs. While it is a matter of common knowledge that this bird will use the deserted nest of another hawk, of a crow, or of a wood-pigeon, this is the case only when its own nest has been destroyed, and not, as is generally supposed, as a matter of caprice. As soon as the young are hatched it seems to be a common practice for the female to eat the empty eggshells, though as often perhaps they are carried away and dropped at a distance from the nest. How greatly fertility is reduced by the strain of increased egg production is shown by the author's observations to the effect that if the first clutch be removed more than 25 per cent. of the second will prove infertile, while the number of eggs in the clutch is also reduced. Late in December, or early in January, these birds will often build flimsy platforms, which are supposed to be used solely for the purpose of dining-tables, though in many cases, it would seem, they serve neither this nor any other purpose. Possibly it would be more correct to regard them as indications of an incipient sexual activity.

THE timber resources of South America are discussed by Mr. Raphael Zon in the *Geographical Review* for October, 1916 (vol. ii., No. 4). South America is principally rich in hardwoods, of which the so-called

Spanish cedar (*Cedrela odorata*) and the *quebracho* are the most important. These are more than sufficient to meet the home demand, and are largely exported, but at the same time short-sighted exploitation bids fair to impair seriously this industry. On the other hand, it is, of course, quite possible that further study of the timber resources will result in the discovery of other hardwoods of commercial value. Of more economic importance is the supply of softwoods. The Parana pine (*Araucaria brasiliensis*) of southern Brazil and the Chilean pine (*A. imbricata*) seem to be the only two species of importance, and are being increasingly used in place of imported coniferous wood from the northern hemisphere. But the limited area of these softwoods and the growing demand for cheap timber make it improbable that South America can ever dispense with her timber imports, and certainly there is no hope of her being able to export softwoods. In view of this paucity of timber there is urgent need of the South American States instituting scientific management of their forests and the prevention of undue exploitation. South America is far less rich in commercial timber than might be supposed, and her resources are not inexhaustible.

THE retreat of the Barry glacier in Prince William Sound, Alaska, has been studied for many years. In 1910 the National Geographic Society's expedition showed that the face had withdrawn three miles since 1899. This expedition gave an exhaustive account of all observations previous to 1910. Later observations are contained in a brief paper by Mr. B. L. Johnson, published as Professional Paper 98 C of the United States Geological Survey. Mr. Johnson visited the glacier in 1913 and 1914, and found in both years that the rate of retreat had been maintained. Between 1910 and 1914 the rate of retreat was 8200 ft. on the eastern side, and about 2500 ft. on the western side. The rate on the western side seems to have decreased after the uncovering of bedrock on that side. The paper is illustrated with several photographs of the glacier in various stages of its retreat.

SOME details of the Indo-Russian triangulation connection are given in the *Geographical Journal* for November (vol. xlviii., No. 5). By 1911 Gilgit had been connected with the Indian system, and the Russians on their side had reached Pamirski port in about lat. 38° 13′ N., long. 75° E. But the connection of Gilgit with the Russian survey across a strip of Afghan territory presented difficulties of a formidable nature, as it involved the crossing of the Karakorams. The only feasible route was from Gilgit up the Hunza valley to the Kilik Pass, involving the survey of about one hundred miles up a narrow, precipitous-sided gorge, flanked by mountains rising 6000–7000 ft. above the valley floor. The number of stations in this survey was thirty-three, and their average height is 16,222 ft. The work was carried out in the face of great difficulties and hardships by the late Lieut. H. Bell, R.E., in 1911 and 1912, and completed by Lieut. Mason in 1913. A report of the work is contained in the Records of the Survey of India, vol. vi. Capt. R. W. Hingston, I.M.S., has some notes of the geology and climate, as well as a valuable paper on his observations of blood at high altitudes.

SOME observations on the *bai*, or so-called "sand-mist," a phenomenon of frequent occurrence in the Far East, are contributed by Prof. Yuji Wada to *Temmon Geppo*, the organ of the Astronomical Society of Japan (vol. ix., No. 6, August, 1916). The mist, which is ascribed to an atmospheric depression over the sandy Tsai-pih district of Central China, is prevalent in spring. In winter the ground is frozen, and in summer it is knit together by grass, but between these seasons the loose surface is churned up by the wind, and clouds of sand rise to a great height and are carried eastward, afterwards collecting moisture and falling as a coloured mist. During the fall the sun is obscured and objects assume a yellow or ashy hue, the conditions closely resembling those attending a solar eclipse, for which the phenomenon was often mistaken by ancient chroniclers. Characteristic of the *bai* is the thick coating of very fine yellow dust which settles everywhere. During a sand-mist at Chemulpo on March 4, 1915, the author measured a fall of sand on a sheet of glass in an underground chamber protected from the wind. A twenty-four hours' deposit on 118·6 sq. cm. weighed one centigram. On the same day a fall of ¼ in. was recorded in Etchu province, Japan. Sometimes the sand descends in a rainstorm. An instance is cited of a violent storm of orange-coloured rain in 1306, which caused the deaths of many persons and cattle. The author concludes that the *bai* is akin to the "blood rain" and "red snow" familiar to European meteorologists.

THE July issue of the *Agricultural Journal of India* (vol. xi., part 3) contains an article on "Photographic Illustration," by Mr. C. M. Hutchinson, which will be very helpful to the many scientific workers whose imperfect acquaintance with the limitations of the half-tone process of reproduction of photographic illustrations has so often led to unexpected disappointment. The questions of lighting, exposure, development, class of plate, and use of light filters are discussed and well illustrated by an excellent series of reproductions.

THE last two parts of the Edinburgh Mathematical Society's Proceedings (May and September, 1916) contain the usual amount of interesting matter. Perhaps the most important paper is that of Dr. J. Dougall on the solution of Mathieu's differential equation; this equation is important for physical applications, and Dr. Dougall has found solutions adapted for computation. Possibly they are not the proper analytical forms; these may be quotients of integral functions, as in the case of the proper representation of the elliptic functions; but the paper certainly shows an advance on the practical side. Other papers deserving attention are Mr. Brown's on Fourier's integral, Mr. Milne's on differential equations, Mr. D. G. Taylor's on linear substitutions, and Mr. Tinto's on space transformations. We have also received Nos. 19 and 20 of the same society's *Mathematical Notes*; they show that the study of mathematics at Edinburgh is in a very healthy condition, and contain a number of elegant demonstrations.

THE researches of Prof. Kamerlingh Onnes have shown that at temperatures below 4° or 5° on the absolute scale mercury, tin, and lead have extremely small electrical resistances. If the temperature of a wire of either of these materials in this super-conducting state is gradually increased, at a certain temperature known as "the critical temperature" the resistance rapidly increases. If the wire is subjected to a magnetic field this critical temperature is lower than it is in the absence of a field. If the current used in testing the resistance is increased, the critical temperature is also lowered. In the Journal of the Washington Academy of Sciences for October 19 Mr. F. B. Silsbee, of the Bureau of Standards, makes use of the experimental data available to show that the effect of the increase of the testing current on the critical temperature is due entirely to the magnetic field that current produces. This accounts for the differences observed in the effect of the current according to whether the wire used in the tests is straight or coiled. If further work supports Mr. Silsbee's theory, it should afford a clue to a more satisfactory explanation of the super-conducting state.

