THURSDAY, MAY 11, 1916.

HARVEY AND ARISTOTLE.

Harvey's Views on the Use of the Circulation of the Blood. By Prof. J. G. Curtis. Pp. xi+194. (New York: Columbia University Press; London: Oxford University Press, 1915.) Price 6*s.* 6*d.* net.

UNPRETENDING as it is, this is an admirable little book. It is concise but full of matter, is scholarly and accurate, and, for those who concern themselves with the history of ideas, very interesting. It is a curious thing that of the scores of orators on Harvey none has given any considerable place to a closer discussion of the relations of Harvey to Aristotle and to Galen. Some of us have touched upon the attitude of Harvey towards the overbearing tradition of these two great ancients, and of the degree, or terms, in which he doggedly asserted his independence of it, or in which he admitted their doctrines or approved their speculations; but no one seems to have completed the task of setting forth exactly how far the ideas, let us say, especially of Aristotle and of Harvey, coincided or diverged. This Prof. Curtis has done, and done finally. Unhappily, upon the appreciation of the reviewer there lies a shadow: this able and interesting scholar died, in September 1913, before the publication of his work. At the author's request, this volume has been edited by his colleague, Frederic Lee, of Columbia University.

Prof. Curtis considers first the attitude of Harvey towards the question of the uses of the alleged circulation of the blood. Why, said not only his opponents but also the master himself, why, if the blood is but a nutrient fluid, need it be scampering in every second of time all round the mammalian frame! Here Harvey was himself a little puzzled; about the respiratory functions and the nature of combustion he was, if I may venture to say so, somewhat less far-seeing than had been some of his remote forerunners, or even Columbus. Unfortunately, he abhorred chemists, seeing, no doubt, very unfavourable examples of the craft. With the supposed cooling effect of the pulmonary ventilation Harvey remained fairly content. The redness of the arterial blood he attributed to a filtering effect of the lungs.

Another principal chapter of Prof. Curtis's history is, of course, concerned with the well-known Aristotelian primacy of the heart. This hegemony Harvey ardently contested; only to put in its place the primacy of the blood. Aristotle's cardiac primacy connoted far more than Harvey dealt with, but, narrowly speaking, when Harvey makes the blood the seat of the Innate Heat—not to mention the soul—and speaks of innate heat as an entity, and, furthermore, as an uncaused entity, it is not apparent that Harvey's view was more far-seeing than Aristotle's. Whether the heart heats the blood, or the blood possesses heat as an innate quality, scarcely seems to us, nowadays, to demand much discussion. Were Prof. Curtis still with us one might have asked of him if the truth were not that the ascendant genius of both these great men was not as philosophers, but as observers. Imagination was not the strength of either of them. Like Aristotle, Harvey, in speculative genius, was surpassed by many of his predecessors and contemporaries. The great Ionian thinkers were full of wonder, as well they might be, whence and how came motion. But this problem did not trouble Harvey overmuch; as an observer he recognised the activity of the circulation, as he saw it, from the *punctum saliens* to the human heart; and when the problem of its origin became pressing he was fain to follow Aristotle, and to find it akin to the quintessence—the motive principle of the stars. The circulation of the blood was one of the subordinate tides of the circulation of the heavens. As regards the heart itself Harvey was no mystic; the blood was the potential, the heart he reduced almost to a muscular pump. But he had no lively idea of the circulation as a hydrostatic and hydraulic mechanism, and, perhaps, before Torricelli and Hales, could not have had.

One may, with all respect, hesitate to be sure that Prof. Curtis was familiar with the pre-Aristotelian thinkers, and the commentaries upon them of Diels, Wellmann, Gomperz, and others. Zeller, indeed, he does mention in one place. It is not altogether reassuring to be referred once or twice to Cicero as a source of our knowledge of their conceptions. From Harvey to Aristotle we are carried back on sound learning, but there, as at a sort of butt end, we stop. The author may have decided, of course, that these were to be the limits of his volume, and properly kept to them. But the history of the circulation cannot be dealt with historically without a wider survey of the doctrine, and beyond the doctrines the ideas, of the pneuma, and of what I have called elsewhere the pathetic quest after oxygen, than he had allowed himself to undertake. That elusive stuff "between air and fire," so keenly apprehended by the Ionians and repeated by Galen, is scarcely congenial to Harvey, or, indeed, to Aristotle. Harvey declared that the "innate heat" was not akin to fire, which he said was a sterilising agent; he was probably unaware of the profound and ancient distinction between fire in its capacity as an artificer and as a destroyer.

It is tantalising, under the restriction of present limits, to bring the review of this remarkable book to an end with so inadequate a discussion of the principles discussed in it, and with no note of the many particulars on which one would gladly have tarried. The notes of reference to quotations are constant and accurate; would they had been, or most of them, footnotes. Incessantly to be turning to and fro between the text and an appendix is a nuisance.

CLIFFORD ALLBUTT.

THE FRESH-WATER FISHES OF AFRICA.

Catalogue of the Fresh-water Fishes of Africa in the British Museum (Natural History). Vol. iv. By Dr. G. A. Boulenger. Pp. xxvii+392. (London: British Museum (Natural History), and Longmans, Green and Co., 1916.) Price 30*s*.

THE British Museum has recently published the fourth volume of Mr. G. A. Boulenger's "Catalogue of the Fresh-water Fishes of Africa." Thus is brought to a conclusion—at any rate, for some years to come—a work of very great value. Mr. Boulenger's research into the ichthyology of the African rivers and lakes has gone far beyond a mere catalogue of species. It began to attract attention nearly twelve years ago by the light that it threw on the past geological history of Africa, the former superficies of this continent at different times in regard to rising and falling levels of land, the connections of the continent with outlying islands, the desiccation or the flooding of great areas of land in the interior, the increase or the restriction of river basins and of lake limits. Briefly summarised, it went to show that the Nile system in past times has been in direct communication with the now isolated Lake Rudolf, and has come very near to the Chad Basin, which again has communicated intermittently with the Niger, while the Niger or its upper portion may at one time have had an outlet into the Atlantic in common with the Senegal, and have been separable by only a few miles of land from the upper waters of the Gambia, the Volta, and of all those streams that flow from north to south through the forests of Guinea and the Gold Coast into the great African Bight. On the other hand, it showed a comparative poverty and isolation in fish fauna of the Zambezi Basin and South Africa; and it illustrated, above all, the specialised character and wealth in fish-fauna of the Congo Basin. This region (with which Tanganyika was not always connected) must have approached very closely to the upper waters of the Gaboon and Cameroons rivers to account for the near relationship between their fish-fauna and that of the Congo Basin.

So far back as 1870, Dr. Günther, of the British Museum, could only catalogue about 255 species of African fresh-water fish. Mr. Boulenger raised this number in 1906 to 974; but he is enabled in the volume now under review to put the total of species at 1425.

In this amazingly complete survey of African fishes he has been helped by many enthusiastic collectors and students, and directly or indirectly by the Belgian, French, and Luxembourg Governments, as well as by those of Egypt and the Union of South Africa. Volume iv. of this magistral work deals with the fresh-water Gobies, the Anabantids or "climbing perch," the Mugilids or Mullets, the Blennies, the Mastacembelids (anguine in form, and so often taken by negroes to be water snakes because many of them are handsomely marked with viperine patterns), and the Tetrodonts. In addition, there is matter supplementary to the other volumes, which gives us further information in regard to the presence of "saw fish" sharks (Pristis) in the rivers of Portuguese Guinea; additional knowledge of the Polypterids of Portuguese Guinea and Liberia, and of that very interesting aberrant type, the Calamichthys of Calabar; of the Mormyrids of the Juba River (Somaliland) and of Portuguese Guinea, Northern Zambezia, the Upper Wele, Lake Bangweulu, and the Lower Niger; of the fresh-water herrings of Angola, the Characinids of western Congoland and Portuguese Guinea, Cyprinids from all parts of Africa, including the far south, and Silurids of an equally wide scope. (It is interesting to note, by the way, that there is a species of fish—*Salarias*, a Blenny—shared between Madagascar and Réunion Island.)

A tribute is justly paid by Mr. Boulenger to the magnificent collecting work accomplished by the late Dr. W. J. Ansorge, who, after exploring Uganda and other parts of Africa in the medical service of the British Government, devoted himself, on his retirement, to a systematic examination of the fish (and other) fauna of Portuguese West Africa, especially Angola and the little-known Portuguese Guinea. It is to be hoped that men like these, who have died in the prosecution of really noteworthy scientific research, might be commemorated by tablets let into the walls of the British Museum of Natural History.

H. H. JOHNSTON.

THEORETICAL AND PRACTICAL CHEMISTRY.

(1) *The Theory of Valency.* By Dr. J. Newton Friend. Second edition. Pp. xiv+192. (London: Longmans, Green and Co., 1915.) Price 5*s*. net.

(2) *Qualitative and Volumetric Analysis.* By W. M. Hooton. Pp. 86. (London: Edward Arnold, 1915.) Price 3*s*. net.

(3) *Laboratory Manual arranged to accompany "A Course in General Chemistry."* By Profs. W. McPherson and W. E. Henderson. Pp. v+141. (Boston and London: Ginn and Co., 1915.) Price 3*s*.

(4) *The Rugby Course of Elementary Chemistry.* By H. P. Highton. Pp. 79. (London: Edward Arnold, 1915.) Price 2*s*. 6*d*.

(1) THE perusal of a treatise on valency leaves an impression of incompleteness and uncertainty, of a mass of theories no single one of which can claim to correlate and interpret more than a portion of the relevant facts. This aspect of the matter, to which reference was made in the review of the first edition of Dr. Friend's excellent volume (NATURE, 1909, lxxx., p. 395), has been accentuated by recent work on radioactivity, and the modified views with regard to chemical combination and valency to which this work has led. The author, although fully aware of the extent to which earlier conceptions are undergoing change, points out that nothing like finality has been reached. He therefore does not

attempt in the present volume any full discussion of the latest views, and merely indicates the main lines along which progress is being made. This is a wise decision.

The chapter on "Exceptions to the Periodic Law" has been enlarged by a brief consideration of the valency of the metals of the rare earths, and their position in the periodic table, as well as by a short discussion of the radio-elements and the existence of isotopes. The exposition of Werner's theory given in the first edition has been amplified by an account of Ephraim's work, the results of which have shown that on the whole the strength of the auxiliary valencies falls as the atomic volume of the metal concerned increases. In this connection reference is made to Werner's recent conclusion that there is no essential difference between principal and auxiliary valencies.

Some theories of valency, such as those of Werner, and of Barlow and Pope, postulate the existence of certain forces, and on this basis attempt to formulate the constitution of the molecule. Others, more definitely physical in character, deal with the *origin* of the forces postulated by the chemist, and are therefore affected by any alteration in the views held as to the structure of the atom. These considerations have led the author to devote a few additional pages to the electronic theory of valency, as this has developed in the light of modern work by Rutherford, Bohr, van den Broek, Moseley, Falk, and Thomson. It will be interesting to see how far the conclusions based on this work, as, for example, the assigning of a valency of two to hydrogen and the consequent doubling of the valency numbers of all other elements, will command general acceptance.

(2) The compilation of tests and the tabulation of methods for qualitative inorganic analysis which mainly constitute the first part of this volume are sound enough, but except for slight differences in the arrangement of the matter and in the general get-up, the thing has been done scores of times already. True, the reactions of some of the less common metals and acids are also described, but this scarcely constitutes such a claim to originality as would justify publication.

The second part contains quite a useful selection of exercises in volumetric analysis, and the explanations and directions given are on the whole satisfactory. The relation, however, between the general definition of a normal solution and its interpretation in the case of oxidisers might be put more clearly. Further, in connection with the use of potassium dichromate, the student might legitimately be puzzled by the statement on p. 74 that "a standard solution is made by dissolving a known weight of pure dry $K_2Cr_2O_7$ in distilled water, and its exact strength can be determined by titrating it against a known weight of pure iron in the ferrous state." The author himself, on the following page, points out that the strength of a solution of potassium dichromate, prepared by dissolving a known weight of the pure dry salt and then making up to one litre, is known exactly.

(3) The authors of this first year college laboratory manual, almost conscious that some apology is required for an addition to the large number of such books already on the market, state in the preface that the volume lays no claim to originality, either in method or in content. All that has been done is to select the exercises which the beginner should undertake. It is really time to protest against this unlimited production of elementary laboratory guides, and to point out again the absurdity of the implied claim that slight differences in the character of the experiments proposed and in the order of their arrangement are of such paramount importance. Why not leave something to the judgment and initiative of the teacher?

The arrangement of the experiments suggested by the authors invites criticism. For example, the most elementary examination of the characteristics of acids, bases, and salts is preceded by a chapter in which work is proposed on fractional distillation, protective colloids, and the colour of ions and molecules. Again, the student's attention is not specifically directed to the production and properties of carbon dioxide until more than half the course has been covered.

Even the hints given in the appendix for the benefit of the instructor are not entirely satisfactory. The direction to prepare dilute sulphuric acid by diluting the concentrated acid in the ratio 1 : 4 is a case in point: a 30 per cent. solution of this acid should not be employed as a dilute reagent.

Altogether, it may be said that in a badly-managed or poorly staffed laboratory the volume under review might be useful as a guide, but that for the student in an institution where competent teaching is available the best hint is that given on p. 75—"report to the instructor for quiz on the methods."

