THURSDAY, DECEMBER 14, 1916.

AT LAST!

THE war has brought many changes of custom and condition, but none is so likely to influence national history as the method adopted in the choice of members of the new Government. For the first time the heads of departments of State have been selected because of their particular knowledge and experience, and not on account of political needs and exigencies. It has been assumed hitherto that a member of the party in power may become in turn the President of the Board of Trade, Board of Agriculture, Board of Education, and of as many other departments as political circumstances may require, without possessing any special qualifications to deal with the affairs of a single one of them. A new principle has, however, now been introduced; and the Government formed by Mr. Lloyd George consists mostly of men who know instead of men who had to be given appointments because of their political claims. The whole nation welcomes this first endeavour to reconstruct on a scientific basis its politics, its statesmanship, its commerce, its education, and its civil and industrial administration. It has been fashionable in political circles to distrust the man who has made it his business to know, and to assume that he must be kept under control by official administrators; but we hope the appointments to offices in the new Government signify that this view has now gone for ever, and has been superseded by the one in which national use is made of the most capable men.

The constitution of the Government evolved under war conditions by Mr. Lloyd George has, in Wordsworthian phrase, so far as the future of education is concerned, "brought hope with it and forward-looking thoughts," and, in any event, has set an example which it is to be hoped may be followed in later appointments. For the first time in the history of the Board of Education a man has been selected for its leader and inspirer entirely apart from political prejudices or ambitions, and without the idea that the position is to be regarded as simply a convenient resting-place for a time in view of some other political office of greater importance, if there be such. Like most of the other offices in the new Ministry, a choice has been made on purely business principles with the sole view of securing for the office the most capable administrator, who will bring not only undivided energies to its effective discharge, but formative and stimulating ideas, high intelligence, learning, and rare gifts of exposition in the written word and in speech.

The appointment of Dr. H. A. L. Fisher, Vice-Chancellor of the University of Sheffield, to the Presidency of the Board of Education will receive the heartiest welcome from friends of education of every grade. It is particularly welcome at the present crisis, when the feeling is rife in all spheres of educational thought that there is need for a complete reform in our methods of education and in the importance assigned to certain subjects. Dr. Fisher comes to the responsible post to which he is assigned from the centre of the industrial life of England, where he has been in close touch with men of affairs with whom the application of science to industrial needs is of paramount importance. He brings, too, a breadth of mind and a keen interest in all democratic movements, especially those concerned with social and economic questions. As a teacher of high repute he will not fail of sympathy with those who are charged with the due training of the youth of the nation in all branches of education. He has already been engaged in important public inquiries, for he was a member of important Commissions, as, for example, that which visited India four years ago to inquire into Indian administration and the conditions of the Public Services. Dr. Fisher has great problems to face and solve, since to be really effective he must break with old traditions which have held the nation hide-bound for many generations. There is, however, reason to believe that he appreciates fully the gravity of the task, and that he has not lightly entered upon it. He brings to its solution a free and liberal mind and an undivided and abiding interest, and it is to be hoped that all parties will unite in giving him the most loyal support.

The lessons of the war have brought home to the English people as never before the need for drastic changes in our educational policy, and we therefore look forward with a confident hope that the new appointment will be abundantly justified in its results and form a precedent for future guidance.

The new Government includes a number of other men who know the "business" with which they have been entrusted. The national needs of the moment are a complete organisation of production, a stringent regulation of, and economy in, consumption, a thorough efficiency of transport, all focussed with the fierce concentration of purpose of an entirely roused people upon one aim, the winning of the war. All these needs have led the Government of the country away from the somewhat arid academic debatableness

of the rostrum into the arena of business life, where things are done, and done with efficiency and dispatch. Hence the nation welcomes the application of the sound principle that men with the "business sense," the intangible ability or intuition which results from a lifetime passed in a successful business environment, should control the national effort. Mr. Lloyd George, as a practical man, has disposed of the superstition that a man of first-class ability in one department of human affairs is equally capable in other realms of activity.