We have received a little book by Mr. J. W. Giltay dealing with bow instruments from a physical point of view ("De Strijkinstrumenten uit een natuurkundig oogpunt beschouwd"; Leyden, 1916, pp. xi+103, illustrated). It is a simple description of the action of the various parts of the violin, with a reference here and there to other bowed instruments. An elementary knowledge of acoustics is assumed. The book should appeal in the first place to musicians taking a scientific interest in their instruments, and in the second place to physicists. For the most part the author describes and discusses the results of earlier workers, especially those of Savart, Helmholtz, and Sir William Huggins, but he has also included a number of his own experiments, particularly on the effect of the air volume enclosed in the sounding-box. He is not convinced that a violin improves by being played upon.

The "Catalogue (No. 369) of Miscellaneous Literature" just issued by Mr. F. Edwards, of High Street, Marylebone, though mainly consisting of books of general interest, contains particulars of several works appealing to readers of NATURE—on botany, travel, and, notably, natural history. The catalogue directs attention to many publications of the Zoological Society of London, offered, for the most part, at greatly reduced prices.

OUR ASTRONOMICAL COLUMN.

Ephemeris of Comet 1916*b* (Wolf).—After having passed conjunction, this comet will again be in a favourable position for observation as a morning star during the winter and spring. The following ephemeris for Greenwich midnight is given by Mr. R. T. Crawford in Lick Observatory Bulletin No. 286:—

	R.A.	Decl.		R.A.	Decl.
	h. m. s.	° ′		h. m. s.	° ′
Dec. 1	15 10 4	−5 13	Jan. 29	16 59 56	−5 15
10	25 10	5 37	Feb. 8	17 21 2	4 28
20	42 39	5 56	18	42 49	3 24
30	16 0 53	6 5	28	18 5 13	2 1
Jan. 9	19 50	6 2	Mar. 5	16 38	1 12
19	39 32	5 46			

The values of log Δ on December 1, December 31, February 1, March 1, are 0·5829, 0·5237, 0·4434, 0·3623 respectively. Taking the brightness at discovery on May 10 as unity, the theoretical brightness on these dates is 3·0, 4·9, 8·8, and 15·6. The path of the comet during the above period is mainly through Ophiuchus.

The Great Red Spot on Jupiter.—This planet being now favourably visible in the evening sky, observations can be conveniently made of the surface markings, which are very abundant and diversified at the present time. The red spot is smaller than formerly, and the hollow in the great S. equatorial belt less prominent. The first-named object will be central at about the following times:—

	h. m.		h. m.
Dec. 3 ...	9 35	Dec. 13 ...	7 50
4 ...	5 26	15 ...	9 28
6 ...	7 4	18 ...	6 59
8 ...	8 43	20 ...	8 37
10 ...	10 21	27 ...	9 23
11 ...	6 12	30 ...	6 52

Mr. F. Sargent, of Bristol, who has been observing this planet with considerable success in recent years, informs Mr. Denning that the large dark spot in the S. tropical zone, known as the "south tropical disturbance," is now about 120° long, so that it extends over one-third of the circumference of Jupiter. The middle of this "disturbance" follows the middle of the red spot about two and a half hours, and the preceding end of the former may be expected to overtake the following end of the latter at the end of January. Since June, 1914, the rate of rotation of the red spot has been about 9h. 55m. 37s., and this rate may be expected to exhibit an acceleration next year when involved with the S. tropical disturbance.

The Meteoric Shower from Biela's Comet.—Though no rich display occurred this year, it is interesting to note that this shower visibly returned. Between November 20 and 24 ten slow meteors were recorded giving a fairly well-defined radiant at 27°+42° near γ Andromedæ. These meteors were seen by various observers, including Mr. Denning at Bristol, Mrs. Wilson at Totteridge, Miss Cook at Stowmarket, and Miss Strover at Bexley Heath. It seems probable that a few of these Andromedids are visible every year, and that meteors are distributed completely around the cometary orbit, though sparingly in sections of it.

The Colours of Stars in Globular Clusters.—Dr. Shapley has recently obtained further important data relating to the colour-indices of stars included in globular clusters (Proc. Nat. Acad. Sciences, vol. ii., p. 525). The stars in a cluster of this type may be supposed to be at sensibly the same distance from the earth, and apparent magnitudes may accordingly be assumed to be directly proportional to the total light emitted. In four clusters which have now been fully investigated, it has been found that the average colour-index is distinctly greater for the brighter stars than for the fainter ones, or that relatively high luminosity is accompanied by greater redness. The total light emission of the bluer stars, for which the surface temperature is presumably in excess of 10,000° C., thus appears to be less than that of many of the redder stars, which have surface temperatures only half as great. Since the emission per unit area is much less for the red than for the bluer stars, it follows that in the clusters investigated the volumes of the bright redder stars are very great in comparison with those of the stars which are fainter and relatively blue. The ancestral relationships of the two classes must be accounted for in any satisfactory hypothesis of the evolutionary sequence of spectral types.

FOSSIL VERTEBRATE ANIMALS.

THE American Museum of Natural History, New York, has lately issued a fifth volume of papers on fossil vertebrata, reprinted from the Bulletin of the museum for the years 1913–14. It has long taken a leading place in researches of the kind here detailed, and the new contributions to our knowledge of many groups of extinct vertebrate animals are of the usual interest and importance. Besides the members of the staff, the authors include other well-known American palæontologists, while Dr. Robert Broom and Baron F. von Huene make specially interesting contributions, having studied the American fossils after their long experience of corresponding specimens from South Africa and Europe. Dr. Broom has, indeed, furnished the American Museum with a large collection of South Africa Permo-Triassic reptiles for comparison with the contemporaneous American groups, and he describes many of his specimens in the volume before us.

Several studies of the early reptiles and labyrinthodonts are appropriately followed by Dr. Broom's discussion of the structure and affinities of the Mesozoic multituberculate mammals and their rare Eocene successors. His description of a new skull of Polymastodon is especially interesting, and he agrees with the usual opinion that some of the herbivorous multituberculates were the ancestors of the existing monotremes. The latest forms of extinct land-reptiles from

the Upper Cretaceous of Alberta, Canada, are also described in several papers by Mr. Barnum Brown, who discusses chiefly the Trachodontidæ (related to Iguanodon) and the horned dinosaurs or Ceratopsia. Among other observations he makes specially valuable notes on the brain-cavities of these two groups. It appears that just before their extinction the dinosaurs in North America exhibited almost incredible variety and eccentricity.

When the first Tertiary mammals were discovered in North America, too little attention was paid to the geology of the deposits whence they were obtained. The American Museum has always recognised this deficiency, and the new collection of papers includes some valuable contributions to our knowledge of the lowest Tertiary formations. Of the mammals themselves, Prof. H. F. Osborn describes the skull of Bathyopsis, a supposed ancestor of the Dinocerata, and a skull with other remains of Eomoropus, a new genus ancestral to the anomalous hoofed animals known as Chalicotheriidæ. Dr. W. J. Sinclair gives technical descriptions of the rare pieces of jaws of pig-like artiodactyls from the Eocene of North America, and Dr. R. W. Shufeldt discusses many fragmentary remains of birds. Dr. W. D. Matthew also describes the important discovery in the lowest Eocene of New Mexico of the skull of an insectivore related both to the existing Chrysochloris of South Africa and to the extinct Necrolestes of South America, thus proving that the close affinities of these two genera do not imply any former direct connection between the two southern continents in which they occur. All the papers are well illustrated with text-figures and plates, and the American Museum is to be congratulated on the manner as well as the matter of its publications. A. S. W.