(4) The views expressed above as to the scant justification for adding to the number of introductory laboratory manuals are in some measure applicable to this case also. If the "Rugby" variety of elementary chemistry course is to be put before us, why not many others as well, which may have quite as good a claim to publicity? At the same time it may be admitted that this volume, which is intended to cover a period of two school years, contains evidences of originality in the way of suggestive experiments and in the devising of simple apparatus for carrying them out. The course on which the book is based is clearly characterised by thought and initiative on the part of the author and his associates. J. C. P.

OUR BOOKSHELF.

Colour: a Handbook of the Theory of Colour. By G. H. Hurst. Second edition revised. pp. vii + 160. (London: Scott, Greenwood and Son, 1916.) Price 7*s.* 6*d.* net.

THOSE who are interested in colour effects, especially, perhaps, dyers, calico-printers, decorators, students, and, to a lesser degree, artists, will find much useful information in this very

moderate-sized volume. The author deals with the production and cause of colour, phenomena of colour, the eye, effects of contrast, and colour measurement. He quotes largely from the standard works of Chevreul, Rood, and, to a smaller extent, from others. Many useful tables are given with regard to the effects of juxtaposed colours on each other, the illumination of coloured objects by coloured lights, and concerning the colour and luminosity of the solar spectrum. The absorption spectra of about forty of the commonest pigments, dyes, and coloured glasses are shown as curves. There are eleven full-sized coloured plates which illustrate in a striking manner the effects of colour combinations and similar matters, though when the student of colour sees the fourteen absorption spectra that are represented in full colour he will wish that it were possible to get such clean-cut absorptions as the diagrams exhibit.

Although this is a revised edition, there is still room for revision. For example, the reader would imagine from the statement at p. 79 that Thomas Young followed Brewster and Maxwell and criticised their theories. If the starch granules in a Lumiere colour plate were of the size that they are stated to be, the grain would be far too fine to be visible by any microscopical methods; and in this process one does not obtain a negative, and then from this prepare a positive which is "viewed in conjunction with a similar screen." In three-colour printing the negatives are not taken through "red, blue, and yellow screens respectively."

Icones Plantarum Formosanarum nec non et Contributiones ad Floram Formosanam. By Bunzō Hayata. Vol. v., pp. vi+358+xvii plates. (Taihoku: Government of Formosa, 1915.)

THIS fifth volume of the Icones of the Plants of Formosa is devoted especially to new material collected in Formosa since 1912. It is a worthy successor to the previous handsome volumes, and contains studies on 385 species and eight varieties of flowering plants and ferns. The studies are illustrated by seventeen quarto plates and numerous text figures. Two hundred and three of the species are new to science, and twenty-three genera hitherto unrecorded for the island are added to the flora. At present the flora is known to comprise 160 families with 914 genera and 3325 species. One particularly interesting discovery is that of a new species of the ancient fern Archangiopteris, the genus first found by Henry in Yunnan in 1899. The addition of the families Burmanniaceæ and Xrideæ to the flora of Formosa is also noteworthy. A large number of ferns are dealt with in this volume, the majority belonging to the Polypodiaceæ; one plant called *Polypodium urceolare* may not belong to this genus, as it is considered by some pteridologists to be a subgenus of Davallia. A long discussion of the points at issue is given in the text.

The volume is very well printed and the illustrations are remarkably clear and good.

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.*]

Science and the State.

IN view of the efforts that are now being made in many quarters to bring about better relations between science and the State, it is interesting to recall Sir David Brewster's dedication of his "Memoirs of Sir Isaac Newton." It is addressed to the Prince Consort, and dated from St. Andrews sixty-one years ago, and yet it is sufficiently suggestive of the circumstances of the present day to be reproduced in full.

To
His Royal Highness
PRINCE ALBERT, K.G.,
Chancellor of the University of Cambridge.

SIR,—In dedicating this Work to your Royal Highness, I seek for it the protection of a name indissolubly associated with the Sciences and the Arts. An account of the Life, Writings, and Discoveries of Sir Isaac Newton might have been appropriately inscribed to the Chancellor of the University of Cambridge, the birth-place of Newton's genius, and the scene of his intellectual achievements; but that illustrious name is more honourably placed beside that of a Prince who has given such an impulse to the Arts and Sciences of England, and whose views, were they seconded by Statesmen willing to extend Education and advance Science, would raise our country to a higher rank than it now holds, among the nations of Europe, in the Arts of Peace and of War. It is from the trenches of Science alone that war can be successfully waged; and it is in its patronage and liberal endowment that nations will find their best and cheapest defence.

That your Royal Highness may be enabled to realise those noble and patriotic views respecting the national encouragement of Science, and the consolidation of our Scientific Institutions, which you have so much at heart, and that you may long live to enjoy the reputation which you have so justly earned, is the ardent wish of

Sir,
Your Royal Highness's
Humble and obedient Servant,
DAVID BREWSTER.

St. Leonard's College,
St. Andrews, May 12, 1855.

The relation of science to the State is referred to on various occasions in the memoirs; and the financial worry, to which the unfortunate illness of the great philosopher in 1692 is attributed, is held up as a black example of national neglect. The project which Brewster favoured was State support for men of science on the lines of the French Academy, and to the lack of such support Brewster attributed the neglect of the Newtonian philosophy in England, while it was being successfully developed in France by Laplace, d'Alembert, Clairaut, and others.

A perusal of the memoirs at the present time carries other lessons. The fierce controversies among the contemporary men of science about priority and plagiarism, which led Newton, time after time, to abjure the society of philosophers, and the factious criticism which they employed, make it clear that, unless they have changed in character, the fullest recognition of men of science by the State will not be exactly the beginning of the millennium; and they change their

character very slowly. Brewster himself uses language about Thomas Young and the undulatory theory which recalls the fact that though a statesman had a great share in it, it was not the State that drummed the greatest philosopher since Newton out of the ranks of science. Something more of regard for the *genus humanum*, the statesman's care, and a little less attention to the *ingenio superavit*, the examiner's business, seem necessary to give science its true position.

Lest I should be thought merely to be indulging in the prevalent habit of "grousing," let me briefly explain. The exponents of science in this country have allowed the issues of the inevitable conflict of studies in science to be dictated everywhere from the examination point of view. That calamity—for it is nothing short of it—is more largely responsible for the apathy of the State towards science than is generally acknowledged.

So far has our control by examination extended that it is not too much to say that, for the general, our education has become the art of passing examinations without having to think, and the educational profession is, in practice, the only human occupation for which a general education is not required.

The difficulty is a real one, but it must be faced; we must find something better to offer, as our idea of education inspired by the study of nature, than 30 per cent. of what is set out in the examination papers put before an individual student in one or other of the alternative courses controlled by men of science. Specialists are, of course, the *corps d'élite* of the army of science, but they ought to be persuaded not to use the nursery as their battleground. That is our business, and we can do it if we will.

NAPIER SHAW.

The Daylight Saving Scheme.

I SHALL be glad if you will allow me to deal with the objections raised to the daylight saving scheme in NATURE of April 27. I have had to content myself with identifying these by the numbers of your paragraphs.

(1) Though people engaged in the trades you mention may not receive the same benefits from the operation of a Daylight Saving Act as in the case of the rest of the population, those at least who are interested in gardening and in any form of athletics would benefit from an extra hour of daylight at the end of their day, and all would effect a saving in artificial light. I have also dealt with this question in my reply to your objection (6). From the fact that these trades regulate their times more by the sun than by the clock, it must at least be granted that they would take no harm from the Act.

(2) If, as seems probable, the daylight saving principle is universally adopted in Europe, there is no reason why there should be any more chaos than at present. It was not proposed to interfere with Greenwich mean time, and that would remain as the universal standard just as it is to-day. Such difficulties as would arise in this respect are only of such a nature as could be got over.

(3) Those places which get twilight all night would not suffer by an alteration of the clock, even though they might not reap any special benefit. A large majority of the population of Great Britain lives in the southern half of the kingdom.

(4) The reason that the proposed date of altering clock time back to Greenwich mean time was fixed for the third week in September was that at the end of the year the atmosphere in the early morning is usually warmer than that which we experience in March and the beginning of April, frosts being practically unknown in September.

(5) I sincerely hope that the intelligence and resource of the gentlemen responsible for these matters are not of such a low order as to be unable to deal with such questions as may arise.

(6) I think that your approximate calculation of the additional darkness which the early-morning workers would experience has failed to take into account the fact that it is light about three-quarters of an hour before sunrise. Very few of those starting work at 6 a.m. would require to use artificial light to rise by. Certainly in September there would be some additional use of light in the morning.

(7) Granting that there would be some additional use of fuel in the morning, you fail to notice that there would be a corresponding saving in the evening.

(8) Nobody appreciates the value of the scientific method more than I do. Might I suggest that the daylight saving scheme is less a question of absolute science than of social and political science? Your principal argument is that it is the scientific men who should decide as to whether or not the provisions of the measure should be adopted, and that they as a body have not expressed their support. The real reason of this is that it is not a question that interests them as a whole in their scientific capacities. All scientific men are interested in time measurement, but they are principally interested in the actual lengths of the units of time, viz., of minutes and hours. Those who have special interest in the relation of clock time to solar time are practically confined to the astronomers, meteorologists, and navigators. Of the five astronomers who have taken up the subject, three were in favour of the Bill. They were the late Sir Robert Ball, Prof. Rambaut, and Prof. Turner. On the other hand, Sir William Christie and the late Sir David Gill opposed the Bill. To anyone who carefully reads the evidence given by these latter gentlemen before the Parliamentary Committee of 1908, it is quite clear that their opposition was based, not on scientific grounds, but merely on grounds of social expediency, and their replies to the questions of the Committee are largely filled with discussions of the habits of shopkeepers, clerks, factory hands, etc., on which subjects scientific eminence is scarcely necessary in order to make one expert. As a matter of fact, Sir William Christie, in replying to the question, "The idea of the Bill is not altogether so unreasonable as it might on the face of it appear?" replied, "No, my view is rather that it does not obtain the greatest convenience. That is really my argument here," etc.

I should scarcely imagine that the rejection of a private Bill by Parliament would be accepted by men of science as a final test of the social value of the measure; however, this is what you suggest to them. In your section No. 7 you make a suggestion as to the reason of our customary time-table. I think really that our time-table has developed to suit the winter light conditions, as such a one is the only single unaltered time-table which is reasonably workable throughout the year. H. W. M. WILLETT.

Sloane Square, London, S.W., May 2.

[We deal elsewhere in this issue with the main points of Mr. Willett's letter.—EDITOR.]

Avoiding Zeppelins.

A LITTLE knowledge of spherical perspective would materially reduce the loss of life due to Zeppelins. There is no danger from a bomb dropped by one of these vessels unless the latter is approaching the zenith, and will reach there in a few seconds. If the Zeppelin appears inclined—that is, unless one end appears exactly over the other—there is no danger. This is easily seen at a glance, but a plumb-line formed by a stone attached to a string will show this with certainty. The Zeppelin will always pass on the side

towards which the upper end points. If, however, it is vertical, and near the zenith, there is great danger. If its altitude is, for example, a mile, a bomb dropped would occupy 18 seconds in falling, if there were no air. Owing to the resistance of the latter, this time is greatly increased. It is only necessary to run at right angles to the apparent direction of the Zeppelin to be safe, even if one does not start until the bomb is dropped. This rule may be tested by standing under a telephone wire, which may be regarded as representing the path of the Zeppelin. A plumb-line will cover the wire only if the observer is exactly under the wire. No allowance is here made for the wind, which always carries the Zeppelin to leeward. It may be better, therefore, to stand so that the Zeppelin is partially covered by the edge of a house, a flagpole, or other vertical line. There is no danger unless the Zeppelin appears to ascend the line, remaining partially covered as it approaches the zenith. The same principles apply to aeroplanes. At sea, the vessel should take a course at right angles to the direction from which the Zeppelin comes. Of course, these methods are useless if the Zeppelin cannot be seen owing to clouds or darkness, unless it is picked up by a searchlight.

E. C. PICKERING.

April 10.

DAYLIGHT AND DARKNESS.

THE House of Commons adopted on Monday a resolution moved by Sir Henry Norman: "That, in view especially of the economy in fuel and its transport that would be effected by shortening the hours of artificial lighting, this House would welcome a measure for the advancement of clock time by one hour during the summer months of this year." The daylight saving scheme put forward by the late Mr. W. Willett in 1907 has, therefore, now been approved by Parliament, and it is proposed to effect the change of time during the night of Saturday–Sunday, May 20–21. The normal Greenwich time is to be restored during the night of Saturday–Sunday, September 30–October 1. In supporting the motion on behalf of the Government, the Home Secretary, Mr. Herbert Samuel, said it was thought that the change could be effected without legislation by Order in Council, "since this is only a war measure adopted for war purposes." On account, however, of the existence of an Act which defines "hour" in any statute as Greenwich mean time in Great Britain, and Dublin mean time in Ireland, and also because, in conformity with this Act, there are fixed the hours in factories and workshops in which women and children are employed, while a number of other establishments, including licensed houses, are compelled by law to keep certain times, the law must be altered in order that the new time should have legal validity. A Bill is, therefore, necessary, and it was introduced in the House of Commons on Tuesday. There is little doubt that the measure will pass, and that from May 21 to October 1 the legal time will be that of Mid-Europe instead of Greenwich mean time.

The time of sunrise in London on Sunday, May 21, is given in the calendars as 4.2, but by the clocks it will be 5.2; and similarly, though the sun will set at 7.50, we shall call the hour 8.50. The actual time of morning high-water at London Bridge will be 4.12, but the clocks on shore will indicate 5.12; and there will be a like difference between tidal times and public times all around the coast. It will be no longer possible to speak of, say, a two o'clock tide to a navigator at a port, for this must mean Greenwich time to him, as tidal tables have to remain unaltered, whereas his two o'clock will be the landsman's three o'clock. For a large part of the population there will be two legal times from May 21 to October 1, and we shall be surprised if this confusion does not lead to serious mistakes and accidents.