The appointments made to the Board of Agriculture will give the greatest satisfaction to agriculturists. Mr. R. E. Prothero, who becomes President of the Board, has a unique knowledge of his subject, both on the scientific and the practical sides. His historical studies have thrown much light on the development of the subject, and shown how the present agricultural position arose, and his experience in connection with the Bedford estates has given him admirable opportunities for learning what is possible under present conditions. Capt. Bathurst, who will probably be Parliamentary Secretary to the Board, is well known as a landowner who has made improvements on his own estate and encouraged others to do the same. He has himself worked a small holding so as to acquire that first-hand knowledge which cannot be won in any other way but by direct contact with the things themselves. If matters have not gone too far, Mr. Prothero and Capt. Bathurst ought, between them, to be able to put the food problem on a sound foundation. They start with the good wishes and the confidence of the agricultural community.

The appointment of business men like Sir Albert Stanley to the Board of Trade, and Lord Rhondda to the Local Government Board, carries on the same admirable principle of selection. The supreme example lies not only in the new offices, the Controllerships of Food and Shipping and the Ministry of Labour, but in the choice of the men to fill these posts. Lord Devonport, who becomes Food Controller, is familiar, as the chairman of the Port of London Authority, not only with the magnitude of the traffic of the greatest port in the world, but also with the intricacy of the details of the greatest food-importing agency of all time; roughly, half our total food supplies are imported, and the major portion of these imports pass through the London Docks. Sir Joseph Maclay, Shipping Controller, started business as a clerk, and is now one of the largest private shipowners in the country; he has that "sense of the sea" which is the despair of the landsmen and the most notable human result of our insular situation. Sir Alfred Mond, First Commissioner of Works, is another excellent appointment; and Dr. Addison, to whom belongs the chief credit for the successful establishment of the Ministry of Munitions, rightly carries on the work of Minister of that department. Even in the case of what have been called the "strictly political appointments," the same principle has been at work; Mr. Hodge, the Minister of Labour, and Mr. Barnes, the Pensions Minister, bring to their labours the *flair* which comes from a lifelong association with the material, *i.e.* the working-man, with which they have to deal. In such fashion the Prime Minister has chosen his colleagues, and with the small War Council and his own abundant energy he promises that relentless, thorough, and efficient concentration on the winning of the war for which we, as a people, have been pining for many months. In the long run, democratic government is by consent of the governed, and the new rulers of Britain will embark upon their mighty effort with the willing consent of the people of this country and of the Empire.

METEOROLOGY FOR GENERAL READERS.

The Weather-Map: an Introduction to Modern Meteorology. By Sir Napier Shaw. Pp. 94. (London: Meteorological Office, Exhibition Road, S.W., 1916.) Price 4*d*.

NEVER has the demand for natural knowledge of all kinds been so insistent as during the present war, and scientific information of the most various kinds has been placed at the disposal of many who have had no previous training in such subjects. They and the students of science have usually no common language, and the ideas which even the simpler technical terms connote are unfamiliar to them. In these circumstances it is no easy matter to place the resources of science effectively at the disposal of all who may wish to utilise them.

Meteorological science has contributed its share, not only in the form of weather forecasts and climatic information, but also in placing its knowledge of the upper air at the service of aviation, gunnery, etc., to aid in the solution of the new problems which are continually being formulated. Here, too, some acquaintance with the general ideas of modern meteorology is necessary if the full meaning of a forecast or the climatological description of a region is to be understood and adequately appreciated. Everyone is interested in the weather, which is indeed a consideration in nearly all human operations and affects our ordinary avocations of peace as well as the operations of war; and though in both these cases it may be necessary at times to disregard the favourable or unfavourable

character of weather or climate, still a knowledge and an understanding of the principles of meteorology will make for a general increase of efficiency.

But since the general education of the majority in this country does not yet include such a knowledge of the atmosphere and of the elements of physics and dynamics as will render meteorological and climatological descriptions fully intelligible, this introduction to modern meteorology has been issued by the Meteorological Office for the benefit, in the first instance, of those who are making use of meteorology in the present war.