STUDIES OF HYMENOPTERA.

SOME small hymenopterous parasites of the notorious Hessian fly form the subject of a paper by C. M. Packard in the *Journal of Agricultural Research*, vi., No. 10. The life-histories of three species belonging to the genera Eupelmus, Merisus, and Micromelus are described, and the figures of eggs, larvæ, and pupæ are especially valuable. The author concludes that never more than a single individual of either of these parasites can mature in a single cecid puparium. Where more than one egg was placed on the same host, one larva only survived; "the rest were killed by that one or starved to death . . . whether the two or more larvæ were of the same or different species."

It is well known that certain species of the Chalcididæ —small Hymenoptera that are typically parasitic in their habits—lay their eggs in plant tissues on which their larvæ feed, and the genus Megastigmus has been noticed as injurious to fir seeds. J. M. Miller (*Journ. Agric. Research*, vi., No. 2) is the first to describe the actual operation of egg-laying by these minute flies; the female pierces the scales of the young cones with her long ovipositor and lays the eggs close to the developing seeds. The process is well illustrated by Mr. Miller's photographs.

The literature of the honey-bee is ever increasing. A noteworthy paper on the sense-organs on the mouth-parts of the bee is published by Dr. N. E. McIndoo in the Smithsonian Misc. Collections (lxv., No. 14); he gives the results of experiments by feeding bees on various substances, and describes with clear figures the minute structure of the sense-organs under discussion. When "undesirable substances" were added to the bees' food, the insects were found to refuse such "after eating more or less of them," and the author concludes that "the olfactory sense in the honey-bee is highly developed, and that it serves as an olfactory and gustatory perception combined."

Systematic work on the ants claims the attention of entomologists in distant regions. In the Ann. South African Museum (xiv., part 2), G. Arnold continues his extensive "Monograph of the Formicidæ of South Africa." A. Gallardo publishes a monograph of the Dolichoderinæ as a contribution to "Las Hormigas de la República Argentina," in the *Ann. Mus. Nat. de Hist. Nat. de Buenos Aires* (xxviii., 1916, pp. 1–130), a praiseworthy feature of which is the addition of at least one clear structural figure to the description of each species. The Argentine ant, *Iridomyrmex humilis*, is discussed at length, the description of its varieties and habits occupying sixteen pages. This insect has in recent years become a serious pest in parts of the United States; colonies have also been introduced into southern Europe, and some time ago these ants gained a temporary footing in a garden near Belfast, whence they invaded the adjacent dwelling-house, with the result of considerable alarm and inconvenience to the inhabitants. G. H. C.

OBSERVATIONS ON RECENTLY DISCOVERED FOSSIL HUMAN SKULLS.[1]

THE announcements made in NATURE last year (1915, August 5, p. 615; September 9, p. 52; and December 2, p. 389) of the discovery of fossil human skulls in Australia (Talgai) and South Africa (Boskop) suggest certain observations concerning the problems relating to early mankind. For not only do they add to the number of the distinct types of early humanity with which we are acquainted, but they also force upon us the further consideration of the question of early migrations, of the reality of which the widespread distribution of certain definite types of stone implements already afforded convincing testimony for all who were willing to accept the plain significance of positive evidence.

There are reasons for believing that when *Homo sapiens* first became differentiated from other human species many human strains other than those which made their way into western Europe in the Upper Palæolithic (which may be called the Early Neoanthropic, see NATURE, August 17, 1916, p. 514) age were also budded off from the original parent stock. Some of these diversely specialised strains were the ancestors of the Australians, others of negroes, others again of the Mongolian race, and yet others of the brachycephalic types of humanity, none of which were represented in Europe, excepting possibly the last of the groups mentioned, which began to filter into eastern Europe in Azilian times, but did not become at all common in the West until the closing phases of the Neolithic. Some of these various strains wandered far from their area of characterisation; and when brought into contact with other stocks were able to transmit their culture. Thus it is possible to explain how, even in the remote period usually called Palæolithic, identical methods of chipping stone implements in widely separated localities can be regarded as certain evidence of the derivation of the technique from a common source, though the actual makers of the weapons may be of different races. Nor can the source of the inspiration be in doubt even if certain peoples may continue to follow the distinctive methods in the twentieth century.

Further, a particular culture-complex may have been built up of practices and customs derived from varied sources: the particular set of them which becomes intermingled in one area, and the type of culture which develops as the result of the blending of these in-

[1] Abstract of a paper read before the Manchester Literary and Philosophical Society on October 31 by Prof. G Elliot Smith, F.R.S.

gredients, are peculiar to, and distinctive of, that area. For example, the well-defined culture-complex which is commonly called Neolithic (see NATURE, May 11, 1916) is characteristic of Europe and the immediate neighbourhood; nor, in fact, was it synchronous or of identical composition in different parts of Europe. But when one passes to the East or the South, although all the ingredients out of which the European Neolithic was compounded may be found, there is no phase of culture which can justly be labelled Neolithic in the same sense as the term is applied in Europe.

THE BRITISH ASSOCIATION AT NEWCASTLE.

SECTION M.

AGRICULTURE.

OPENING ADDRESS (ABRIDGED) BY E. J. RUSSELL, D.Sc., PRESIDENT OF THE SECTION.

I AM going to deal to-day with the possibilities and the prospects of increased crop production, which, both in its narrow aspect as a source of national wealth, and in its wider significance as the material basis of rural civilisation, must always remain one of the most important of human activities.

The main obstacles to increased plant-growth lie in the climate and in the soil. Climate apparently cannot be altered; so we have to adapt ourselves to it by growing crops and varieties suiting the conditions that happen to obtain. But soil can be altered, and it is possible to do a good deal in the way of changing it to suit the crops that are wanted.

On light soil the two great obstacles to be overcome are the lack of water and the poverty in plant nutrients. Both arise from the same cause, the lack of colloidal substances, such as clay and humus, which have the power of absorbing and retaining water and plant nutrients. There are two ways of dealing with the problem; one is to get round it by increasing the depth of soil through which the roots can range, and the other is to remedy the defect by adding the necessary colloidal substances—clay, marl, or organic matter. In practice it is not possible to add sufficient to overcome the defect entirely, and therefore both methods have to be used.

Depth of soil is perhaps the most important single test that can be applied to light sands. If the soil is shallow, and is underlain by solid rock, pebbles, or gravel, the case has hitherto been hopeless, excepting where the climate is persistently moist. I know of no instance of successful treatment in tolerably dry regions; the areas are generally left alone. They form picturesque heaths, some are used as rabbit-warrens or golf courses, some are recommended for afforestation.

If the rock, instead of being solid, is simply a thin layer separating the sand above from a great depth of sand below, then the improvement can be effected by removing it.

Once the light soil is made deeper it can be still further improved. The most permanent improvement is to add clay, or preferably marl; this used to be done in many parts of England, but it now only survives on certain fen or peaty soils.