All orders referring to lighting-up times, closing of parks and other places at dusk, burglary as distinct from larceny, and like matters determined by solar time, will need adjustment; in fact, Parliament has now to define legal time afresh. Lighting-up times will, we suppose, continue to be based upon Greenwich times, with the necessary differences for latitude and longitude, for they obviously cannot be determined by the meridian of Mid-Europe. On May 21, for example, the lighting-up time in London is 8.50, and at Liverpool 9.11, but in all cases an hour will have to be added to give the clock times of lighting-up. Here, again, the double standard of time-reckoning—one in calendars and tables, and another in daily use—will be most confusing.

The claims as to the great saving of expenditure on fuel for illumination to be effected by the daylight saving measure are, we believe, largely over-stated. For two months from the end of this month there will be no need for artificial lighting until 9 p.m. or later in any part of the British Isles; and in such places as Newcastle and Glasgow the lighting-up times will be nearer 10 p.m. than 9 p.m. during most of this period. Men of science, like other citizens, recognise the cheapness of using daylight; what they object to is the alteration of clocks, instead of alteration of habits, to induce reasonable use of daylight hours. Whatever time is indicated by the clocks, most people will not retire until an hour or two after the sun has gone and they have used artificial illumination for indoor rest or recreation. Though the clocks will indicate 10.30 when daylight occupations must end during June and July, we doubt greatly whether there will be much reduction of the habitual interval between the close of the outdoor life and the time of retiring.

The daylight saving principle is, in fact, unnecessary for at least half the period during which it is to be in force; and over a large part of the British Isles the hours of actual darkness are then so few that the amount of artificial illumination used cannot be greatly reduced by advancing clocks by one hour. Mr. Willett arrived at the 154 additional hours of daylight which his scheme was to give the country by reckoning an extra hour for each of the 154 days from April 15 to September 15, and our legislators, journalists, and commercial men base their conclusions as to the saving of fuel and light upon this estimate, which they apply to the whole country. If we

omit from the estimate June and July, when the amount of artificial illumination required is very small, and there is no real night, the 154 hours are reduced to 93; and for one-third of this number of days artisans who commence work at 6 a.m. will be given nearly an hour's additional darkness. During the cold and dark morning hours of September we shall expect definite complaints from early workers as to the disadvantages of the scheme to them. If their times are changed to 7 a.m. instead of 6 a.m., they will have to leave an hour later, and the whole purpose of the measure will be defeated.

In a letter to Sir Henry Norman, stating that the Government intended to give facilities for the discussion of his motion on daylight saving, Mr. Herbert Samuel, the Home Secretary, said: "In the House of Commons all interests are represented, and the Government would desire to ascertain its opinion on this question." We submit that the House of Commons is not essentially more competent to discuss the question than it is that of the eccentricity of the earth's orbit or of the obliquity of the ecliptic by which differences in the lengths of days are caused. In the debate in the House on Monday, few points of scientific significance were mentioned, and the matter was considered almost entirely from the point of view of public convenience and the marvellous economy—the amount of which varied with a member's eloquence and calculations—to be effected. It is urged that the views of men of science on social legislation have no greater authority than those of the general public; but, on the other hand, we may be permitted to reply that members of the House of Commons, chambers of commerce, county and borough councils, and like corporations do not understand the scientific aspects of their social measure, and that they, as well as enthusiastic writers in the daily Press, are attracted by a specious plan without regard for its natural significance. By scientific aspects we do not mean the interests of men of science, but the natural conditions of daylight and darkness in different latitudes and longitudes of these islands, and the consequences of a double time-standard. There can be no true discussion of the daylight saving scheme unless this side of the subject is presented as well as the social and economic arguments; and in Monday's debate in the House of Commons, it was left out of account almost entirely.

The fact that Germany has introduced the daylight saving scheme, and has naturally been followed by Austria and Holland, is not a reason why we should adopt it, but the reverse. It is now announced that in Denmark, Sweden, and Norway the same plan is to become effective on May 15 and to extend to September 30, though what advantages the lands of the midnight sun can derive from a daylight saving scheme in summer months are difficult to discover. Germany probably decreed the change of time because we refused to do so, and for us to imitate her now is not complimentary to our national intelligence. The case is different with France, on account of our close relations with that country and because the French time-standard is that of the Greenwich meridian; but the committee of the French Senate appointed to examine the proposal of the Chamber of Deputies has not yet reported in favour of it, and the paper by M. Lallemand of which a summary was given in last week's NATURE adduces cogent reasons against it. As the adoption of Greenwich time by our Ally was a manifestation of the *entente cordiale*, it seems undesirable now to abandon this common standard and use German time unless France wishes to make the change with us.

Most of the foregoing points, with others, were mentioned in an article in NATURE of April 27 referred to by Mr. H. W. M. Willett in a letter which appears in our correspondence columns this week. The intention of the article was to state precisely some of the chief objections to the principle of daylight saving by seasonal changes of the national time-standard. Scientific men think that this standard, like others, should be invariable; advocates of the daylight saving scheme wish the standard to oscillate and to believe that 11 a.m. is noon for five months of the year. Agricultural, engineering, and building trades adapt their hours to the sun, and workers on tidal waters with the tides; but as the tendency of city life is towards lateness of rising and retiring, and as habits are difficult to alter, they are to be counteracted by putting forward the hands of timepieces by one hour during the summer months.

Whether the change may be justified on the grounds of social expediency is not a matter upon which men of science can express an authoritative opinion; but the natural objections and difficulties remain unaltered whatever legislative action is taken. To the fact that for a large part of the population of our islands the daylight saving principle is unnecessary, Mr. Willett's reply that they would not suffer is scarcely sufficient justification for the change. He offers no solution of the difficulties as regards the differences of times in calendars and tide-tables in comparison with the altered civil times, though in a maritime nation such as ours this is a most important point. As to artisans who have to be in the works at 6 a.m., and therefore to rise about 5 a.m., Mr. Willett will find that when longitude is considered, as well as the period of dawn, many thousands of workers will, throughout September, on account of having to rise at what is 4 a.m. Greenwich time, have to rise in the dark instead of in daylight as hitherto. If fuel and light saved in the evening are used in the morning, it is difficult to see how substantial economy can be gained in these cases.

A scientific journal is not concerned with the expediency of a measure, and the facts of Nature are, of course, not affected by social legislation. Whether men of science support or oppose the daylight saving scheme may be of little conse-

quence; but they are, at any rate, best able to understand its meaning, and to distinguish between promise and performance. It remains for the general public to arrive at the same state of knowledge by experience.

GERMAN METALLURGY AND BRITISH METHODS.

MUCH attention has been devoted in the Press recently to the strong position of the German metallurgical industries, both before the war, and now after a year and three-quarters of stress. It is not too much to say that apart from this metallurgical industrial foundation, the war would have ended in three months. The growth of modern German metallurgy is due largely to two causes, and these are closely connected in origin and result. They are trade combinations, such as are represented by the "Stahlwerksverband," and scientific management and control. As we have said, these are closely associated, for apart from large undertakings, with regular output, there can be no large laboratories, with highly trained and reasonably remunerated scientific staffs. On the other hand, apart from scientific direction the success of large combinations, such as Krupp's, would be impossible. The tendency of the war appears to have been in the direction of unifying and standardising many of our metallurgical industries, and this tendency is likely to continue when peace is proclaimed.

At present, owing to the war, there is a considerable demand for metallurgists in this country, and more particularly for such as have had a few years' works experience in addition to college training. Hitherto, the supply of such men has roughly met the demand, but the number trained has been wholly inadequate to the real needs of the country. The crux of the question is the want of recognition on the part of manufacturers of the value of scientific knowledge in their businesses. Three results may be expected from the work of a properly trained metallurgist, namely, greater uniformity, economy, and originality. But the system adopted in many British establishments, and particularly in those of moderate size, will never yield satisfactory results. A young man straight from college is appointed at a salary of perhaps 120*l.* per annum, placed in a small, ill-ventilated room, supplied with the minimum of apparatus, and kept on routine analyses. No prospect is held out to him of regular advancement, or of profit sharing. He sees office boys, who have had nothing spent on their education, promoted to be secretaries and general managers, because they come into personal contact with the directors; while he remains unseen and unknown to the powers that be.

Some public-school boys and university trained men are, from weakness of character, unfit for positions of responsibility. But the great majority of them are of a different type, and form the very best of our young manhood, as we see in other directions alike in peace and war. The position of the scientifically trained man in our metal works is very unsatisfactory. He has no trade union to protect his interests, and no professional body which is strong enough to fix a reasonable scale of remuneration. If our metallurgical industries are to be carried on successfully after the war many more properly trained metallurgists will be required. Capable men will only be attracted if suitable inducements are offered; otherwise they will naturally drift into other employments. In the midland counties, for example, the bright son of a local resident can be trained, at the expense of the State, to become an elementary schoolmaster; he will work twenty-five hours per week, and receive a pension. Or he may decide to study metallurgy, in which case he must spend at least 300*l.* on fees and maintenance, and devote three years to study. He will then get no higher stipend than the schoolmaster, no pension, and be expected to work about fifty hours weekly.

In Germany the value of scientific training has been long recognised. If we are to retain our position after the war it will be by development of industrial undertakings which are conducted on a large and comprehensive scale. Such employers alone can, as a general rule, utilise the best scientific training, or adequately remunerate and recognise their properly trained assistants. A man who has been trained on broad scientific lines is not merely capable of conducting, or superintending, accurate analyses. If he is treated as a confidential adviser, like a doctor or a lawyer, his abilities will have free scope. It is by such men that we can hope rightly to direct the large metallurgical operations which will be more than ever necessary in this country after the war.

T. T.

A MARKET-GARDEN RESEARCH STATION.[1]

FEW people other than those connected with the trade know of the extent and importance of the market-growing industry in this country. The general public is so accustomed to imposing statistics of imported fruit and vegetables that it is apt to ignore the not unsatisfactory fact that a large proportion of the market produce consumed in this country is home-grown. Still less does the public realise the extent of the capital and the skill and enterprise of the growers engaged in this industry. Although it may be regarded as lying beyond the scope of this severely practical first report of the work of the research station recently established by the growers in the Lea valley, we could wish, nevertheless, that the director had prefaced his account of the year's work by a short statement of the "statistics of production" in the market-growing industry. For we believe that such a statement would evoke widespread interest among the intelligent public.

Those who know of the origin and purpose of this new research station believe that it is destined to do a great work, and are anxious that its activities may not be curtailed by reason of insufficient

[1] First Annual Report (1915) of the Experimental and Research Station. (Nursery and Market Garden Industries' Development Society, Ltd.).

funds. The more widely its aims are known the greater the chances of this station receiving the support which it deserves. For deserve it, it does. When hard-headed, hard-working, practical men band themselves together and put their energies and money into the establishment of a research station, and particularly when these men are Englishmen, they deserve no less support than is given to a polar expedition or a football cup-final. Fortunately, this enterprise, due in the first place to the initiative of the Lea Valley and District Nurserymen's and Growers' Association, and also, as we believe, to the persuasive enthusiasm of Dr. Russell, of Rothamsted, has received a generous measure of support from the Board of Agriculture, from the Hertfordshire and the Essex County Councils, and from the Duke of Bedford. With the funds thus obtained laboratories and experimental glasshouses have been built at an outlay of 3278*l.*, of which sum all but 650*l.* has been paid.

A brief account of the preliminary researches carried out during 1915 will serve to indicate what a number of problems of practical importance emerge so soon as the searchlight of investigation is turned on an industry. As a preliminary to the investigation of yields of tomatoes, the soil of the five houses built for the cultivation of this crop was standardised. The soil in each house received the same amounts of lime, straw-manure, and bone-meal, and also similar treatment with respect to mulching, top-dressing, watering, etc. Fifteen varieties of tomato were grown in each of the five houses. Yet in spite of the similarity of soil conditions and of plants, the yields from the houses varied very considerably. House No. 2 stood highest with 3 tons 19 cwt. of fruit, and house No. 5 lowest with 3 tons 6 cwt.; in each case from 918 plants. Is this difference, which amounts to about 16 per cent., to be accounted for on the basis of experimental error, or is it to be attributed to some varying factor, such as the seed? In other words, would the isolation of pure lines of tomatoes help to bring the lower nearer to the higher yield? We have no doubt but that it would; but evidently the last word must lie with experiment.

Tests with humogen carried out with tomatoes and cucumbers offer no ground for the hope that this material is destined to replace manure or reduce cost of production. As with the experiments at Wisley and elsewhere, so here; the addition of humogen led to little or no increase in the crop, and the present writer is steadily inclining to the opinion that the remarkable results obtained at Kew were due to the accidental admixture of some fertiliser—presumably a phosphate—with the humogen which produced those results.

Very interesting are the results recorded in the report of observations on the yield of cucumbers from the slightly warmer and slightly cooler halves of four houses. In each case the part of the house nearer the boiler, and hence appreciably warmer, gave a lower yield. Anyone who has experienced the tropical warmth of a cucumber house must have felt that it was too much of a good thing. It looks as though the plants feel this too, and that a little rest from intensive speeding up of production is no less beneficial to them than to other living things. The director, Mr. A. B. Lister, is to be congratulated on the excellent start that he has made. He has a fine opportunity, and we feel sure that he will use it to the best advantage of the society which has had the enterprise and faith to harness science to the market cart. They will remember, however, that she is slow-moving, not showy, expensive to keep, and, above all, needs to be given her head. F. K.