In calling it "The Weather-Map" Sir Napier Shaw lays stress on an essential condition of weather-forecasting which is usually overlooked by those who are not conversant with its procedure, namely, that success depends not upon the skill or the long experience of a single observer, but upon the organised collection of information from as wide a circle of observers as possible, which can then be plotted on a map of the region. Similar maps prepared at intervals of a few hours enable the trained meteorologist to see what changes are taking place, and he can then draw his conclusions as to those which will take place in the near future. When this is generally known and more widely understood, the advantage of preparing forecasts at one centre will be recognised, since it provides much fuller information, and that on a surer basis than is possible for a single observer of long local experience only. But if the local meteorologist is provided with such a weather-map, he can by his knowledge of local conditions amplify with advantage the general deductions of the central institution.

The construction of a weather-map, therefore, is here considered in detail. First, the weather at a number of stations in the British Isles and the North of France on the afternoon of a summer day last year (6 p.m., August 2, 1915) is shown cartographically, and similar maps show the distribution of the winds, the temperature, and the pressure on the same occasion. The distribution of each is explained and discussed so as to lead up to the normal weather-map, on which all these factors are represented together.

This brings us to a short reference to the sequence of weather and its classification according to a few simple types of pressure distribution, and two examples are given of the effect of notable cyclonic depressions which have passed over the British Isles. A series of five maps represents the movement of the depression of November 12–13, 1915, which gave rise to severe gales on our coasts, and four others enable the reader to follow the changes which took place in wind, weather, etc., as the deep depression of December 27–28 of the same year passed over these islands. From the careful description of a weather-map here given anyone can obtain a clear idea of the utilisation of meteorological observations for practical needs. But to ascertain the physical causes of the variations which are shown upon the map, so that we may deal with them as events following causes, is the general problem of the application of the sciences of dynamics and physics to the atmosphere—a problem of the highest interest, but of the utmost difficulty.

The upper air and the conditions prevailing there are shortly described, but the reader is warned that in order to go further he must make himself acquainted with words and ideas which may be unfamiliar to him if he is to make intelligent use of the information which modern meteorology provides. To assist him in this a glossary of brief explanations of many technical meteorological terms and short articles on kindred matters is stated to be in preparation. As a supplement are given climatic summaries for London and Paris, and for Philippopolis, Babylon, Cairo, and Dar es Salaam as representing the types of climate in various theatres of war. The form which these take is somewhat different from that which is ordinarily met with in works which treat of climate. The extreme conditions and the variation of the climatic factors are more important in military operations, etc., than the mean values with which the climatologist is usually concerned. Hence we find that the greatest and least recorded rainfall for each month are given, as well as the average number of days in each month on which rainfall was between certain fixed limits, viz. 1–5, 6–15, 16–25 mm. Similarly, besides the absolute extremes, the normal monthly extremes of temperature are given as indicating the range of temperature to be anticipated in each month; and as for rainfall, a table showing the average number of days in each month on which the maximum and minimum temperatures fall between certain limits clearly exhibits the march of temperature throughout the year and the special character of each month.

These tables, together with a series of isoplethic diagrams of the mean temperature, pressure, wind, rainfall, and humidity at the four observatories of the Meteorological Office, should appeal to everyone as giving climatological information in a form peculiarly suited to practical needs.

This elementary introduction to meteorology will appeal to a much wider circle than those whose present duties on service require the use of meteorological information, for it will be found most useful in all schools where the daily weather-maps are in use as an exposition of their construction and of their place in meteorological science.

H. G. L.

THE ROYAL SOCIETY'S CATALOGUE OF SCIENTIFIC PAPERS.

Catalogue of Scientific Papers. Fourth Series (1884–1900). Compiled by the Royal Society of London. Vol. xv., Fitting–Hyslop. Pp. vi+1012. (Cambridge: At the University Press, 1916.) Price 2*l.* 10*s.* net.

THE Royal Society is to be congratulated on the publication of the fifteenth volume of its Catalogue of Scientific Papers. The first twelve

volumes of the catalogue cover the period 1800 to 1883, forming an alphabetical list of authors' names, with the titles of all the papers they published during those years. The volume now issued is one of a series which will complete the work to the end of the year 1900.