The usual method of increasing the absorptive power of light sandy soils is to add organic matter, by dressings of farmyard manure, by feeding crops to sheep on the land, or by a method that wants much further investigation, ploughing crops or crop residues straight into the soil. But the organic matter disappears at a very rapid rate, so that the process needs repeating in one form or another every second or third year. The addition of organic matter must generally be accompanied by the addition of lime or limestone, otherwise the soil may become "sour"—a remarkable condition, detrimental to plant-growing, but not yet fully understood by chemists, and therefore more easily detected by the vegetation than by analysis. Few light-land farmers use lime or chalk as regularly as they should for the best results.

Further, it is necessary to add all the plant-nutrients, for sand is usually deficient in these, excepting in places calcium phosphate. The common English practice is to import feeding-stuffs to be eaten by sheep on the land, so that the great proportion of the nitrogen, potash, and phosphates thus brought on to the farm shall get straight into the soil. This is not sufficient, however, and artificial manures should be used as well and far more extensively than at present; nitrogen, potash, and phosphates are all wanted.

These additions do not end the matter. Light sandy soils are very prone to weeds, and constant cultivation is necessary to keep them down. Fortunately the cultivation serves another purpose as well; it helps to retain the moisture content of the soil.

Thus the management of a light sandy soil is a constant struggle; it demands constant surface cultivations, frequent additions of fertilisers, of organic matter and lime, and periodical deep ploughings to check any tendency to pan formation. When all this is done these light soils become very productive; they will grow almost any crops, and they can be cultivated easily and at almost, but not quite, any time. One of their chief defects is that cereal crops do not produce so much grain as might be expected; in the words of the practical man, they will not "corn out." This phenomenon requires further investigation.

On the other hand, neglect in any of these directions soon leads to failure.

These are the conditions for the successful management of light soils; how far can they be attained? This is a purely economic question. It is obvious that success is only possible if the gross returns are sufficient to cover the costs. Now, a very great deal of experience has shown that the ordinary farm-crops—wheat, barley, swedes, etc.—do not bring in sufficient gross return to encourage good farming. Numerous instances occur on the tracts of light Bagshot sands. Some of the old four-course farms still survive—wretched little affairs, the tenants of which are constantly struggling against chronic poverty. Again, considerable areas of light land in Hertfordshire caused their cultivators to go bankrupt in the 'nineties when only these ordinary crops were grown. The old Townshend and Coke method of feeding sheep on the land is satisfactory, but it requires the triple, and not very common, qualifications of capital, good knowledge of sheep, and of crop management. The situation in Hertfordshire was saved by the potato-crop, which, on these farms, brings in a gross return of 25*l.* or more per acre, against a return of 7*l.* from wheat at pre-war prices. Of course, the expenditure on potatoes is much greater than on wheat, but that does not matter; the point is that the expenditure has to be incurred in any case if the land is to be kept in good cultivation, and potatoes bring in the necessary return, while wheat does not. Potatoes are the commonest of money-finding crops, but they are not the only one. Greens are in some places very successful, bringing in 17*l.* or more gross return. In North Kent various market-garden crops are used. In parts of Norfolk blue peas have answered satisfactorily. Clover-seed is a useful adjunct in places, but it is not sufficiently trustworthy as the chief money-maker.

It is not necessary to take the money-finding crop very often; once in four years may prove sufficient. But the system is capable of considerable intensifica-

tion if the farmer has sufficient capital, or if his holding is so small that his capital can be more intensively used. It is possible to grow nothing but crops bringing in a large gross return; in districts round Sandy, Biggleswade, etc., the market-garden crops have been exclusively grown for very many years with great success; this method also proves very successful on the Bagshot sands. It is not clear, however, that this type of farming could be indefinitely extended.

The best hope for improvement of these light soils lies in increasing the number of money-finding crops, improving the methods of growing them—*e.g.* the introduction of the boxing and spraying of potatoes—and their relation to the other crops or the live stock, and improving the organisation for disposing of them, so that farmers will feel justified in spending the rather considerable sums of money without which light soils cannot be successfully managed.

We can now leave these light soils and pass to the opposite extreme—the heavy clay soils. These suffer from the fundamental defect that the clay easily deflocculates and assumes a sticky, pasty condition when wet, and a hard, lumpy condition when dry. In spite of a good deal of laboratory work, deflocculation is not well understood; it is known, however, to be a special case of a very general phenomenon—flocculation of suspended colloids—and it will presumably succumb to treatment when the general problem is solved. Important advances have been made in the last few years by Perrin, and it would be interesting to apply his methods to clay.

For the time being the only feasible method of flocculating clay is to add lime or chalk, but experience shows that liming and chalking must be accompanied by drainage to be a complete success. Any attempt to improve crop production on heavy lands involves these as the first steps.

Where clay soils are drained and limed it is possible to begin to do something with them. Wheat, beans, mangolds, cabbages, and grass can all be produced. But, when all is said and done, clays still suffer from two disadvantages: they are only suited to a limited number of crops, and they are difficult to cultivate. The land may be too hard in autumn to be ploughed for winter corn; too wet in winter to be ploughed for spring corn; and too dry in spring to be prepared for mangolds. There are times in between when something can be done, but only the man who is skilful enough to take full advantage of these intervals has any hope of success. Most men, therefore, prefer not to run the risk of cultivation, and lay the land down to permanent grass.

There are two directions in which the risk can be reduced, though it will still remain a serious factor.

The great difficulty of cultivation arises largely from the circumstance that only on a relatively small number of days are both soil and weather suitable for ploughing. The result is that much of the work is left until late, and late work tends to be bad work. This can only be overcome by speeding up the process of ploughing during the favourable opportunities, and so far as I can see this is only possible by the use of motors. I believe, therefore, that motor-ploughs and cultivating implements will play a considerable part in the improvement of heavy land.

A second direction in which the risk can be reduced is by keeping up the supply of organic matter in the soil. Probably the cheapest and most satisfactory way of doing this is by ploughing in crop residues, such as, for example, are left by a seeds mixture, a clover ley, or ploughed-up grass-land.

Once these great fundamental things have received attention, all these soils—loams, sands, and clays—can be further improved by proper treatment with fertilisers. A great deal of good work has been done on this subject, and the results are steadily being diffused among farmers.

In most field experiments there is no indication of any end-point, and apparently the more the crop is fed the larger would be the yield. But the process does come to an end. The final limit is reached by the inability of the plant to stand up any longer or to grow any bigger. When the corn-crop gets beyond a certain size it is almost invariably beaten down by the wind and rain, so that the difficulty of getting it in becomes considerable. Heavy dressings of nitrogenous manures also predispose the crop to fungoid disease, attacks apparently being facilitated by the thinning of the cell-walls and the change in composition of the cell-sap.

The way for further progress is then to seek new varieties that can stand up and resist disease. And here a good deal has been done. Biffen has shown how desirable properties may be transferred from one wheat to another, and his investigations are revealing the limits within which it is possible to construct a variety of wheat according to the grower's specification. Similar work is badly wanted for other crops. Fortunately our great seedsmen are fully alive to the possibilities in this direction, and have already done much useful work. It is not only in the case of cereals and potatoes that new varieties can be sought; there is great scope also for new varieties of all other crops.