NOTES.

IT is announced that the Government has decided to send an expedition to the Antarctic to relieve Sir Ernest Shackleton. The failure of the *Endurance* to put in an appearance gives cause for considerable anxiety; and while it is not impossible that she may still return unaided, no time can be wasted in organising relief. The arrangements for the expedition are to be put in the care of a small committee of polar experts, which is now being formed. Among those who will probably be asked to give their advice are Dr. W. S. Bruce, who is almost the only explorer in this country who knows the Weddell Sea, and Sir Douglas Mawson. Capt. J. K. Davis, who was recently in London on a short visit, has already been consulted. The choice of a ship will be difficult, as there are very few vessels in existence which are suitable for navigation in the Weddell Sea. In all probability the *Aurora*, despite the damage she has sustained, can be refitted and sent to the Ross Sea to fetch Capt. Macintosh and his comrades, who were left ashore in Erebus Gulf. Mr. Stenhouse, who brought the *Aurora* to New Zealand, is now on his way to this country.

A BRONZE memorial tablet to the memory of Capt. Scott and his companions, who perished on their return journey from the South Pole, has been placed in St. Paul's Cathedral. The memorial takes the form of a medallion portrait of Capt. Scott and a relief panel of the polar party on the march. It is surmounted by three allegorical figures—Discipline, Glory, and Courage. The tablet is the work of Mr. S. N. Babb, and is part of the national memorial scheme to the lost explorers, for which funds were collected when the news of the disaster became known. The inscription reads:—"In memory of Captain Robert Falcon Scott, C.V.O., R.N., Dr. Edward Adrian Wilson, Captain Lawrence Edward Grace Oates, Lieut. Henry Robertson Bowers, and Petty Officer Edgar Evans, who died on their return journey from the South Pole in February and March, 1912. Inflexible of purpose—steadfast in courage—resolute in endurance in the face of unparalleled misfortune—their bodies are lost in the Antarctic Ice—but the memory of their deeds is an everlasting monument." Mr. Asquith, in unveiling the memorial last Friday, said that whatever softening influences may have been at work during our long years of peace, there were never wanting men of our race to maintain our best traditions of courage and endurance. The heroism of the lonely end of Scott and his companions might, in these crowded days of great opportunity, be equalled, but could not be surpassed. These were men who, before the great ordeal which, on a world-wide stage, is now testing our national manhood, showed in the dim polar twilight, without witnesses, and, for all they knew, with no record which would ever reach their countrymen, the supreme quality of self-forgetful courage and endurance.

THE *Nieuwe Courant* learns from Frankfort that Prof. August von Wassermann, at present head of the Royal Institute for Infectious Diseases at Berlin, will be appointed director of the Institute for Experimental Therapy and of the Georg Speyerhaus at Frankfort, in succession to the late Prof. Paul Ehrlich.

SIR R. HAVELOCK CHARLES, Serjeant-Surgeon to the King, and President of the Medical Board of the India Office and of the Society of Tropical Medicine and Hygiene, has, at the request of the Secretary of State for India, accepted an invitation to become dean of the London School of Tropical Medicine in succession to the late Sir Francis Lovell.

ANNOUNCEMENT was made in the House of Commons on May 8 that the following had been appointed a Committee to inquire into the administration of the Royal Flying Corps:—Mr. Justice Bailhache (chairman), Mr. J. G. Butcher, M.P., Mr. E. Shortt, M.P., Mr. J. H. Balfour Browne, K.C., the Hon. Sir C. Parsons, K.C.B., and Mr. Charles Bright. A military officer of high rank is to be invited to join the Committee.

ON account of the war, the council of the British Medical Association has decided to postpone as regards 1916 the holding of an annual meeting at Cambridge. In the present circumstances the council has arranged that the annual representative meeting and statutory general meeting shall be held at the Connaught Rooms, London, on Friday, July 28. In the annual report, to be presented at that meeting, the council recommends that Sir T. Clifford Allbutt be elected president of the association for 1916–17.

UNDER the auspices of a commission appointed by the Imperial Academy of Sciences of Petrograd, a series of monographs is being published dealing with the natural resources of the Russian Empire. No. 5 of the series (Petrograd, 1916) treats of the native sources of tungsten and tin ores. The author, P. P. Suščinskij, says that hitherto neither the mining nor the smelting of these ores has been organised on a regular basis in Russia, but that quite recently, in response to the requirements of Russian industry and of the Imperial Defence Committee, an electro-metallurgical company has been formed in Petrograd for the preparation of special kinds of steel for the Admiralty. The article concludes with an illustrated account of Russian tungsten and tin mines.

THE annual meeting of the British Science Guild will be held at the Royal Society of Medicine, 1 Wimpole Street, London, W., on Wednesday, May 17, at 4.0 p.m. The chair will be taken by the president, the Right Hon. Sir William Mather, P.C., and an address will be given by the Right Hon. Andrew Fisher, P.C., High Commissioner for the Commonwealth of Australia, on "The Establishment of a National Institute of Science and Industry in Australia." Other speakers will be Sir Alfred Keogh, K.C.B., Dr. R. Mullineux Walmsley, Sir John S. Young, and Prof. J. Perry, F.R.S. On account of the public attention recently given to the relation of science to national affairs, the meeting this year will be of exceptional interest. Tickets of admission may be obtained from the secretary, British Science Guild, 199 Piccadilly, London, W.

MR. CORNELIUS HANBURY, who died on April 11, in his eighty-ninth year, was the chairman of the board of directors of the well-known firm of Allen and Hanburys, Ltd. Although Mr. Hanbury had trained and qualified for the medical profession he entered the business very early in his career, and eventually became the sole proprietor. Under his able guidance rapid development took place, laboratories and other premises being established at Bethnal Green, and, after the conversion of the business into a company, at Ware also. He was cousin of the late Daniel Hanbury, whose work in connection with the natural history of drugs is recognised as classical, and also of the late Sir Thomas Hanbury, whose magnificent gardens at La Mortola, near Mentone, were the admiration of every scientific botanist. Mr. Hanbury served for some years on the council of the Pharmaceutical Society of Great Britain, acting as treasurer from 1876 to 1878.

PROF. H. P. WIJSMAN, whose death at Utrecht on March 19 is announced, was the son of an Amsterdam pharmacist, and studied at the Amsterdam University under Profs. van't Hoff, de Vries, and Oudemans, taking the degree of Doctor of Science in 1889. Very shortly after graduating he was appointed chemist to a yeast and spirit factory at Delft, but soon resigned this position to become professor of toxicology at Leyden University. To great versatility Prof. Wijsman added, in an unusual degree, the desire and ability to organise. He was instrumental in founding a pharmaceutical laboratory in Leyden, and in establishing an analytical bureau and an Imperial control station for milk, butter, and cheese. On his return from the Dutch East Indies, he took an active interest in the development of the celebrated Colonial Museum of Haarlem and its transference to the more central position of Amsterdam. He represented the Dutch Government at numerous scientific congresses, and attracted considerable attention at the recent International Pharmaceutical Congress at The Hague by a lecture on the cultivation of important plants in Java, which was illustrated by a series of kinematograph films. Prof. Wijsman's ability and geniality gained him many friends, and his loss will be felt by his British as well as by his Dutch colleagues.

THE death of Mr. C. Lees Curties, which occurred on April 24, will be greatly lamented by a large circle of scientific men, many of whom will feel that they have lost a personal friend, as well as a notable figure in the optical world. He and his father before him had built up a unique business, and 244 High Holborn was regarded by many as a rendezvous where one was sure to meet some kindred spirit and to hear the latest scientific news. Mr. C. L. Curties greatly extended the business by the establishment of a factory where microscope stands are made, and of an optical department for the construction of object glasses. He had a thorough knowledge of the microscope (of which he was a most expert manipulator), as well as a wide and varied acquaintance with all sorts of scientific instruments, owing to the great number that was constantly passing through his hands. He was always ready to place his expert knowledge at the disposal of anyone who asked his advice. There can be little doubt that his death was hastened by the heavy strain due to extra work on account of the war, and to his persistent refusal to give himself a much-needed holiday.

WE have just learned with regret that Prof. Jules Gosselet died at Lille on March 20, as the result of a chill contracted while arranging his geological collection in the University after recent disturbance by the bombardment of the city. Prof. Gosselet was born at Cambrai (Nord) on April 19, 1832, and began his well-known geological researches in the Franco-Belgian coalfield and surrounding regions in 1852. From 1865 until 1902 he was professor of geology and mineralogy in the University of Lille, and numbered among his pupils many distinguished French geo-

logists, including his successor, Prof. Charles Barrois. From 1876 onwards he co-operated with the Geological Survey of France, and in 1888 published his classic memoir on the geology of the Ardennes. His work on the Devonian and Carboniferous rocks especially was not only of fundamental scientific value, but also touched many problems of economic geology which were of immediate importance to the community in which he lived. He was an inspiring teacher and an ideal leader of field excursions, and retained his active enthusiasm until the end. On his retirement in 1902 his friends and admirers established a Gosselet prize for geology, and placed a bust in the museum he founded at Lille, and the account of the proceedings in the *Annales de la Société Géologique du Nord* (vol. xxxi.) is accompanied by an excellent portrait of the professor. He was a foreign member of the Geological Society of London, and was awarded its Murchison medal in 1882.

THE memorandum advocating the substitution of nitre-cake for sulphuric acid in the manufacture of sulphate of ammonia, recently issued by the Ministry of Munitions, having been severely criticised, the proposal has been examined by the Sulphate of Ammonia Association. The latter body recommends makers of sulphate of ammonia to use nitre-cake as a temporary expedient for the duration of the war, subject to the following considerations:—(1) That no attempt be made to produce a salt containing less than 24 per cent. of ammonia unless special forward contracts can be made with manure mixers for lower qualities; (2) that the nitre-cake used should not contain more than 0·05 per cent. of nitric acid; (3) that the quantity of nitre-cake should not exceed 10 per cent. by weight of the acid used, except in special circumstances. If a larger quantity than 10 per cent. of nitre-cake is employed difficulties arise from two causes: first, from precipitation of sodium sulphate, resulting in the production of an irregular quality of salt; secondly, from irregular working of the bath owing to the impossibility of control without frequent titration.

SOME French anthropologists have taken the trouble to examine on scientific principles the character of the remarkable wooden Hindenburg figure which the enthusiastic German loyalists have been invited to decorate with nails of gold and other metals. In *L'Anthropologie* (vol. xxvii., Nos. 1–2, for January-April) M. R. Verneau compares them with a collection of remarkable fetishes decorated in the same way by the negroes of equatorial Africa and the adjoining regions, of which he gives a number of excellent illustrations, both animal and human. He expresses the pious assurance that the German devices will be as useless as the savage fetishes from Loando, and that it is not by the use of such methods current in the lower culture that the ultimate triumph of civilisation can be prevented.

IN the Journal of the Royal Society of Antiquaries of Ireland for December, 1915, Mr. J. J. Buckley contributes an interesting article on some early ornamented leather work. Ireland possesses many specimens of this class of work, such as the satchel which holds the famous MS., the Book of Armagh, in the library of Trinity College; that associated with the shrine called the Breac Moedóig in the National Museum; and a binding of the Life of St. Columba in the Franciscan Library, Dublin. Other satchels of the same type are preserved at Stonyhurst College and at Corpus Christi College, Oxford. There is good evidence that the Irish in very ancient times were acquainted with the use of oak bark for tanning leather, but whether this process was used in the manufacture of the material of these satchels is uncertain. The date of these specimens still remains a matter of speculation. That of the Book of Armagh was obviously not made to protect the MS., and the same appears to be the case with the specimen in the National Museum. But that at Corpus Christi College seems to have been made for the book which it covers. The satchel at Stonyhurst has been attributed to the seventh century, but Count Plunkett places it as late as the beginning of the seventeenth. In any case, the style of ornamentation is early, and it may be hoped that as we now possess in this paper excellent photographs, a further study will decide the date of a class of work which is of interest for the study of Irish art.

IN NATURE of December 30, 1915 (vol. xcvi., p. 487), appreciative reference was made to part ii. of the third volume of the monograph by Howard, Dyar, and Knab on the mosquitoes of North and Central America and the West Indies. It was remarked in the note that vol. ii., containing the illustrative plates, "has presumably not yet been published, as we are unable to trace its receipt." Dr. L. O. Howard writes to remind us that vol. ii. was issued at the same time as vol. i. (1912), and this fact is mentioned in a long review published in NATURE of June 26, 1913 (vol. xci., p. 420).

IN the *Zoologist* for April Capt. Philip Gosse contributes a brief but very welcome account of the mammals which he obtained in Flanders during such leisure moments as his duties with a field ambulance allowed him. The list is not a long one, but it contains some interesting items, among which figure some noteworthy colour variations of the water shrew (*Neomys fodiens*). The black rat he found to be pretty common in the farm buildings, where it was living in company with the brown rat, a somewhat unusual occurrence. In the trenches, however, it does not seem to have been met with, but the brown rat swarms there.

ORNITHOLOGISTS owe much to Mr. Edmund Selous for the strenuous efforts he has made to secure protection, during the breeding season, for birds breeding in Iceland, the eggs of which are coveted by the egg-collector. In some cases he has only been able to achieve this end by fully compensating the local collectors for the loss of revenue they sustained by leaving the sitting birds unmolested. These efforts he describes incidentally in the *Zoologist* for April, in the course of his account of his ornithological observations made in Iceland during 1912. His efforts to keep a continuous watch on a pair of nesting eagles were frustrated by the intolerable attacks of swarms of mosquitoes, which here gathered in clouds so dense as to obscure the sun.