Vol. xv. contains the names of authors from "Fitting" to "Hyslop," so that three volumes are required to reach the end of letter H in the alphabet. It would appear, therefore, that eight volumes may be needed to index the literature of the seventeen years 1884–1900, whereas the papers published in the eighty-four years 1800–1883 could be indexed in twelve volumes.

The volumes for 1884–1900 so far published have been produced under the direction of Dr. Herbert McLeod, whose love of accuracy is well known. An examination of vol. xv. reveals the extreme pains that have been taken to render every detail correct. We would particularly direct attention to the care taken to avoid confusing authors of the same name. Where the director has been unable to satisfy himself as to the identity of an author whose surname alone is given in the paper, that fact is duly indicated. At the present time, when England and Russia are drawn together by common interests, we are glad to observe many entries in Russian characters, such entries having a translation for the convenience of those who are not yet able to read the language of our Ally.

We very much regret that Dr. McLeod has been obliged, through ill-health, to resign the directorship of this work. In the volumes of the catalogue published under his direction he has set a standard of accuracy which is hard for any successor to attain. We hope that Dr. McLeod has been able to leave the manuscript for the remainder of the author index for 1883–1900 so far complete that the Royal Society will have no difficulty in publishing it.

Although a work of this character should find a place upon the shelves of every scientific library, it is obvious that the expense of its production must be too great to be covered by the sales. The late Dr. Ludwig Mond and other generous friends of the undertaking provided funds to make up the deficit. The Catalogue Committee of the Royal Society found that these funds were practically exhausted by the end of 1914. This has not deterred the Society from continuing the publication of the series of volumes. In so doing it has acted in the interest of science, for a work of this kind is most valuable when the papers indexed are still of living interest.

It will be remembered that the Royal Society's Catalogue of Scientific Papers is designed to index all the scientific literature of the nineteenth century. The corresponding work for the twentieth century has been undertaken by the International Catalogue of Scientific Literature, which has already carried on the index from 1901 to 1913.

"L'HOMME MACHINE."

Man—An Adaptive Mechanism. By Prof. G. W. Crile. Pp. xvi+387. (New York: The Macmillan Company; London: Macmillan and Co., Ltd., 1916.) Price 10*s.* 6*d.* net.

ACCORDING to Prof. Crile, the proper term for describing man is mechanism. "Man is essentially an energy-transforming mechanism, obeying the laws of physics, as do other mechanisms." This obedience to the laws of physics is generally admitted by biologists; the question is whether the mechanistic (or chemico-physical) description, which is true so far as it can go, is exhaustive and adequate. Prof. Crile insists that it is, but when we find him including in his conception of mechanism "the fabrication of thought" (by which the mechanical formulæ were themselves fabricated), we wonder if he has sufficiently considered his position. He seems to us to have passed insidiously from a scientific materialism which is admittedly a progressive working hypothesis in physiological research to a philosophical materialism which holds that a true and full description of the world can be given in terms of matter and motion.

When we lay down the mechanically heavy but psychically lightsome volume, and ask ourselves what its chief contributions are, we may select the following. (1) The author gives many forcible illustrations of the unity of the organism. In the web of behaviour what we call mental and what we call bodily are inextricably interwoven. More than that, the whole bodily life is correlated with a subtlety which can scarcely be exaggerated, verifying St. Paul's remark that the various members of the body work as if they had "a common concern for one another." The author gives a very vivid account of the physiological linkage concerned with the transformation of potential into kinetic energy. In this "kinetic system" "the brain is the initiator of response, being activated by the environment within or without the body; acting like a storage battery, it contributes the initial spark and impulse which drives the mechanism. The adrenals act as oxidisers, making possible the transformation of energy and the neutralisation of the resulting acid products. The liver is the chief fabricator and storehouse of the carbohydrate fuel by which muscular action and heat are produced. The liver also plays a large *rôle* in the neutralisation of the acid products of the transformation of energy. The muscles are the engine or motor in which is consummated the final step in the transformation of energy into heat or motion. The thyroid, by supplying a secretion which facilitates the passage of ions, would seem to be the organ of speed control, governing the rate at which the transformation of energy is effected."