But there is another way in which science can further the problems of crop-production. Instead of aiming solely at increased yields per acre, attempts may be made to reduce the cost and increase the certainty of production per acre.

One of the most hopeful ways of attacking this problem is to increase the efficiency of the manurial treatment. No manurial scheme is perfect; no farmer ever recovers in his crop the whole of the fertilising constituents applied to the soil; there is always a loss. In our Broadbalk experiments, where wheat is grown year after year on the same land and large dressings of artificials are used, we do not recover in the crop more than about 30 to 40 per cent. of the added nitrogen.

Now, whilst we can never hope for perfect efficiency, *i.e.* for 100 per cent. recovery, we can hope to do better than this. On our own fields we improve considerably on it every year by the adoption of a proper rotation.

Further experiments on the relationship between the efficiency of fertiliser action and the rotation are very desirable.

Another great direction in which economy is possible is in the management of farmyard manure. It has been a common complaint against agricultural investigators that they have concerned themselves exclusively with artificials, and left untouched the greater problem of the manure-heap. For farmyard manure is the staple manure of the countryside, about 37 million tons being made per annum in this country The value at 5*s.* per ton is 9,250,000*l.*; all the artificial manures consumed in Great Britain probably do not much exceed 6,500,000*l.* in value each year.

Through the generosity of the Hon. Rupert Guinness we have been able at Rothamsted to attack this important subject, and Mr. Richards has obtained some striking results, showing what losses may take place and indicating methods of avoiding them.

Another direction in which saving is possible is in the soil itself. It is now forty-six years since Lawes and Gilbert built those remarkable drain gauges at Rothamsted which for the first time enabled chemists to determine precisely the quantity of fertilising material washed out from the soil by rain. When there was no crop on the ground the soil lost by drainage about 40 lb. of nitrogen in the form of valuable

nitrates, a quantity as great as is contained in a 24-lb. bushel crop of wheat.

It appears that this wastage of nitrates in winter can be greatly reduced, but the process requires suitable crops and rapid cultivation methods. Neither of these ought to be beyond the power of the agriculturist to provide. The possibilities are many. Wibberley has discussed several schemes of continuous cropping that satisfy these requirements, giving a succession of crops which cover the land at the critical time when losses would occur. And our implement-makers are steadily increasing the number and effectiveness of the implements, while motor traction promises also to increase the speed of working.

A further direction in which improvement is possible is in cultivation. Reference has already been made to the necessity for increasing the speed of ploughing so as to get the work forward and enable the farmer to plough just as much as he likes in autumn, or, if he wishes, to get in a bastard fallow or a catch-crop. The motor-plough seems the only solution, and as soon as the difficulties of engine construction are got over and the price becomes sufficiently low, I think it must displace the horse-plough as inevitably as the railway displaced the stage-coach. Both the soil and the human factors tend this way. So long as a man and two horses, and in some parts of the country a man and a boy and three horses, can only manage to plough an acre a day, it is obvious that the farmer cannot afford to pay more than a small wage for the work; but when a man on a motor-plough can do several acres a day a considerably higher wage becomes possible.

The last economy to which I shall refer is the choice of crops. The farmer grows his crops for profit, and clearly ought to select the most profitable for the purpose. This can only be done by keeping accounts. No crop ought to be grown that does not pay its way; it should be displaced by one that does. On our own farm we find that wheat, oats, and barley are about equally profitable; but the crops in the root- or fallow-break vary enormously—potatoes bringing in most profit, while swedes, on the other hand, are invariably grown at a loss on our land. I believe this would be found not uncommon in the southern part of England. Amos and Oldershaw have recently gone into the cost of silage crops in these conditions. More experiments and inquiries are greatly needed to widen the range of this class of crops, and give us something that will be as useful as swedes but more profitable.

Besides these improvements in crop-production which affect all farmers, even the best, there are two other ways in which we can hope for further developments.

One is to raise up the ordinary farmer to the level of the good one. The average crop of wheat for the country is officially reported to be 32 bushels, but no good farmer would be content with less than 40. If we accept the official average there must be a good amount of wheat grown at much less than the best that is possible even now. A vast amount of educational work has to be done to spread the knowledge of the best methods, varieties, manures, etc.

The other is to extend the area of land under cultivation. There are still wastes to be reclaimed, as Mr. Hall is reminding us, while even on farmed land the proportion under the plough each year is only small, and is constantly decreasing. Grass-land only produces about one-half of what arable-land yields, and it is imperative to the proper development of the country that some of it should be broken up. The farmer knows this, but he does not put his knowledge into practice. He cannot always afford the risk. There is a fundamental distinction between farming and manufacturing that is often overlooked in discussions on the subject. Except in rare cases—sugar beet and some kinds of seeds—the farmer does not grow for contracts, but always for what manufacturers would call "stock." The manufacturer makes a contract to supply certain goods at a certain price; he knows what his machinery will do, he can insure against many of his risks, and get out of the contract if others befall him. He knows to a penny how much he will be paid, and so he can calculate to a nicety how much he can afford to spend, and how far he can go in introducing new methods. Now the farmer cannot do this. He cannot be certain what yield or what price he will get. He starts spending money in August on a crop that will not be sold for fifteen months, and he has no idea how much money he will receive in return. The whole thing is a hazard which cannot be covered by insurance. Obviously, then, the farmer must leave a big margin for safety, so he balances his risks by laying down some of his land to grass, where the risks are at a minimum. But when you ask him to intensify his methods, and, as a necessary corollary, to break up some of his grass-land, he has a perfect right to ask who is going to bear the extra risk.

The problem has been burked in the past, but must be faced in the future. It is essentially a question of distribution of risk, and it ought not to be beyond the political insight and economic wisdom of those whose business it is to settle these matters.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

SHEFFIELD.—Dr. W. E. S. Turner has been appointed lecturer in charge of the new department of glass technology. Mr. G. A. Birkett, formerly of the University of Liverpool, has been appointed to the new Vickers lectureship in Russian. A permanent appointment is deferred until the conclusion of the war.

The council has nominated Mr. A. J. Hobson, J.P., to be a pro-chancellor of the University in succession to the late Sir George Franklin.

MISS H. DE PENNINGTON, assistant lecturer in chemistry at the Blackburn Technical School, has been appointed research assistant to Prof. J. B. Cohen at the University of Leeds.

WE learn from the *Münchener Medizin. Wochenschrift* that the medical faculty of the University of Göttingen has received two legacies, each of 10,000 marks, under the wills of the late Prof. von Esmarck and of the late Prof. Paul Ehrlich, of Frankfurt. The money will form a fund for assisting needy medical students.

IN connection with the present campaign for the preservation of infant and child life, the governing body of the Battersea Polytechnic has arranged for a public lecture to be given by Dr. C. W. Saleeby. The lecture will be entitled "The Saving of the Future," and will be held at the Battersea Polytechnic, Battersea Park Road, S.W., on Thursday, December 7, at 7.30 p.m. No tickets of admission are required.