THE annual report of the Zoological Society of London never fails to furnish items of interest. Having regard to the anxious times through which we are passing, the report for 1915, just issued, assumes an enhanced importance, since it affords us an index both of our financial stability and our capacity for study and recreation. Though partly by deaths and partly by resignations the number of fellows of the society has been reduced by nearly a hundred, the number of visitors has been well sustained, so that the society, at the end of the financial year, finds itself in possession of ample funds. The cost of provisions has increased materially, and the council has therefore considered it prudent to decrease the stock by disposing of some animals that could easily be replaced. Apart from the cost, there has been no difficulty in obtaining the necessary supplies of food for all the animals in the Gardens, and although

special endeavours have been made to replace expensive articles of diet by less costly substitutes, the normal food has been at once supplied in those cases where the health of the animals appeared to suffer.

EXPERIMENTS on the action of tobacco decoctions in destroying certain insect pests of the vine are described by Dr. Mario Topi in the *Atti dei Lincei*, XXV., (1), 5. Two varieties of grape vine were selected, and it was found that with two applications of the decoction the larvæ of Eudemis were about half as numerous on the treated plants as on the others, and those of Conchylis were slightly lower too. On the other hand, the number of damaged branches was also reduced by about 50 per cent. by the treatment.

THE heavy loss of nitrate by washing out from arable soil during the wet winter of 1915–16 is very clearly shown by Dr. E. J. Russell and Mr. A. Appleyard in the current number of the *Journal of the Board of Agriculture*. The most striking case is that of the Broadbalk dunged plots at Rothamsted, one of which was fallowed and the other cropped. During the summer the fallow plot accumulated nitrate until, by the middle of September, the top 18 in. of soil contained 170 lb. of nitric nitrogen per acre, equivalent to nearly 10 cwt. of nitrate of soda. The losses then began, and were so heavy in November and December that by February the magnificent stock of nitrate had been reduced to 50 lb. of nitrogen. This loss is equivalent to 7 cwt. of nitrate of soda, no small item at present prices. The Broadbalk fallow plot is no doubt an extreme case, but the cropped plot also suffered considerable loss. It never accumulated nitrate like the fallow plot, the maximum being 90 lb. of nitrogen per acre; half of this was lost during the winter, or as much nitrogen as is contained in 24 bushels of wheat and the corresponding amount of straw. The losses are naturally greatest on these heavily manured soils, but the fields which were not unusually well done lost about 30 lb. of nitrogen per acre. Some of the loss on the fallow plot could have been prevented by sowing mustard or other quick-growing crop in September. This could have been fed off or ploughed in, thus holding the nitrogen in less soluble form until the spring. The obvious lesson is that land which has been got into good condition in autumn should at once be sown with either the crop it is intended to carry or a catch crop.

THE Summary Report of the Mines Branch of the Department of Mines for 1914 has just been issued by the Canadian Government. This gives a brief *résumé* of the work done by this branch during the year in question, together with a preliminary report on the mineral production of the Dominion. It appears that there is a falling off in the output of nearly all mineral products and metals, the only exceptions of any importance being in the two items of pyrites and natural gas; in the former the increase amounts to 42 per cent., in the latter to only 3 per cent. The total value of the mineral production is given as 128,475,499 dollars, as against 145,634,812 dollars in 1913. The decrease is stated to be due to conditions arising from the war, owing to which many mines have either closed down or decreased their activities. It is not to be inferred that the diminution is due to any other than temporary causes.

THE Geological Survey of Great Britain has issued a memoir (price 4*s*. 6*d*.) on "The Thicknesses of Strata in the Counties of England and Wales, exclusive of Rocks Older than the Permian." The director, Dr. Strahan, has taken a large share in the preparation of this useful work of reference, which will aid teachers in drawing up correct geological sections, and will serve as a permanent guide to those who seek for water or for coal. Sketch-maps are given of each county, showing the sites where subterranean information has been obtained, and in some cases contour-lines are drawn to mark the depths below sea-level at which certain important horizons may be struck. The base of the Permian (or top of the Coal Measures) is thus included in the features shown in Nottinghamshire. The lowering of the denuded chalk surface below sea-level and the infilling of its hollows by Glacial deposits are well seen in the map of Norfolk, where the Saham Toney boring passed through 248 ft. of Glacial drift, the base of which lies more than 100 ft. below the sea. Under the head of Kent, we note that the Dover boring has penetrated 1152 ft. of Coal Measures. The depths at which coal-bearing strata have been reached in other counties, such as Cheshire and Leicestershire, will be looked on with interest by economists.

THE United States Coast and Geodetic Survey has issued a tabulated list of the geographical positions on the North American Datum, with descriptions and elevations of all triangulation stations on the coast and geodetic survey in Alabama, on the Gulf Coast in Mississippi, and on the eastern oblique arc in Louisiana (Special Publication, No. 24). The field work of the triangulation included in this publication was done between the years 1846 and 1911, and many of the original stations could not be recovered, but where possible stations were remarked. The results of the entire eastern oblique arc triangulation appeared in a previous publication in 1901 (Special Publication, No. 7). That publication, however, dealt primarily with the purely scientific problem of the determination of the figure of the earth, and only the positions of those points included in the main scheme of triangulation were published.

PROF. HILDERBRANDSSON (*Kungl. Svenska Vetenskapsakademines Handlingar*, Band 51, No. 8) gives some further results of his researches. He states that in winter the course of the meteorological elements over the part of the ocean lying between Iceland and Norway agrees with that which occurs over the north of Europe, but is in opposition to the course of the same elements over the subtropical region, the Azores to the Mediterranean. The same opposition between north and south is said to occur in North America, but inversely to the relation in Europe, so that if the winter is cold in the north of Europe, it is cold in Mexico and the United States, but mild in the south of Europe and in the north of North America. Various other relationships are given, and are supported by tables and charts. If the correlation coefficients were worked out they would not be very high, but Prof. Hilderbrandsson states that the relations are disturbed by external causes of a superior order, such as the varying heat of the sun.

SOME observations on the green ray sometimes observed at sunrise and sunset are described by G. Guglielmo in the *Atti dei Lincei*, XXV., (1), 5. The author discusses the various theories that have been advanced to account for the fact that the duration of the phenomenon may exceed the limit attributable to dispersion. He finds, moreover, that the ray is sometimes more bluish and sometimes less so. Among the various causes which may modify the effect or its duration are mentioned atmospheric absorption of the violet and indigo rays, waves in the atmosphere, and abnormal variations of density in the lower strata.

Of course, if the sun sets behind a sloping hillside, the duration may be considerably altered by this cause.

THE March number of *Terrestrial Magnetism and Atmospheric Electricity* contains a table by Mr. J. P. Ault of the values of the deviation of the compass from true north in the Bering Sea and the Pacific Ocean, determined by the magnetic survey ship *Carnegie* during her voyage from Alaska to New Zealand in the latter half of 1915. Throughout the whole of her course, which from the western side of the Bering Sea was almost directly south, the compass pointed to the east of true north by amounts varying from half a degree in latitude 45° N. to 16° or 17° at Alaska and New Zealand. The British Admiralty charts give the compass deviation too high by amounts which, in the Bering Sea, exceed a degree, and in latitudes 37°, 21°, 14°, 12°, 0° N., 15° and 45° S. are nearly a degree.

BULLETIN 609 of the United States Geological Survey deals with the fractional precipitation of some ore-forming compounds at temperatures only slightly removed from atmospheric, and in all cases below 100° C., by Mr. R. C. Wells. The experiments have been made with the object of elucidating the chemistry of ore deposition, and they have shown the order of solubility of the compounds of each of the classes investigated—sulphides, hydroxides, carbonates, and silicates. On the whole, the most interesting, and probably the most complicated, series is that of the sulphides. Soluble sulphides may act, and do act, not only as precipitating, but also as reducing agents. It appears from the results given that the concentration of the sulphide ion is so greatly affected by change of acidity that the latter is the principal factor determining the precipitation of sulphides. A mixture of two metallic salts yields, by fractional precipitation, an initial precipitate, containing the sulphides of both metals, but, as a rule, if the mixture is heated or is permitted to stand, one sulphide largely or wholly dissolves. The order of precipitation, beginning with the metal that separates first, is palladium, mercury, silver, copper, bismuth, cadmium, antimony, lead, zinc, nickel, cobalt, ferrous iron, arsenic, thallium, and manganese. Attempts to form chalcopyrite by fractional precipitation of ferrous and cupric sulphate were unsuccessful.

PAPER No. 33 of the Survey Department of Egypt, entitled "The Magnetic Survey of Egypt and the Sudan," by Mr. H. E. Hurst, embodies the results of field observations made by the author and Mr. C. B. Middleton between October, 1908, and January, 1914. Use is also made of observations taken between 1893 and 1901 by Captain (now Major) H. G. Lyons, F.R.S., and of the results obtained in the Red Sea between 1895 and 1898 by Lieut. Rössler, of the Austrian surveying ship *Pola*. The publication includes charts of magnetic declination, inclination, and horizontal force respectively. The epoch to which the observations are reduced is January 1, 1910. Helwan, where magnetographs were installed in 1907, served as base station. The area dealt with extends from Damietta, 31° 25′ N., to Wadelai, 2° 42′ N. lat.; but it is comparatively narrow, especially in the extreme south. A remarkable feature is the closeness with which the lines of equal dip—from 42° N. to 16° S.—conform to parallels of latitude. The magnetic equator crosses the Nile at about 11° N. lat. The lines of equal declination have mostly throughout the greater part of their length the same general direction as the Nile. The lines of equal horizontal force, from 0·295 to 0·350 C.G.S., seem to cross the Red Sea nearly orthogonally. The local disturbances encountered were extremely small, especially in comparison with those described by Prof. J. C. Beattie in his "Magnetic Survey of South Africa."

A COPY of the report of the secretary of the Smithsonian Institution for the year ending June 30, 1915, has been received. The report reviews the affairs of the institution, and summarises the activities of its several branches. Among the explorations and researches inaugurated in furtherance of one of the fundamental objects of the institution, which is the "increase of knowledge," we notice the clearing of fog by electrical precipitation. The fact was long ago established that all dust and fog particles in the open atmosphere are electrified and subject to dispersion or precipitation, but how to clear fog from a street, along a railway, or from the neighbourhood of a ship at sea, and to do it in a manner commercially feasible, has been a matter of study for many years. The question recently aroused fresh attention in the neighbourhood of San Francisco, through researches planned by the University of California in co-operation with the United States Lighthouse Service, and it was decided by the Smithsonian Institution to make a grant to further this investigation, which is under the general direction of Dr. F. G. Cottrell. The American Institute of Electrical Engineers has also appointed a committee to co-operate in this work. The essential element to success in scattering fog seems to be some form of electrical apparatus of very high direct voltage, with facilities for its control and ready application.

THE H. W. Wilson Company, White Plains, New York, has published a supplement to the "Readers' Guide to Periodical Literature," which forms an index to general periodicals not included in the guide. The periodicals indexed in the supplement include NATURE, the *Hibbert Journal*, the *Philosophical Review*, and others published in this country.

OUR ASTRONOMICAL COLUMN.

URANUS.—This planet is now an early morning object in the constellation of Capricornus. When its position is known it is easily visible with quite small apertures; thus on April 29 it was seen with a hand telescope of 1⅛ in. opening, at G.M.T. 3h. 34m. The dawn had then, of course, overpowered all stars in the region. On May 12 the position of Uranus will be R.A. 21h. 13·2m., declination −16° 47·6′, diameter 3·8″.

MERCURY.—On September 21 of last year Mercury passed within 1′ of Spica, and a long series of positional measures was secured at the Union Observatory, Johannesburg (Circular No. 30). The observations made by Messrs. Innes and Worssell with a 9-in. refractor possess exceptional interest, as both observers agree regarding the visibility of a small N. polar cap and an indistinct band south of it. This appears on the reproductions as a narrow dusky zone in about latitude 45°. As an index to the conditions under which the observations were made, it may be stated that the conjunction occurred six days prior to elongation, the diameter of the slightly gibbous disc being 6·2″. The data indicate that the approximate G.M.T. of conjunction was 2h. 57m. 42s., when the zenith distance of Spica would be 51° 4′ at the Union Observatory. The truncated cusp recorded by other observers may perhaps find an explanation in this Johannesburg observation.

THE LYRID METEORS OF 1916.—Mr. W. F. Denning, writing from 44 Egerton Road, Bristol, says:—Cloudy weather seriously interfered with the observa-

tions. On April 20 Mrs. Wilson, at Totteridge, recorded several meteors between 9.30 and 10.45, when it became overcast. A bright meteor was seen at 9.46 p.m., with radiant at 202°+8°. Two bright Lyrids were seen at Bristol at a later hour. On April 21 Miss Cook, at Stowmarket, saw about twelve meteors, including eight Lyrids, between 9.39 and 11.49 p.m. On April 23, 25, 26, 29, and 30 Mrs. Wilson obtained further observations, and meteors were also seen at Bristol on the same nights, but they were very scarce, notwithstanding the splendid skies presented on several of the dates mentioned.

The most important observation was that of a bright but very late Lyrid on April 26, at 9.49, by Mrs. Wilson and by the writer at Bristol. The two observations proved that the centre of the shower was at 278°+35° on that night, and that the radiant is really a moving one, the position being at 271°+33° on April 20.

Below are the observed paths of a few brilliant meteors, duplicate observations of which would be very valuable.