(2) Distinctive of the book is the emphasis laid on acidosis, or increased concentration of H-ions in the blood. This may be induced, as is shown in well-illustrated detail, by excessive muscular activity, excessive emotional activation, surgical

MEDICAL TREATMENT FOR DISABLED SOLDIERS.

OUR medical service is faced with a task which will try its skill and endurance to the utmost. "There are already," says a writer in the *Lancet* (November 8, p. 867), "at the lowest estimate 50,000 disabled soldiers discharged from the military hospitals as unfitted for further service." Every week will add to the number. It is true that these discharged men have been cured of their immediate wounds, but we must also realise that they are still convalescent. A large proportion stand in urgent need of a continued medical supervision. There are those whose lungs have been permanently damaged by poisonous gases or by the adhesions which follow healed wounds of the chest. In others the heart is injured and needs careful treatment; more frequently still, the nervous system has been thrown into a state of disorder which only nursing and skill will restore. There are thousands with damaged joints and muscles who can yet be brought back to take a full part in civil life if they receive the requisite attention.

No one will question that it is the nation's duty to attend to the immediate plight of these men. We have two national organisations which could take the problem in hand: the Army Medical Service and the National Health Insurance Commission. The Army has already enrolled most of the medical men who are specially qualified to deal with such cases; medical practitioners working under the National Health Insurance Commission are already overtaxed.

The Government of France, we learn from the *Times* (November 14), has had to face this problem —a much greater one than falls to us. The disabled French soldier, when he is discharged from a hospital in Paris, still remains a soldier, a soldier still under discipline, and passes at once under the care of an organisation housed in the Grand Palais des Beaux Arts, splendidly situated, as every visitor to Paris knows, on the north bank of the Seine. Paintings and statuary have made room for all the modern appliances needed to restore stiffened joints and wasted muscles. The Grand Palais has become a portal through which disabled soldiers emerge as men again fit to take up a useful place in civil life. If necessary, they are trained for a trade or office, such as their physical limitations will allow them to undertake. The treatment has often to be prolonged, and discipline secures a continuity of application and a completion of cure. So well has this system worked in Paris that steps are being taken to have similar organisations set up in provincial military centres of France.

The French are solving a difficult problem, and leading in a way we shall do well to follow. In this country we have established at Roehampton and at Erskine the means by which officers and men are fitted with artificial limbs. There can be no question that these two institutions are fulfilling a national service, but the limbless form only a portion of our disabled men. Massage, electrical treatment, graduated exercises under skilled men and women are the chief means of treatment we can place at their service. We have, too, says the writer in the *Lancet*, "in Sir Alfred Keogh an extraordinarily sympathetic as well as able Director of the Army Medical Service, so that we can feel assured that the cause of the disabled soldier will be treated as a matter of the gravest national importance."

PROF. A. M. WORTHINGTON, C.B., F.R.S.

THE death of Prof. A. M. Worthington at Oxford on December 5, after a short illness, will be deplored by many men of science and a large circle of students who came under his educational influence. Born in Manchester in 1852, Prof. Worthington was educated at Rugby and at Trinity College, Oxford, afterwards working at Owens College, Manchester, and at Berlin, in the laboratory of Prof. Helmholtz. From 1877 to 1879 he was headmaster of the Salt Schools, Shipley, and from 1880 to 1885 he was an assistant-master at Clifton. In 1887 he was appointed headmaster of H.M. Dockyard School at Portsmouth, where he first took a hand in the training of the students of naval engineering, then quartered on H.M.S. *Marlborough*. In 1887 he was transferred to Keyham, Devonport, as headmaster and professor of physics at the new Naval Engineering College, and in that post he remained for the next twenty years. In 1909, owing to the reduction in staff that became necessary at Keyham, which was then being gradually closed down under the new scheme of naval education, Worthington was transferred to the Royal Naval College, Greenwich, as professor of physics, but owing to ill-health he retired in 1911. The main part of Worthington's life was thus spent at Keyham, where he made a great success of the educational side, of which he had charge.