THE fifth annual Conference of Educational Associations is to be held in the University of London on January 1–6 next. The inaugural address is to be delivered on January 1 at 3 p.m. by Mr. A. L. Smith, master of Balliol. Among the associations taking part in the conference this year are the School Nature Study Union, the Child Study Union, the Committee for the Development of Regional Survey, the Association of Science Teachers, and the National Association for Manual Training. Among the large number of addresses arranged for may be mentioned the following:—The possible educational value of kinemas, by

Prof. R. A. Gregory; the response of plants to light, by Dr. Harold Wager; nitrates from the air, by Mr. E. K. Scott; and handwork as character training, by Mr. A. H. Angus and Dr. P. B. Ballard. Full particulars of the arrangements can be obtained from the conference secretary, Mr. Frank Fairman, 9 Brunswick Square, London, W.C.

LORD MILNER presided at a lecture on November 22 at King's College, by Dr. Fisher, Vice-Chancellor of the University of Sheffield, on "The Intellectual Groundwork of Politics." In moving a vote of thanks to Dr. Fisher, Lord Milner referred to recent discussions on the place which science should occupy in the school curriculum. He expressed the opinion that the great progress which the human race has made in recent times has given such an enormous importance to applied science that a man is now scarcely at home with the problems of the day—certainly not with the economic questions—without some knowledge of the sciences, and consequently not fully able to master the political problems which depend upon them. The training in physical science is not, he said, so much book learning as actual science and practical acquaintance with some form of science. Whatever the effort, an important share in the educational life of every boy and young man in future should be to bring him into close relation with the great achievements of science. That he believes is essential, and as important to men who are going to devote themselves to a political career as to men who are going to devote themselves either to scientific research or to the pursuit of some business which largely depends on the results of science.

A LECTURE delivered at Stellenbosch, by Prof. S. J. Shand, of Victoria College, on the occasion of the passing of the University of Stellenbosch Act, is published in the Stellenbosch *Students' Quarterly* for June last. Prof. Shand took as his subject the making of a university, and drew distinctions between colleges and universities. The aim of college teaching, he said, is the imparting of existing knowledge with the specific object of enabling a man to pass certain tests and tc satisfy necessary conditions in order that he may advance his prospects in life. The only aim of a university, he urged, is, or ought to be, the advancement of learning in the widest sense. When a professor does not work at his subject and is content merely to teach it, he may find a useful place in a school or college, but there is no room for him in a university. It is perhaps, Prof. Shand continued, the most serious charge that can be brought against the South African colleges that they have done nothing to encourage research and discovery. It should be the business of the newly constituted universities to remedy this state of affairs by recognising that the advancement of knowledge is the most important service they owe to the State. It should be insisted upon, therefore, that the professors shall not be regarded simply as teachers; their business is the advancement of knowledge no less than the spreading of it, and that this object may be pursued they must not be too much burdened with formal teaching.

THE council of the Institution of Naval Architects offers for competition the "Martell Scholarship in Naval Architecture" of the annual value of 100*l*., and tenable for three years. Candidates must forward a written application to the secretary of the institution, 5 Adelphi Terrace, W.C., by January 15, 1917. They must not be less than eighteen or more than twenty-one years of age on March 1, 1917, and must at that date have been continuously employed for at least two years upon naval architecture or marine engineering. The scholarship will be awarded in connection with the competitive examinations for scholarships held by the Board of Education next May and June, in the following subjects:—Naval architecture, pure mathematics, applied mechanics (materials and structures), and either machines and hydraulics or heat engines. Candidates will be required to furnish by January 15 next evidence that they have passed some literary test in English. If a candidate can produce similar evidence of a knowledge of French, German, or Spanish, credit will be given for such knowledge. Successful candidates will be required to undergo a three years' course of study in naval architecture in a college approved by the council, and this course will be combined with practical training in a shipyard or marine engine works. The council of the institution administers other scholarships which are offered for competition among students of the institution, particulars concerning which may be obtained from the secretary.

SOCIETIES AND ACADEMIES.

LONDON.

Physical Society, November 10.—Prof. C. V. Boys, president, in the chair.—B. W. **Clack**: Diffusion in liquids. The paper contains the results of the experiments described by the author in Proc. Phys. Soc. Lond., xxi., p. 374, 1908; xxiv., p. 40, 1911; and xxvii., p. 56, 1914, collected and recalculated in accordance with a theoretical correction recently communicated by Dr. Griffiths (Proc. Phys. Soc., xxviii., p. 255, 1916). It is found that in the solutions employed the correction is not considerable, except in the case of the strongest solutions of KCl (2·7 normal), where it amounts to 6 per cent. The paper contains the corrected theory of the method, and the value of the coefficient of diffusion is tabulated at different limiting concentrations and at various temperatures.—Prof. H. **Nagaoka**: The regularity in the distribution of the satellites of spectrum lines, with a note on the structure of the green line of mercury, and terms of correction in using a concave grating. The paper describes a further development of the work done by the author and Mr. Takamine on the distribution of the satellites of the mercury lines. It is shown that much of the discord between the results of various observers of these satellites is due to the unsatisfactory nature of the principal line as a datum from which to define their positions, and that if the distances be measured from one of the distinct satellites good agreement is obtained. If these separations be expressed as differences of wave-number, instead of wave-length, a remarkable symmetry in their distribution becomes apparent. For example, among the satellites of the green line, 5461, can be found three groups of symmetrical triplets, of which the wave-number differences are in the simple ratios 1 : 3 : 12. Similar results are obtained for other lines, the principal component of λ 4359 being shown for the first time to consist of a triplet, of which the middle component is relatively weak. A similarity in the distribution of the satellites exists for all the lines examined, and certain wave-number intervals are common to all.

CAMBRIDGE.

Philosophical Society, November 13.—Dr. Marr, president, in the chair.—Prof. **Wood**: The surface law of heat loss in animals. Figures expressing in pounds of starch equivalent a number of successful and economical rations for fattening cattle were shown within the limits of error of experiment to fall on a curve expressing the theoretical food requirements calculated according to Rubner's surface law for live-weights varying from 80 lb. to 1400 lb.—Prof. **Punnett** and Capt. P. G. **Bailey**: Inheritance of henny plumage in

cocks. Experiments on the inheritance of henny feathering in cocks were begun in 1910, the original cross being between a gold-pencilled Hamburgh cock and a silver Sebright hen. Both cock-feathered and hen-feathered male offspring resulted from this cross, and the later work has shown that hen-feathering in the male behaves as a dominant character which can be transmitted by either sex.—Dr. **Marshall** and K. J. J. **Mackenzie**: Extra mammary glands and the reabsorption of milk sugar. The authors observed that the shape of the udder has been held for some considerable time to be correlated with capacity for milk production in the cow. In three cases examined in which supernumerary glands were in a state of apparently complete functional activity (the milk not being withdrawn from them) there was proof of the occurrence of reabsorption of milk sugar, since such could be detected in the urine, in one instance in very considerable quantity, and in the middle of the lactation period.—A. **Amos**: Experimental work on clover sickness. In the past "clover sickness" has been ascribed to a variety of causes, *e.g.* exhaustion of plant food, production of toxic substances, lack of lime, plant diseases. Under present conditions in England "clover sickness" is due in most cases to one of two plant diseases: eelworm (*Tylenchus devastatrix*), clover rot (*Sclerotinia trifoliorum*). Observations on life-history of *Sclerotinia trifoliorum*:—*First Appearance on Clover.*—As early as October, or as late as January. *Active Growing Period.*—From date of appearance until mid-April, especially during moist, dewy weather. Slow growth may be continued through the summer. *Formation of Sclerotia.*—To a small extent on stems during winter months; chiefly on dead roots in April and May. *Germination of Sclerotia.*—In October after ground is cooled and moistened by first autumn rains. To a less extent in November, and one case recorded on May 3. *Depth of Germination of Sclerotia.*—The Sclerotia germinates more freely on or near the surface than when buried one inch. *Distribution of Spores.*—The ascospores, formed in the apothecia, are shot into the air and carried by wind. *Other Hosts.*—By infection: Beans, peas, alsike, lucerne, white clover, trefoil, sainfoin. By observation in the field: Beans, alsike, lucerne, trefoil, sainfoin. *Methods of Control.*—Avoid growing two clover crops in quick succession. Other methods of control are being tested.—G. N. **Watson**: Bessel's functions of equal order and argument.