Date	h. m.	Mag.	From		To		Observer
			°	°	°	°	
April 20	9 46	1	234	+10¾	243	+10	Mrs. Wilson
	11 1	1	256½	36	226	35	W. F. D.
	11 6	1	276¼	14½	276½	13	W. F. D.
21	11 22	1	215	25	205	20	Miss Cook
	11 49	4×♀	202	25	190	18	Miss Cook
25	10 1	1	240½	29	237¼	20	Mrs. Wilson
	10 53	♀	323	52	341	38	Mrs. Wilson
26	9 49	1	211	51	184	46	W. F. D.
29	9 32	♂	235	4½	244	2¼	Mrs. Wilson
	11 17	1	187	−6	184	−13	Mrs. Wilson
30	11 17	1	278½	20	276	18	W. F. D.

SCIENCE IN EDUCATION AND THE CIVIL SERVICES.

THE meeting convened by the committee formed in connection with the memorandum on the "Neglect of Science," published in February last, held on May 4 at Burlington House, was remarkable for its enthusiasm, its size, its unanimity, and its representative character. Leading and lesser lights belonging to science, literature, art, and commerce came from all parts to affirm their faith that our educational system needed rectification in the interest of physical science, in order to minimise the frequency of the occurrence of national "regrettable incidents." The lecture theatre of the Linnean Society was densely packed, and for three hours the audience listened with close attention to the convincing periods of the twenty-five speakers supporting the resolutions submitted.

Lord Rayleigh, Chancellor of the University of Cambridge, presided, and in his opening remarks he referred to the deplorable ignorance of science shown by all classes of society. In indicating the remedy, Lord Rayleigh emphatically denied that men of science had any desire to abolish or to cripple the study of literature—a point that was endorsed by many later speakers. The modern curriculum was already congested, and place must be made by limiting the study of ancient languages. "There is a certain type of mind for which classical education is best, but for the majority of schoolboys I think it is nothing less than an absurdity to talk about impressing them with the language and literature of the ancients. Such a result is not achieved with the average boy. I was myself an average boy. A great friend and brother-in-law of mine, Henry Sidgwick, used to say that the greatest impediment to a literary education was classics."

In proposing the first resolution, "That the natural sciences should be made an integral part of the educational course in all the great schools of the country, and should form part of the entrance examination at all the universities," Sir E. Schäfer replied effectively to the contention that men of science need a classical education in order that they may be able to express themselves clearly, and the unprejudiced eye-witness of the meeting could not have failed to remark that devotion to science was in no way incompatible with the power of clear expression and a sense of literary perception. Dr. Bridges, the Poet Laureate, seconded the resolution in a forcible speech, in which he advocated a drastic reform of our educational system. A knowledge of the world we live in, and of our own bodies, is a vital necessity to all classes. The question of remunerating the teachers adequately was also of urgent importance.

The Rt. Hon. Huth Jackson, director of the Bank of England, deeply regretted his ignorance of science, the knowledge of which would have prevented him from supporting commercial ventures which in themselves were unsound, and in other cases would have made him abandon the banker's typical attitude of refusing to listen to any new idea. Lord Montagu of Beaulieu dealt principally with the neglect of science in Government circles. Six years ago he had warned the Government that it should take in hand the manufacture of acetone, which is indispensable for the production of propellant powder. The advice was unheeded, and at the beginning of the war this country possessed but a single toy plant in the Forest of Dean. He had also pointed out the importance of low-temperature distillation of coal, from which benzol, toluol, and other by-products are obtained, including T.N.T., essential for our Army; but nothing was done. In the year before the war we spent 500,000*l.* with great reluctance on aviation experiments; Germany spent seven millions. "Where America has more than 250 people at work in a certain research department, in this country we have only four or five. The attitude of the nation towards science is not one of dislike, but of contemptuous neglect. There is an infinite field for the use of science in the Government of the country. In India there is no scientific adviser to the Government. The country is pre-eminent to-day in pure science, but not in applied science, or as regards general scientific education all over the country."

Dr. Macan, master of University College, Oxford, said that by making the study of English and of science two of the corner-stones of our educational edifice, we should be working in the truest spirit of Hellenism. The genuine study of antiquity would not suffer by limiting the amount taught in our schools, and the idea that the curtailment of such instruction would demoralise our youth was a delusion; for ethical and physical training are the chief factors in the formation of character. The science students at Oxford had sacrificed themselves in the war no less than their literary comrades. Mr. H. G. Wells urged the importance of distinguishing between the kind of teaching required for the training of science specialists and that which should be part of the education of all. The latter kind would involve a much smaller expenditure upon apparatus than the former, and would not demand more than 10–15 hours per week. "We want the elementary Greek which is done in schools, and which does not go on to a thorough knowledge of Greek, to be cut out. We want to stop Latin verse-making for most pupils; and we do not believe in the premature teaching of history to a child whose political sense is entirely undeveloped. We do not propose to make the philosopher supreme in this country at present, but we do want to bring our statesmen into a relationship of co-operation with

the mass of scientific and practical knowledge which has accumulated in the course of civilisation." Our lawyers and politicians had failed lamentably from want of scientific and practical knowledge, but they could not be exterminated; they must be "practicalised," brought to see the virtue and necessity of natural knowledge, and to know how to apply it.

The second resolution affirmed the necessity of assigning capital importance to science in the examinations of the higher branches of the Civil Service, and of making it an obligatory subject for entrance to Sandhurst. The proposer, Sir Harry Johnston, subjected the present regulations to a scathing criticism, and emphasised the unpractical nature of the examination questions, which were not framed with the object of testing the knowledge and ability of candidates in matters which they would need in their careers. Introducing the third resolution, Sir Ray Lankester declared that for seventy years the cry of the reformer had been heard, but with no practical result. The governing classes and the Press were united in supporting the existing conditions, and the only practicable proposal for immediate action was to alter the basis of Civil Service examinations. The great schools could not move because they were dominated by the universities, and the latter were shackled by the Civil Service regulations; apply the pruning-knife to the last-named, and the body educational would immediately acquire the power of regeneration.

Other notable speakers were Lord Portsmouth, Profs. Thomson, Poulton, and Dr. Parnell, of Oxford, Dr. Shipley, of Cambridge, the headmaster of Sherborne School, Colonel Crompton, Sir Hugh Bell, and Mr. A. Dyke-Acland. The fourth resolution, authorising the committee to bring the proposals to the notice of the Government, was, like the others, passed unanimously; and the uppermost thought in our minds as we left this memorable gathering was the hope that "the eyes of men might be opened that they may see light."

NATIONAL FOOD SUPPLY AND NUTRITIONAL VALUE.[1]

THE statistics of our national food supply, in so far as they have been available, have hitherto comprised no more than bald statements as to the amount available of this or that marketable foodstuff. We have been told how much meat, home-killed or imported, has been upon the market, how much wheat, potatoes, etc., but no one has as yet taken the trouble to determine the actual nutritional value of the food supply we have to rely upon. Without such knowledge it is impossible properly to appraise the national position, or determine whether we have a safe margin upon which to draw when retrenchment is called for. The truth, as Prof. W. H. Thompson points out in the very timely study before us, is that we are in such matters a happy-go-lucky people, and leave the nation's affairs too implicitly in the hands of our legislators and administrators without insisting that business or scientific knowledge shall be sufficiently taken into account. So far as it is possible to do so Prof. Thompson has now given us the information required, and the preparation of his paper must have cost him much labour. He tells us how much protein, how much fat and carbohydrate, and how many calories of food energy are available for the nutrition of Great Britain as a whole. His survey of the subject has been made independently, without reference to previous investigations.

Anyone endeavouring to collect data which will represent the position with accuracy meets with difficulties. Chief among these is that arising from the fact that in the food estimates for Great Britain no figures are given for agricultural produce fed to live stock, or consumed by the population of the farms. Prof. Thompson, in making a correction for this deficiency in the statistics, assumes that the agricultural population is at least as well supplied with the produce of the farms as is the general population. We doubt whether he is altogether right in this assumption, believing that the agricultural labourer gets on the whole less than his share of the foodstuffs he is instrumental in producing. Other difficulties have to be overcome in the endeavour to arrive at a final estimate, and we cannot at present expect complete accuracy. In the study under review it is clear that every effort has been made to obtain the best possible information.

Of the total protein supply of the nation, 33·75 per cent. is furnished by grain foods, of which 74 per cent. is imported, 10·56 per cent. by vegetables, 31·62 per cent. by flesh meat, of which more than half is imported, 15·06 per cent. by dairy products, and about 2·5 per cent. by eggs. The author points out that much more might be made of eggs as a source of protein supply, by increasing the home produce. Of the carbohydrate supply, 54·26 per cent. is drawn from cereal food, 24·5 per cent. from sugar, 14·55 per cent. from vegetables, the only other source of any consequence being dairy products (excluding butter), which add 3·32 per cent. Of the fat available, 47·04 per cent. is derived from meat, 30·18 per cent. from dairy products, 13·25 per cent. from lard and margarine, and 5·14 per cent. from cereal foods, the remaining sources being relatively unimportant.

Prof. Thompson's calculations lead to the conclusion that taking the nation as a whole only 10 per cent. of the total food energy is supplied in the form of protein, or, as the author puts it, "one-tenth of the driving power of the human engine is derived from protein material." No less than 59 per cent. of the energy is supplied as carbohydrate; fats yield 30 per cent.

It is customary when calculating the food available for individuals from statistics referring to the whole community to reduce the population to "man" value. This is done by reducing the figures for women, and those for children of different ages, by means of certain factors based upon the supposed relative nutritional demands. The figures representing the total food values available are then divided by the "reduced" population, and the result gives the amounts available "per man." So calculated, the quantity available for the daily ration of a man works out at 101·7 grs. protein, 587·12 grs. carbohydrate, and 136·5 grs. fat; corresponding to 4129 calories in energy value. Knowing what is actually available, we are now in a position to decide how far we can safely economise in our consumption, and having clear information as to the relation between imports and home-grown foodstuffs, we can measure what would be the effect of any serious interference with the former.

The above figures, based as they are upon statistics from ports and markets, may prove, however, a little puzzling to those accustomed to study the actual dietaries of English families. The value for protein seems low, and that for the total energy seems high. The figure, 101·7 grs. protein, represents a gross value for foods delivered at the ports or sold off the

[1] "The Food Value of Great Britain's Food Supply." By Prof. W. H. Thompson. Reprinted from the Economic Proceedings of the Royal Dublin Society, Dublin. (Dublin: Royal Dublin Society; London: Williams and Norgate.) Price 2s.

farms, and must be reduced to something like 97 grs. for the ration "as purchased." This, however, is about the amount consumed by the more poorly fed among the population—by the agricultural labourer, for instance. One would have expected the average for the whole country to be appreciably higher. On the other hand, the value 4129 calories (3875 "as purchased") seems high for the energy ration, and the proportion it bears to the figure for protein is exceptionally high. We cannot but think that Prof. Thompson has failed to make sufficient allowance for the starch, and especially for the fat, which, while appearing in the market returns, is diverted to industrial uses and never reaches the mouth of the consumer. If the figure for protein accurately represents the available supply and measures our consumption before the war it would seem that there is not much room for economy in the amount eaten.

Prof. Thompson, in considering the possibilities of economy, emphasises, however, a point upon which most writers have insisted: "The British nation as a whole relies too much on flesh meat for the protein element of its food. This is the most costly of all the common articles of diet to produce." He has himself shown, "from calculations based on average results, that an acre of land, if used for grazing sheep or cattle, produces per annum not more than 260 oz. of protein, and 290 kilolitre calories of energy. Whereas, if used for tillage, the same area of land produces in wheat 19 times as much protein, and 15 times as much food energy; in beans 20 times as much protein, and 9 times as much food energy; in peas 10 times as much protein, and 4 times as much food energy; in potatoes 17 times as much protein, and 30 times as much food energy."

"Economy practised in the direction indicated would entail no loss of efficiency, and would work out to the economic advantage of the country as a whole. It would also have another indirect result. The food of Great Britain is brought from the ends of the earth, the charges for transit adding considerably to its cost. A man of twelve stone weight requires, as already stated, nine times his own weight of food every year, or three-quarters of his own weight every month. This entails in freight charges an outlay which adds considerably to the food item in a working-class budget. Every additional ton weight of home-produced food should reduce this sum, if freight charges be justly apportioned."

THE FUTURE OF CHEMICAL INDUSTRY.

AT a recent meeting of the New York Section of the Society of Chemical Industry, Dr. Baekeland was awarded the Perkin medal for his discoveries in technical chemistry. Dr. Baekeland, in acknowledging the honour, gave an interesting account of the introduction of the well-known Velox paper into photography, and the successive steps in the production of bakelite—an artificial resin of great hardness and durability, which has found a variety of important applications.

The portion of the address which should command most attention at the present time is not so much the account of the inventive skill, tenacity of purpose, and never-failing resourcefulness, associated with a highly-trained scientific mind, which have brought Dr. Baekeland's investigations to a successful issue, for these are qualities which have been shared by most of the great inventors; but his views on the present and future condition of the chemical industries of the United States. For these conditions are not unlike our own, and we may well learn a lesson from one who by education and experience in the laboratory and in the works is so well equipped to speak with authority.