As a lecturer, Worthington was very fine. His favourite subjects were dynamics, hydraulics, optics, and statical electricity. These he presented to his students logically and clearly, illustrating them by many well-thought-out experiments performed with the simplest possible apparatus. He always laid out his lecture table with great care, so that each experiment could be seen by all. In the laboratory he was equally good, and was a most painstaking and energetic instructor, always endeavouring to make the student think for himself. He was a pioneer in the introduction of practical physics into schools, and his work in this direction, carried on at Clifton College, is embodied in his excellent little text-book, "Physical Laboratory Practice."

In his dealings with the naval officer in charge of the college at Keyham, Worthington always strove to maintain the dignity of his position and that of his civilian staff, whom he backed loyally in all matters of discipline. Here his ability to write a good letter stood him in good stead and won many a battle with a new commander who failed to gauge his strength.

As a popular lecturer on scientific subjects,

Worthington was particularly good. His delightful voice and masterly style invariably held his audience up to the last moment. Occasionally he lectured to the convicts at Princetown, and twice the present writer helped him with experiments and lantern slides, the first lecture being on astronomy and the second on the dynamics of rotation. On the first occasion it did not seem possible that an audience of 1000 convicts would be entertained with such a subject as astronomy. But Worthington was in his best form, and held their attention from first to last. The second lecture was even more successful than the first, owing to the experiments.

Worthington's original work in physics is well known. He published papers on surface-tension, the stretching of liquids, the splash of a drop, and other subjects. All his work was marked by great experimental skill, especially that on the stretching of liquids and on splashes. He devoted a large amount of time to the latter subject. The apparatus used was simple, but in his skilful hands the results obtained were accurate and beautiful. Of the many hundreds of experiments made, he only published those that brought out points in a connected chain of phenomena.

He published several scientific works, the chief of which was on the "Dynamics of Rotation." Marked by great lucidity of style, this book ably filled a place in the library of physics. He also wrote and had printed a number of pamphlets on wave motion, hydraulics, statical and current electricity, and optics, for private circulation among his students. These were all most carefully prepared after much discussion with his assistants.

Worthington was a man of strong and decided character; having marked out a line of action, he stuck to it, and fought for it with all his might. In fact, he rather loved a fight, being a Lancashire man. His considered judgments were always sound, but he was impulsive at times. He ruled his department at Keyham on the principle that a headmaster should make his presence felt, and in that he succeeded; on the whole, he ruled with much wisdom, and undoubtedly the many officers who passed through his hands will recall his influence on them as entirely for their good.

To his friends and those who understood him, Prof. Worthington's death is a great loss.

PROF. JOHN WRIGHTSON.

THE death of Prof. John Wrightson, on November 30, at seventy-six years of age, removes a well-known authority and writer from the agricultural world. As professor of agriculture (1864-79) at the Royal Agricultural College, Cirencester, he formed one of a small but eminent group of teachers, including Church and Fream, who have left a lasting mark on their subject. After his departure from Cirencester he founded Downton College, of which he was president until it closed in 1906 from inability to compete with State-aided institutions. Many of his former pupils, both at Cirencester and Downton, have done much to promote the improvement of agriculture. For some years Wrightson was professor of agriculture and agricultural chemistry at the Royal College of Science, and chief examiner to the Science and Art Department in the "Principles of Agriculture."

As a writer Wrightson was distinguished by his careful selection of matter and by lucidity of style. He and Principal Newsham recently compiled a "Text-book of Agriculture" which is extremely practical in nature and has been much appreciated by many educational institutions. For many years Prof. Wrightson was agricultural editor to the *Times*, and wrote the periodical reports on crops up to the time of his death. His intimate friends, and they are many, will feel the loss of his genial personality and old-fashioned courtesy. His intellectual powers remained unimpaired by age, and his unobtrusive generosity will be remembered with gratitude by many. His name will always occupy an honoured place in the history of British agriculture, especially as regards the educational developments of which the Royal Agricultural College, the Royal Agricultural Society of England, and the Board of Agriculture (when Sir Thomas Elliott was Secretary) have been pioneers. J. R. A.-D.