PETROGRAD.

Imperial Academy of Sciences, October 1.—O. **Backlund**: Chandler's period of variation of latitude.—A. **Krištafovič**: Some Chinese forms in the Sarmatian flora of South Russia.—E. F. **Liskun**: The meat problem under existing economic conditions.—R. E. **Regel**: The mushroom fungus industry. The value of beardless barley as horse fodder.—B. P. **Gerasimovič**: The two groups of helium stars.—S. K. **Kostinskij**: The probable motions in the spiral nebula of Canes Venaticorum observed with the stereocomparator.—B. N. **Gorodkov**: Biological study of *Pinus sibirica*, Mayr, in East Siberia.—S. S. **Ganešin**: Contributions to the flora of the Government of Irkutsk.—P. N. **Čirvinskij**: Quantitative chemical composition of the pallasites and the application to them of Avogadro's law.—E. **Burkser**: The radio-activity of the lakes and springs of South Russia.—P. **Zemiatčenskij**: The absorptive capacity of Russian clays. Part i. Experimental.—V. **Mokrinskij**: Geology of the Kerč Peninsula. The sulphur deposit of Čekur-Kojaš (Crimea).—V. M. **Rylov**: Contributions to the fauna of the free fresh-water Copepodes of North Russia.—Vl. N. **Šnitnikov**: Itineraries of the excursions in the province of Semiréčie from 1907–15.—N. N. **Adelung**: Contributions to the knowledge of Palæarctic Blattoides. I. Genus Ectobius, Steph. General considerations: new forms of western Europe.—I. A. **Smorodincev**: The organic bases of pork.—B. P. **Babkin**: The natural chemical stimulants of the movements of the small intestines.—I. S. **Plotnikov**: The addition of bromine to non-saturated hydrocarbons under the influence of light.

October 15.—E. S. **Fedorov**: Systems of planigons as technical isohedra in the plane.—G. A. **Tichov**: New researches on the problem of the cosmic dispersion of light.—N. N. **Kalitin**: The variable RT Persei.—N. N. **Monteverde**: Development and present state of the medicinal plant industry in the Poltava Government.—Ja. V. **Samoilov**: Sources of pyrites in Russia.—F. A. **Satsyperov**: Russia's medicinal plants.—S. F. **Žemčužnij**: Preparation and properties of pure platinum.—K. A. **Flaksberg**: Russia's wheats.—E. **Miakinen**: The discovery of some rare chemical elements in Finland.—E. D. **Revutska**: Russian sources of Iceland spar.—V. I. **Vernadskij**: Notes on the distribution of the chemical elements in the earth's crust. VII. Bismuth.—V. I. **Vernadskij**: The simple relations found by Prof. Moureu between certain natural gases.—O. O. **Backlund**: Scapolite from the river Kanda.—K. I. **Skriabin**: Materials for a monograph on avian Nematodes.—D. **Rubinstein**: Note on the Sagittæ of the Black Sea.—A. N. **Kiričenko**: Notes on some Reduviidæ (Hemiptera-Heteroptera).—P. I. **Valden**: Sir William Ramsay.

PARIS.

Academy of Sciences, November 13.—M. Camille Jordan in the chair.—The President announced the death of Oscar Backlund, correspondant in the section of astronomy.—G. **Bigourdan**: An old observation of an eclipse of the sun, made at Paris in 1630. A reproduction of a manuscript found in the National Library. It is anonymous, but is probably due to Gassendi.—C. **Guichard**: Triple orthogonal systems such that a system of Lamé curves may be formed of spherical lines, the centres of the spheres which contain them being on a sphere, or a paraboloid, of revolution.—W. **Kilian** and J. **Révil**: The breccias (conglomerates) of Tarentaise.—G. **Vasseur**: (Posthumous note.) Discovery of remains of Anthracotherium in the Sannoisian formations of the basin of Aix-en-Provence.—L. **Hartmann**: Systematic variation of the value of the kinetic energy in the elastic shock of bodies.—R. **Guillery**: A new system of transmission by a ball joint. The new joint, described and illustrated, gives a flexible transmission, and is economical in construction, as except for one pair of faces rough castings can be utilised.—E. **Belot**: The exponential law of the distances of the planets and satellites. New approximations.—H. **Bordier** and G. **Roy**: Colloidal iodine. In an earlier paper it has been shown that certain characters of solutions of iodine in water indicate that the iodine is in the colloidal state. The amount in solution is too small for the cryoscopic method to give decisive information. Experiments with the ultra-microscope lead to the conclusion that iodine in pure water is in the colloidal state, but in the form of granules too small to be seen with the ultra-microscope. In the presence of gelatin larger particles, visible in the instrument, are formed.—M. **Molliard**: The catalytic action of potassium nitrate in the alcoholic fermentation produced by *Sterigmatocystis nigra*. The presence of the nitrate prolongs the alcoholic fermentation and gives an increased yield of alcohol. The proportion exerting the maximum effect is much less than with yeasts, 4 per 1000 instead of 50 per 1000.—F. **Vincens**: The development

and structure of the perithecium of a Melanospora.—A. **Piédallu**: The acclimatisation in France of a rapidly growing tannin plant, the Canaigre (*Ramex hymenosepalum*). This plant comes from Arizona and the neighbouring regions, and gives tubercles containing 28 to 30 per cent. of tannin. It has been proved to develop naturally in France, and survives the winter. It is rapid in growth, and should prove a valuable source of tanning material. Field cultivation experiments will be carried out.—M. **Caullery** and F. **Mesnil**: Viviparity and parthenogenesis in the polychetal Annelids; a new viviparous Syllidian, *Ehlersia nepiotoca*.—P. **Bonnier**: Enteritis.

BOOKS RECEIVED.

Fatigue Study: The Elimination of Humanity's Greatest Unnecessary Waste. By F. B. Gilbreth and Dr. L. M. Gilbreth. Pp. 159+Figs. 33. (London: G. Routledge and Sons, Ltd.) 6*s*. net.

An Elementary Grammar of the Ibo Language. By Rev. J. Spencer. Third edition, revised by T. J. Dennis. Pp. x+116. (London: S.P.C.K.) 10*d*.