Dr. Baekeland points out that the country has enough capable chemists, but that there are conditions under which the best chemists cannot succeed, for success depends just as much on the kind of men who are at the business end of the new chemical enterprises. "It will certainly do no harm," he says, "to many of our new chemical enterprises if among their directors they have at least some chemists as well as purely business men or bankers and lawyers." "Why should a chemist," he asks, "if he is intelligent enough to master the most intricate problems of chemistry, not be able also to learn how to exercise enough common sense and good judgment to help to discuss and devise successful business policies?" He points out that all the largest chemical enterprises of the world have always had prominent chemists among their directors, and the policy of these enterprises has not been left entirely in the nands of a set of purely business men who remained wilfully ignorant of the essential technical parts upon which their enterprise was based. He refers also to the industrial part played by the German banks, who, with a staff of scientific advisers, have mastered the art of nursing new chemical industries.

A successful industry, he says, must be built upon sound scientific knowledge, which consists in the putting into practice principles of efficiency and introducing knowledge where ignorance formerly existed, with its usual accompaniments of waste and slovenliness. It does not mean merely dividends for its stockholders or wages for its workmen. Dr. Baekeland looks with considerable apprehension on the future of some of the ventures which are being started now by men who are merely trying to make money quickly, who look upon their chemists merely as temporary tools, and see in their enterprise only a pretext for realising their greedy ambitions.

Finally, Dr. Baekeland touches upon the educational question. He exonerates the chemist for the part that chemistry has been forced to play in the war by showing how war is ages older than science and has been born of greed, iniquity, and lust for power. It is the main inheritance of the aims and thoughts of the past, rendered respectable by a rather large share of our so-called classical literature, together with our awe for tradition, which keeps us in the cold, relentless grip of the wrong ethics of bygone ages.

J. B. C.

RECENT WORK ON GENETICS.

DR. L. DONCASTER'S work on sex-limited colour-inheritance in cats is well known to students of heredity, the typical "tortoiseshell" coat being almost always characteristic of a female. An account of the microscopic structure of a testis from a tortoiseshell male which after repeated matings failed to beget kittens is given by Dr. Doncaster and Mr. D. W. Cutler in the December number of the *Journal of Genetics* (vol. v., No. 2). The tubules were absolutely devoid of spermatocytes and spermatozoa, while the interstitial tissue which is supposed to be concerned with the secretion of the sexual hormones was exceptionally well developed. The belief that the rare tortoiseshell tom-cat is normally sterile is thus confirmed, though the records of breeders show that a fertile male of this colour has been known. The conclusion drawn, therefore, is the possibility that "the abnormal transmission of a sex-limited colour-factor to a male may sometimes cause the animal to be sterile, and in other cases not have this effect."

This number of the journal contains also an impor-

tant paper by Dr. E. A. Cockayne on "Gynandromorphism." Insects with the secondary sexual characters of both male and female variously combined in a single individual are favourite curiosities among collectors. Dr. Cockayne is able to describe the internal reproductive organs and the genital armature in several specimens of these abnormalities. He divides such insects into three groups:—(1) Genetic hermaphrodites, with both ovaries and testes and the genital armature of both sexes represented—these are often laterally divided into a male and a female half, though the symmetry is rarely exact; (2) primary somatic hermaphrodites, which have either ovaries or testes, but both male and female structures in the armature; and (3) secondary somatic hermaphrodites, unisexual as regards the whole reproductive apparatus, but with secondary characters of both sexes in the wings, feelers, or elsewhere. The great majority of the observed cases fall into the second of these divisions. Dr. Cockayne accepts the view that sex is a Mendelian unit character, and suggests that in the "halved" gynandromorphs there must be an irregular division of the sex-determining chromatin in the first cleavage of the zygote-nucleus, while in the other types there may be "a failure in the normal process of fusion of the sex-chromosomes of the spermatozoon and ovum" or "a difference in the potency of the factors for sex occurring in the two parents."

The heredity of bone-fragility in man is discussed by Profs. H. S. Coward and C. B. Davenport in Bulletin 14 of the New York Eugenics Record Office. From a number of family histories it appears that this condition (osteopsathyrosis) behaves as a Mendelian dominant often correlated with a blue colour in the sclerotic coat of the eye, but not complicated by special association with either sex-factor. A man and woman, both free from the condition, need not fear, therefore, that it can be transmitted through them to offspring, even though they may have brothers or sisters affected.

G. H. C.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

IT is announced in the issue of *Science* for April 7 that Harvard University has received a bequest of 10,300*l.* from the estate of Mr. J. A. Beebe, and one of 10,000*l.* from the estate of Mrs. W. F. Matchett; the income of both is to be used for general purposes.

IN the House of Commons on May 9, Sir Philip Magnus asked the Prime Minister whether, having regard to the general demand that had been expressed for an exhaustive inquiry into our present educational system, particularly with regard to the claims of science to occupy a more important place in the curriculum of our schools, he could make any statement as to the proposal for the appointment of a Royal Commission to consider and to report upon the question of the organisation of education in this country. In reply, Mr. Asquith said:—"When the Government are in possession of the results of the various inquiries they have set on foot it will be possible to decide whether any useful purpose would be served by setting up a Royal Commission."

THE growing unrest in the minds of thoughtful persons on the subject of public education finds expression in a leading article of the current issue of the *Times* Educational Supplement, which, during the last twelve months, has consistently pleaded for a more liberal conception of the aims of education in the elementary school and of the necessary extension of the compulsory period of school attendance until the age of fifteen, so as to make effective for all children the elements at least of a secondary education from the age of eleven. As in many other matters of high importance, the events of the war have brought into clear vision many national shortcomings, not the least of which is to be found in the domain of education, alike in respect of means and method, subjects of instruction, the length of the school life, and the care of the adolescent. It is clear that the nation cannot hope to maintain and advance its position as a civilised Power of the first rank unless the mental and moral training of its future citizens receives the devoted attention of the best minds of the nation, whose advice and guidance shall be accepted independent of any merely pecuniary considerations. The issue is vital to the national well-being. Bodies like the Royal Society, the British Science Guild, the Teachers' Guild of Great Britain, various education authorities, and teachers' associations are all moving for an inquiry at the hands of men of high responsibility, eminent in the world of science and industry, and of men known for their devotion to the educational well-being of the nation. No mere departmental committee, however reinforced, will meet the grave responsibilities of the problems involved. Even in the stress of an unparalleled war—indeed, because of it—it is essential that immediate steps be taken to review our whole system of education and to find a remedy for the crying evils that beset it.

IN an article in the current *Fortnightly Review*, by Mr. Archibald Hurd, we are invited to consider "The German Peril after the War," and its bearing upon the economic well-being of the British Empire. Much in the way of abuse is poured out upon the entire German nation, who are characterised as the "best-educated and most unmoral people of Europe, whose guile, lack of principle, and innate baseness we have only been in a position to comprehend since this war opened." When the war is over and victory has been achieved, "Germany with its vast population of from 60,000,000 to 70,000,000 will remain . . . with its vast resources organised, prepared to reassert its position in the world." We shall then embark upon an economic struggle scarcely less deadly in its effects than the war in which we are now engaged. It is admitted that German education—skill in applying the fruits of scientific discovery—energy, enterprise, and power of organisation have brought her into strenuous rivalry with Great Britain, but it has been accompanied apparently with a Machiavellian ingenuity of means and purpose unrivalled in the world's history. "Germany has had a monopoly in explosives, chemical dyes . . . and many other essentials of modern industry, including laboratory and optical glass." "Our sick could not be tended because she controlled essential chemicals," and "in a hundred and one trades Germany has had complete control." The trend of the article favours fiscal measures as the most effective palliative, yet at the same time the nation is urged to reform its system of education and to co-ordinate science and industry. The author, however, fails to realise the true source of Germany's great economic position, namely, her educational efficiency.

A WHITE PAPER issued on April 25 contains reports of the Advisory Committee on grants to Welsh universities and colleges, and of the Departmental Committee on the National Medical School for Wales, which were both made in 1914, and Treasury minutes thereon, one of which is dated April 18 last. This minute points out that a Royal Commission has now been appointed to inquire into the organisation and work of the University of Wales and Welsh colleges, and goes on to say that the Treasury is prepared to concur in the recommendations of the Advisory Com-

mittee on condition that the new grants will be applied, pending the reconstitution of the University, to meet existing liabilities and not for new developments. The allocation of the existing annual grants of 31,000*l.*, as well as of the new grants, will be liable to reconsideration after the reorganisation of the University. The Treasury has decided to include in the 1916–17 Estimates an additional sum of 5500*l.* for the first year of the new grants, provided the local authorities continue their contribution of 2000*l.* to the University College at Cardiff. The raising of a further sum of 3500*l.* out of rates, in accordance with the recommendation of the Advisory Committee, is waived until after the war. The Treasury will, however, feel bound to attach such a condition after the war. If that condition is complied with in future years, it will be prepared in addition to pay 500*l.* for each further 500*l.* raised by local authorities over and above 5500*l.* until the total additional grant from the Exchequer to the University and the colleges reaches the figure of 11,000*l.* per annum. The minute also states that the Treasury will be prepared in due course to give effect to the recommendation of the Departmental Committee that half the additional annual cost of maintaining the National Medical School at Cardiff, up to a maximum grant of 5000*l.* a year, should be paid by the Exchequer, on the conditions set out in the reports of the Departmental Committee.

THE plea for increased attention to science put forward in the memorandum, signed by thirty-six men of science, issued last February, referred particularly to the position of scientific subjects in the public schools and at Oxford and Cambridge, and to the marks obtainable, in comparison with classics, in the examinations for the highest posts of the public service. It appears to have been the deliberate purpose of the promoters of the memorandum to limit consideration to these points, which they believe to be of fundamental importance. In any case, a reform of the present attitude towards science shown by administrative officials and legislators might be started by making scientific subjects of capital importance in the examinations for appointments in Class I. of the Civil Services; and it is possible that there is practical wisdom in limiting attention to these aspects instead of surveying the whole field of education. As the object of the memorandum was to assert the claims of science to fuller recognition in the school and the State, it was not necessary to acknowledge the complementary part played by literary studies in a complete education; yet it is scarcely too much to say that none of the men of science who signed the memorial was unmindful of it. A letter which appeared in the *Times* of May 4, signed by several leading representatives of science, as well as of the humanities, suggests that the value of literary studies is being overlooked, while the claims of science are being urged. Science is tacitly classified as technical knowledge and necessary for national prosperity, but it is held that in the education "which will develop human faculty and the power of thinking clearly to the highest possible degree . . . the study of Greece and Rome must always have a large part." In other words, "early specialisation is injurious" if it means elementary science teaching, but not when, as at present, it signifies classical languages and literature. We do not believe for a moment that the best interests of classical and literary studies would suffer if science were given the place in the curriculum now occupied by Greek and Latin; for few pupils ever reach the stage of intelligent appreciation of works in these languages, and for the majority of them good translations in English would serve as useful a purpose as vague interpretations of classical texts.

SOCIETIES AND ACADEMIES.

LONDON.

Challenger Society, April 12.—Dr. G. H. Fowler in the chair.—E. T. **Browne**: The geographical distribution of Siphonophores. Nearly all the species are tropical, and only one (*Diphyes arctica*) has permanently established itself in cold water. Of ninety species recognised, seventy are common to the Atlantic and Indo-Pacific, and most of the remainder have been found in the Atlantic only.—C. Tate **Regan**: The distribution of the clupeoid fishes of the genus Sardina. The species inhabit the zones between the mean annual surface isotherms of 12° C. and 20° C. They are *S. pilchardus*, of Europe, *S. neopilchardus*, of Australia and New Zealand, and *S. sagax*, of South Africa, Japan, California, and Chile.

Royal Meteorological Society, April 19.—Major H. G. Lyons, president, in the chair.—E. V. **Newnham**: The persistence of wet and dry weather. The rainfall records of Greenwich, Kew, Aberdeen, and Valencia have been examined in order to find out how often rain falls on the day following successive runs of one, two, three, etc., wet or fine days. The common notion seems to be that after a long run of wet days the chance of a fine day becomes greater, but statistics do not support this conclusion. Generally speaking, the expectation of rain on any day has been found to increase rapidly as the number of previous successive wet days increases, and to diminish with the number of successive fine days in the past. After very long spells of either kind the expectation of further rain reaches a practically steady value. The same conclusion holds for the expectation of rain in a given hour after different runs of wet and dry hours. In illustration, some of the results may be quoted. At Valencia, after seven days of drought, rain falls on the eighth day twenty-four times out of one hundred, but after seven rainy days eighty-six times. For Kew the corresponding increase is rather less, namely, from twenty-seven to seventy-three.—Prof. H. H. **Turner**: Discontinuities in meteorological phenomena. In a former paper certain critical dates, about six years apart (and formed according to a specified law, apparently related to the movements of the earth's axis), were specified for 200 years back; and it was shown that a number of meteorological data changed abruptly in character at these dates. In simple cases the intermediate chapters are alternately hot and cold, or wet and dry, though other changes are more complex. In the present paper various new data are submitted to the same test and give confirmatory results. The most noteworthy case is that of the mean temperatures at Paris, which confirm the dates for the past century. The changes at the critical dates are shown to be abrupt; the alternation is consistent for seventeen chapters out of eighteen; and it is shown to vary in amount according to a law which suggests the regular action of two disturbing causes, one of which has already been shown to play an important part in these phenomena, and has a period of about forty years; the other, of about fifty years, appearing clearly in Mr. Douglass's measures of Californian tree-rings.

Mathematical Society, April 27.—Sir J. Larmor, president, in the chair.—Major **MacMahon**: Some problems of combinatory analysis.—Dr. S. **Chapman**: The uniformity of gaseous density, according to the kinetic theory.—G. N. **Watson**: Bessel functions and Kapteyn series.—T. C. **Lewis**: Four Tucker circles.—Prof. H. S. **Carslaw**: The Green's function for the equation $\nabla^2 u + \kappa^2 u = 0$ (II.).—J. **Hodgkinson**: The nodal points of a plane sextic.—S. **Pollard**: The deduction of criteria for the convergence of Fourier's series from Fejer's theorem concerning their summability.—Prof. W. H.