NOTES.

THE question of national laboratories of scientific research has been brought forward recently in France. In the *Comptes rendus* of the Academy of Sciences for November 13 is a preliminary report by a committee composed of MM. Jordan, Lippmann, Emile Picard, d'Arsonval, Haller, A. Lacroix, Tisserand, and Le Chatelier on this question. It is pointed out that all the great industrial nations possess national laboratories of scientific research, systematically directed towards the study of technical problems. The National Physical Laboratory in England, the Bureau of Standards and the Carnegie Institution in the United States, the Physikälische Reichsanstalt and the institutes founded by the Wilhelm Gesellschaft in Germany are given as examples. France has no corresponding institution, and after a full discussion of the questions of control, staff, and work to be done, the following resolution was unanimously carried:—"The Academy of Sciences, convinced of the necessity of organising in France, in a systematic manner, certain scientific researches, expresses its wish that a National Physical Laboratory should be started, for the prosecution of scientific researches useful to the progress of industry. As in other countries, this laboratory would be placed under the control and direction of the Academy of Sciences." On November 27 this question was further considered by the academy, and it was suggested that the general direction of the laboratory should be entrusted to a council, one-half of the members to be nominated by the academy, one-quarter representatives of the State departments, and the remaining quarter delegated by the principal industrial interests. Certain existing State laboratories might be affiliated to the National Laboratory. A considerable grant for establishment and maintenance will be necessary.

A PROLONGED trial, which has lasted 145 days, the longest British trial with the exception of the Tichborne case, and concluded with the longest speech on record in the British Bar, illustrates the inconvenience

of the adoption by Rhodesia, under the influence of Mr. Hayes Hammond, of the American mining law. According to that system, instead of each mining company holding all the minerals vertically below its surface, it has the right to work under its neighbours' lands any reef that it can follow from the surface. In this case the Globe and Phœnix Gold Mining Co. was extracting very rich ore from beneath the surface held by the Amalgamated Properties of Rhodesia. The question at issue was whether this ore was part of the Phœnix reef, in which case it belonged to the Globe and Phœnix Co. by virtue of its extralateral rights, or whether it came from an independent reef. The Phœnix mine at the surface worked two parallel reefs, which came together underground, and at greater depths bifurcated several times. The Globe and Phœnix Co. claimed these bifurcations as branches of one reef. According to the plaintiff company there are no branching reefs, and the alleged Phœnix reef consists of at least five independent reefs which had been brought into practical continuity by a complex series of faults. It was claimed that the so-called coalescences and bifurcations were junctions due to faults, and that the great variations in the ore indicated that different parts of the reef had been formed at different times and by different processes, and were therefore distinct reefs. The geological evidence was subject to the drawbacks that the reef had been long ago removed at the critical junctions, and that the evidence collected by the survey of the fifteen miles of underground workings was in places inadequate, as it was not always realised what would be the essential points. The Globe and Phœnix Co. admitted that the reef was not formed in a short time and all parts of it simultaneously, as it probably grew by the slow extension of a branching system of cracks. Mr. Justice Eve's decision in favour of the Globe and Phœnix Co. therefore decides that such a slowly formed branched sheet of ore, in spite of considerable variations in its contents and some breaks in its continuity, is one reef.

WE much regret to announce the death, on December 10, of Mr. Clement Reid, F.R.S., late of H.M. Geological Survey, at sixty-three years of age.

WE regret to record the death on December 11, in his eighty-ninth year, of Mr. W. Ellis, F.R.S., formerly superintendent of the magnetical and meteorological department, Royal Observatory, Greenwich.

MR. RANSOM, of Hitchin, has placed with the Pharmaceutical Society funds to endow a research fellowship to bear his name. The sum to be invested for the purpose will yield about 100*l.* yearly in perpetuity.

THE Primate of Ireland (Dr. Crozier), in whom the appointment is vested, subject to the approval of Oxford University, has appointed Mr. J. A. Hardcastle, a grandson of Sir John Herschel, to be astronomer to the Armagh Observatory in succession to Dr. J. E. L. Dreyer, who recently resigned to take up work at Oxford.