The Rain-Children: A Fairy-Tale in Physics. By T. H. Orpen. Pp. 112. (London: S.P.C.K.) 2*s*. 6*d*.

Guida Pratica del Meccanico Moderno. By A. Massenz. Pp. xxiv+351. (Milano: U. Hoepli.) 4.50 lire.

Tempera e Cementazione dell' Acciaio. By M. Levi-Malvano. Pp. xii+261. (Milano: U. Hoepli.) 4 lire.

Proceedings of the Royal Society of Edinburgh. Session 1915–16. Parts i. and ii. Vol. xxxvi. Pp. 192. (Edinburgh: R. Grant and Son.) 11*s*.

Bacon's Large Scale Map of the French Battle Front (Peronne to Verdun). (London: G. W. Bacon and Co., Ltd.) 1*s*. net.

British Birds. By A. Thorburn. Vol. iv. Pp. vii+107+plates 61–80. (London: Longmans and Co.) Four vols., 6*l*. 6*s*. net.

University of London. University College. Abridged Calendar. Session MDCCCCXVI.–MDCCCCXVII. Pp. cxviii+272. (London: Taylor and Francis.)

Cambridge Botanical Handbooks. Algæ. Vol. i. By Prof. G. S. West. Pp. x+475. (Cambridge: At the University Press.) 25*s*. net.

Twenty-ninth Annual Report of the Bureau of American Ethnology to the Secretary of the Smithsonian Institution, 1907–1908. Pp. 636. (Washington: Government Printing Office.)

Thirtieth Annual Report of the Bureau of American Ethnology to the Secretary of the Smithsonian Institution, 1908–1909. Pp. 453. (Washington: Government Printing Office.)

Differential and Integral Calculus. By Dr. C. E. Love. Pp. xviii+343. (London: Macmillan and Co., Ltd.) 9*s*. net.

DIARY OF SOCIETIES.

THURSDAY, NOVEMBER 30.

LINNEAN SOCIETY, at 5.—(1) The Floral Anatomy of some Compositæ; (2) Demonstration on the Force for Dispersal of Fruits: J. Small.—A Note on the Seed of *Iris pseudacorus*, Linn.: T. A. Dymes.

SATURDAY, DECEMBER 2.

GEOLOGISTS' ASSOCIATION, at 3.—The Palæoliths of Farnham: H. Bury.

SELBORNE SOCIETY, at 5.30.—Russian Ideals and Potentialities; Baron Alphonse Heyking.

MONDAY, DECEMBER 4.

ROYAL GEOGRAPHICAL SOCIETY, at 8.30.—The Kansu Marches of Tibet: R. Farrer.

ARISTOTELIAN SOCIETY, at 8.—The Function of the State in Promoting the Unity of Mankind: Dr. B. Bosanquet.

ROYAL SOCIETY OF ARTS, at 5.—Coal and its Economic Utilisation: Prof. J. S. S. Brame.

TUESDAY, DECEMBER 5.

INSTITUTION OF CIVIL ENGINEERS, at 5.30.—Keadby Bridge (*Discussion*): J. B. Ball.—Experiments on Earth-pressures: P. M. Crosthwaite.

RÖNTGEN SOCIETY, at 8.15.—Some Remarks upon Pastilles: Dr. Levy and Mr. Stenning.

WEDNESDAY, DECEMBER 6.

ENTOMOLOGICAL SOCIETY, at 8.—Descriptions of South American Micro-Lepidoptera: E. Meyrick.

SOCIETY OF PUBLIC ANALYSTS, at 8.—Copying-Ink Pencils and the Examination of their Pigment in Writing: C. A. Mitchell.—Brazilian Oil Seeds: E. R. Bolton and Dorothy G. Hewer.

ROYAL SOCIETY OF ARTS, at 4.30.—The Coal-tar Colour Industry: C. M. Whittaker.

GEOLOGICAL SOCIETY, at 5.30.

THURSDAY, DECEMBER 7.

ROYAL SOCIETY, at 4.30.—*Probable Papers:* The Cytomorphosis of the Marsupial Enamel-organ and its Significance in Relation to the Structure of the Completed Enamel: J. T. Carter.—The Development of the Pancreas, the Pancreatic and Hepatic Ducts in *Trichosurus vulpecula*: Margaret Tribe.—The Fossil Human Skull found at Talgai, Queensland: S. A. Smith.—The Typical Form of the Cochlea and its Variations: H. J. Watt.—The Structure and Biology of Archotermopsis, together with Descriptions of New Species of Intestinal Protozoa, and General Observations on the Isoptera: Dr. A. D. Imms.

CHILD STUDY SOCIETY, at 6.—Psycho-analysis in Relation to Children: Dr. Constance E. Long.

CHEMICAL SOCIETY, at 8.—Spinacidene: A New Hydrocarbon from certain Fish-Liver Oils: A. Chaston Chapman.—The Nitration of 2-acetylamino-3:4-dimethoxybenzoic acid and 3-acetylamino-1:2-dimethoxybenzene: C. S. Gibson, J. L. Simonsen, and M. G. Rau.

FRIDAY, DECEMBER 8.

ROYAL ASTRONOMICAL SOCIETY, at 5.

MALACOLOGICAL SOCIETY, at 7.—A Revision of the Species of the Family Pleurotomidæ occurring in the Persian Gulf, Gulf of Oman, and Arabian Sea: Dr. J. Cosmo Melvill.—The Occurrence in England of *Helicella neglecta*: A. S. Kennard and B. B. Woodward, with Notes on the Anatomy by Dr. A. E. Boycott, and on the Radula by the Rev. E. W. Bowell.—The Occurrence of *Eulota fruticum* in a Living State in Kent: A. S. Kennard and B. B. Woodward.

CONTENTS.

	PAGE
American Books on Agriculture. By E. J. R.	245
Matter and the Structure of the Ether	246
Flotation of Ores. By H. L.	246
Our Bookshelf	247
Letters to the Editor:—	
A Further Probable Case of Sex-limited Transmission in the Lepidoptera.—J. W. H. Harrison	248
Scarcity of Wasps.—Rev. C. S. Taylor	248
The Reconstruction Committee and its Sub-Committees	249
Government Control over Flour. By William Jago	250
Science and the Civil Service	251
Possible Potassic Fertilisers	252
Notes	253
Our Astronomical Column:—	
Ephemeris of Comet 1916*b* (Wolf)	257
The Great Red Spot on Jupiter	257
The Meteoric Shower from Biela's Comet	257
The Colours of Stars in Globular Clusters	257
Fossil Vertebrate Animals. By A. S. W.	257
Studies of Hymenoptera. By G. H. C.	258
Observations on Recently Discovered Fossil Human Skulls. By Prof. G. Elliot Smith, F.R.S.	258
The British Association at Newcastle:—	
Section M—Agriculture—Opening Address (Abridged) by E. J. Russell, D.Sc., President of the Section	259
University and Educational Intelligence	261
Societies and Academies	262
Books Received	264
Diary of Societies	264

Editorial and Publishing Offices:

MACMILLAN & CO., LTD.,

ST. MARTIN'S STREET, LONDON, W.C.

Advertisements and business letters to be addressed to the Publishers.

Editorial Communications to the Editor.

Telegraphic Address: PHUSIS, LONDON.

Telephone Number: GERRARD 8830.