Young: Note on functions of upper and lower type.—Mrs. G. C. **Young**: The derivates of a function.

MANCHESTER.

Literary and Philosophical Society, March 21.—Prof. S. J. Hickson, president, in the chair.—Prof. F. E. **Weiss**: Recent views concerning the nature of so-called "graft hybrids." The author gave an account of the recent researches made on graft hybrids, describing, among others, the curious form of *Cytisus Adami*, obtained early last century by grafting the purple Cytisus on the yellow Laburnum, and the more recent productions resulting from grafting shoots of the tomato upon young plants of the nightshade. In this, as in the purple Laburnum, reversions to both parental forms are common. Other cases of so-called hybrids are known between the hawthorn and medlar, the quince and pear, and the almond and peach. A summary was given of the various views put forward to account for the production of these curious intermediate forms, and the relationship of the graft hybrids to ordinary seed hybrids was discussed.

April 4.—Prof. S. J. Hickson, president, in the chair.—Prof. G. Elliot **Smith**: The origin of the cerebral cortex. The cerebral cortex was called into existence during the process of evolution of the vertebrates, and, though difficult to detect in certain fishes, is to be regarded as a distinctive and inherent feature of vertebrate structure. The microscopic *formatio pallialis* of the Cyclostomes represents the undifferentiated rudiment of the whole of the pallium (hippocampal formation, piriform area, and neopallium of the highest vertebrates), and not merely the hippocampus. The cerebellum grew up around the central terminations of the nerves which bring into the nervous system special information concerning the animal's position in space; and its cortical mechanism developed in response to the need for bringing this information under the control of other influences, such as the nerves of vision, touch, the muscular sense, etc., before it is transmitted to the muscles of the body as a whole. The cerebral cortex grew up in a similar way around the central terminations of the olfactory nerve.—Prof. G. Elliot **Smith**: The commencement of the Neolithic phase of culture. Evidence pointed to the introducers of the Azilian culture as representing an early wave of the Neolithic people, coming probably from Africa into Europe. The author suggested that sporadic bearers of the same culture probably made their way into Europe for many centuries before the close of the Palæolithic epoch there. This would explain many similarities of Magdalenian to Azilian implements, and of both to those of Predynastic Egypt.—J. W. **Jackson**: The geographical distribution of the use of pearls and pearl-shells. The special appreciation of pearls is intimately associated with the geographical distribution of elements of a culture, including, amongst other things, the use of shell-purple for dyeing and of conch-shells for trumpets. Through Phœnician trade the knowledge of the pearl spread from the eastern Mediterranean *viâ* the Red Sea and Persian Gulf to India and Ceylon, China and Japan, Indonesia and the Pacific Islands, and, finally, the New World.—J. W. **Jackson**: The use of shells for the purposes of currency. No form of shell-money has been used so extensively as the money-cowry, *Cypraea moneta*, and this is used in a natural state. The date of the introduction of this cowry-currency is unknown, but it was in use in Egypt in Predynastic times. Shell-currency has been recorded from the Sandwich Islands, New Hebrides, and New Caledonia, and it was extensively used in China and on the Pacific coast of North America. Portuguese voyagers refer to its use in West Africa in the fifteenth century, and it is at present in vogue in tropical Africa.

PARIS.

Academy of Sciences, April 25.—M. Camille Jordan in the chair.—The president announced the death of M. Emile Jungfleisch, member of the Academy.—G. **Bigourdan**: Monthly distribution of average cloudiness in France. A discussion of observations from thirty-five stations in France and foreign stations close to the French frontier. In the scale adopted 0 indicates blue sky, and 10 a completely clouded sky, and the results are shown in thirteen charts, one for each month, and one for the yearly average, giving the isonephs, or lines of equal cloudiness. More observation stations are required before full conclusions can be drawn.—T. **Levi-Civita**: The regularisation of the problem of three bodies.—W. **Sierpinski**: A cantorian curve which contains a biunivocal and continuous image of any given curve.—E. **Baticle**: Calculation of the thrust on a supporting wall by a powdery mass with free plane surface.—Gabriel **Sizes**: Properties of the law of resonance of vibrating bodies.—J. **Deprat**: The structure of the internal zone of the preyunnan sheets.—Emile **Belot**: Contribution to the study of the causes of volcanoes. An experiment showing the production of a miniature crater by the action of locally applied heat to a mixture of water and sand, showing why the vapour is evolved at a considerable distance from the source of heat. Assuming a connection between volcanoes and the influx of sea-water, this explanation removes the difficulty of the South American volcanoes situated a considerable distance from the sea.—E. **Mathias**: Three observations of globular lightning made at the summit of the Puy de Dôme.—F. **Jadin** and A. **Astruc**: The manganese in some springs connected with the central massif and some stations in the plain of Languedoc. The amounts of manganese found vary between 0·001 and 0·4 mgr. per litre. The data confirm the conclusions given in previous communications on the amounts of manganese in French mineral waters.—Henry W. **Brölemann**: An evolutive process in Diplopod Myriapods.—E. **Kayser**: Contribution to the study of the ferments of rum. A study of the fermentation products produced from beetroot, molasses, and cane-sugar molasses by various yeasts. Figures are given for the higher alcohols, volatile acids, aldehydes, and ethers.—F. **Garrigou**: The hygienic, rational, and economical treatment of human excreta.—M. **Marage**: True and simulated deaf-mutism resulting from wounds received in battle. The medical examination of such cases should avoid experiments causing pain to the patient, and in the case of a painful treatment, involving possibly negative results, the consent of the patient should always be obtained.—H. **Busquet**: The rapid immunisation by small doses of nucleinate of soda, or chaulmoogra oil, against the hypotensive action of large doses of these substances.

BOOKS RECEIVED.

Statics: A First Course. By C. O. Tuckey and W. A. Nayler. Pp. 299. (Oxford: Clarendon Press.) 3*s*. 6*d*.

Historical Introduction to Mathematical Literature. By Prof. G. A. Miller. Pp. xiii+302. (London: Macmillan and Co., Ltd.) 7*s*. net.

The Principles of Agronomy. By Prof. F. S. Harris and G. Stewart. Pp. xvi+451. (London: Macmillan and Co., Ltd.) 6*s*. net.

The Influence of Ancient Egyptian Civilization in the East and in America. By Prof. G. Elliot Smith. Pp. 32. (Manchester: University Press; London: Longmans and Co.) 1*s*. net.

Annual Report of the Director, Kodaikanal and Madras Observatories for 1915. Pp. 24. (Madras: Government Press.)

An Intermediate Text Book of Magnetism and Electricity. By G. F. Woodhouse. Pp. x+264. (Sedbergh: Jackson and Son.) 6s. net.

Canada. Department of Mines. Preliminary Report on the Mineral Production of Canada during the Calendar Year 1915. Nos. 348, 349, 350, 383, 408. (Ottawa: Government Printing Bureau.)

Spitsbergen Waters. Oceanographic Observations during the Cruise of the *Veslemöy* to Spitsbergen in 1912. By F. Nansen. Pp. 132. (Christiania: J. Dybwad.)

Proceedings of the Geological Society of South Africa. To accompany vol. xviii. of the Transactions. January-December, 1915. Transactions of the Geological Society of South Africa. Vol. xviii. Pp. 134+plates xvi. (Johannesburg.)

The Purpose of Education. By St. George Lane Fox Pitt. New edition. Pp. xxviii+144. (Cambridge: At the University Press.) 2s. 6d. net.

The Value of Science in the Smithy and Forge. By W. H. Cathcart. Pp. xiv+163. (London: C. Griffin and Co., Ltd.) 4s. net.

A Guerra E. O. Pensamento Medico. By Prof. R. Jorge. Pp. 63. (Lisboa: Sociedade das Sciencias Medicas.)

Department of Commerce. Scientific Papers of the Bureau of Standards. No. 274. (Washington: Government Printing Office.)

Imperial Department of Agriculture for the West Indies. Sugar-Cane Experiments in the Leeward Islands. Report on Experiments conducted in Antigua and St. Kitts in the Season 1914–15. Parts i. and ii. Pp. 76. (Barbados.)

Yorkshire's Contribution to Science, with a Bibliography of Natural History Publications. By T. Sheppard. Pp. 233. (London: A. Brown and Sons, Ltd.) 5s. net.

Cassell's Modern School Series. Historical Section. The Tale of Ancient Peoples. By A. E. McKilliam. Pp. 128. The Tale of the Nations. By A. E. McKilliam. Pp. 160. (London: Cassell and Co., Ltd.) 10d. net and 1s. net respectively.

The Practical Principles of Plain Photo-Micrography. By G. West. Pp. xii+145+plates viii. (Dundee: The Author, University College.) 4s. 6d. net.

Annuario publicado pelo Observatorio Nacional do Rio de Janeiro, 1916. Anno xxxii. Pp. vi+259. (Rio de Janeiro.)

DIARY OF SOCIETIES.

THURSDAY, MAY 11.

ROYAL SOCIETY, at 4.30.—Seventh Memoir on the Partition of Numbers. A Detailed Study of the Enumeration of the Partitions of Multipartite Numbers: Major P. A. MacMahon.—Legendre's Functions $P_n(\theta)$ when n is Great and θ has any Value: Lord Rayleigh.—The Occurrence of Gelatinous Spicules and their Mode of Origin in a New Genus of Siliceous Sponges: Prof. A. Dendy.—The Classification of the Reptilia: E. S. Goodrich.—The Experimental Production of Congenital Goitre: Dr. R. McCarrison.

ROYAL INSTITUTION, at 3.—Flints and Flint Implements: Sir Ray Lankester.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—Annual General Meeting.

INSTITUTION OF MINING AND METALLURGY, at 5.30.—*Discussion:* The Influence of the War on the Mining and Metallurgical Industries.

FRIDAY, MAY 12.

ROYAL ASTRONOMICAL SOCIETY, at 5.—The Surface Currents of Jupiter in 1915–16: S. Bolton.—Observations of V Cassiopeiæ in 1910–16: A. N. Brown.—The Certainty of the Canals of Mars: G. H. Hamilton.—The Illumination of the Field of a Photographic Objective: H. C. Lord.—The Law of Distribution in Star-clusters: J. H. Jeans.—The Efficiency of Sun Spots in Relation to the Mean Daily Range of Terrestrial Magnetic Declination: Rev. A. L. Cortie.—The Theory of Star-streaming and the Structure of the Universe. II.: J. H. Jeans.—The Distribution of Stars in Globular Clusters: A. S. Eddington.—Stars with Large Proper Motion between Declination 65° and the North Pole: Royal Observatory, Greenwich.—Solar Prominence in 1915: G. J. Newbegin.

PHYSICAL SOCIETY, at 5.—The Latent Heats of Fusion of Metals and the Quantum Theory: Dr. H. S. Allen.—(1) Lenses for Light Distribution; (2) The Choice of Glass for Cemented Objectives: T. Smith.

MALACOLOGICAL SOCIETY, at 7.—Descriptions of New Mollusca: G. B. Sowerby.—Solander as a Conchologist: T. Iredale.—Misnamed Tasmanian Chitons: T. Iredale and W. L. May.

SATURDAY, MAY 13.

ROYAL INSTITUTION, at 3.—X-Rays and Crystals: Prof. W. H. Bragg.

MONDAY, MAY 15.

ARISTOTELIAN SOCIETY, at 8.—Symposium at Oxford—The Theory of the State: Hon. B. Russell, S. Ball, C. D. Burns, and G. D. H. Cole.

ROYAL SOCIETY OF ARTS, at 4.30.—Vibrations, Waves, and Resonance: Dr. J. Erskine-Murray.

TUESDAY, MAY 16.

ROYAL INSTITUTION, at 3.—Unconscious Nerves—their Functions in Internal Life: Prof. C. S. Sherrington.

ROYAL STATISTICAL SOCIETY, at 5.15.

INSTITUTION OF PETROLEUM TECHNOLOGISTS, at 8.—Petroleum Refining: A. Campbell.

WEDNESDAY, MAY 17.

ROYAL METEOROLOGICAL SOCIETY, at 4.30.—The Re-adjustment of Pressure Differences—Two Species of Atmospheric Circulation and their Connection: L. C. W. Bonacina.

ROYAL MICROSCOPICAL SOCIETY, at 8.—Some Suggestions regarding Visual Efficiency in the Use of the Microscope and other Optical Instruments: J. W. Purkiss.—A Case of Apparent Intelligence exhibited by a Marine Tube-bearing Worm, *Terebella conchilega*: A. T. Watson.—Alien Oligochæts in England: Rev. Hilderic Friend.

ROYAL SOCIETY OF ARTS, at 4.30.—Hindu Hand-painted Calicoes of the Seventeenth and Eighteenth Centuries, and their Influence on the Tinctorial Arts of Europe: G. P. Baker.

THURSDAY, MAY 18.

ROYAL SOCIETY, at 4.30.

ROYAL INSTITUTION, at 3.—Flints and Flint Implements: Sir Ray Lankester.

FRIDAY, MAY 19.

ROYAL INSTITUTION, at 5.30.—The Movements of the Earth's Pole: Col. E. H. Hills.

INSTITUTION OF MECHANICAL ENGINEERS, at 6.—Spur-Gearing: D. Adamson.

SATURDAY, MAY 20.

ROYAL INSTITUTION, at 3.—The Finance of the Great War—New Problem and New Solutions: Prof. H. S. Foxwell.

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