THE "Cecil" medal and prize of 10*l.* is offered by the Dorset Field Club for award in May next, for the best paper on "The more recent applications of electricity in the present war, especially in the treatment of wounds and diseases arising therefrom." The competition is open to persons of from seventeen to thirty-five years of age, born in Dorset, or resident in the county for a year between May 1, 1915, and May 1, 1917. Competing essays should be sent to Mr. H. Pouncy, the *Chronicle* Office, Dorchester.

THE death is announced, in his ninetieth year, of the Rev. W. D. Macray, librarian, historian, and archæologist, whose life was spent in the service of the Bodleian Library. His first work was a manual of British historians down to A.D. 1600, but the main study of his life was bibliography, as shown by the catalogue of the Bodleian Library, and "The Annals of the Bodleian," published in 1868. He also edited works for the Rolls Series, and prepared a calendar of the muniments of Magdalen College. He was in charge of Ducklington parish for more than forty years.

PROF. A. S. UNDERWOOD, who died on December 2, occupied the chair of dental anatomy and physiology at King's College Hospital for twenty-two years, and became inspector of dental examinations on behalf of the General Medical Council. He had also been president of the Odontological Society, and held several other offices in connection with dental science. He was born in London on January 10, 1854, and throughout his professional career did much to encourage research among those who were engaged in practice. He himself was successively interested in the production of dental caries by the action of micro-organisms, the detection of organic matter in human enamel, and the anatomy of the maxillary sinus. In 1912 he took part in the restoration of the lower jaw of Piltdown man, and in 1913 he published an X-ray photograph of this fossil, which was discussed at the time in NATURE.

THE death is announced of Dr. José Echegaray, member of the Spanish Academy, and president of the Spanish Academy of Sciences. Born at Madrid on April 19, 1832, he began early to incline to mathematical studies, and in 1854 he was appointed professor in the School of Bridges and Roads. From that time onwards his activities widened, and he gradually became one of the prime movers in the modern revival of science and other intellectual studies in Spain. His numerous popular articles on scientific subjects in the magazines and reviews were especially attractive, and aroused great interest. He was also a poet and author of plays, and in 1904 he shared with Mistral the Nobel prize for poetry. In 1905, when already seventy-three years old, Dr. Echegaray was called to the professorship of physics in the University of Madrid; he then began with renewed energy to promote the study of mathematics, and was occupied with the proof sheets of his last work, in several volumes, at the time of his death on September 14, 1916. Between 1868 and 1874 Dr. Echegaray took a prominent part in political life, and while Minister of Public Works, Instruction, and Agriculture founded the Spanish Geographical and Statistical Institute.

THE August issue of "Records of the Geological Survey of India," which reached us a few days ago, includes the following note by the director of the survey, Dr. H. H. Hayden, upon Mr. R. C. Burton, who died of wounds on April 9, at twenty-six years of age:—"I greatly regret to have to record the death of Mr. R. C. Burton, assistant superintendent, Geological Survey of India. Mr. Burton joined the department in January, 1912, and was posted to the Central Provinces, where, during his short period of service, he did admirable work in helping to solve the question of the origin of the calcareous gneisses which constitute such an important element of the Archæan group of that area. His investigations into the origin of the bauxite of Seoni and adjoining districts also gave evidence of marked ability, and by his death the Geological Survey has lost one of the most promising, as well as one of the most popular, of its younger members. Mr. Burton joined the Indian Army Reserve of Officers early in April, 1915, and, after a

short training in India, was attached to the 104th Rifles in Mesopotamia, where he died on April 9 from wounds received in action on the previous day. His loss is keenly felt by all his colleagues."

WE regret to announce the death of Sir James B. Lyall, K.C.S.I., G.C.I.E., an ex-Lieutenant Governor of the Punjab, and younger brother of the late Sir Alfred Lyall. Both brothers were educated at Eton and Haileybury College, and through the influence of an uncle, a director of the East India Company, obtained appointments in the Indian Civil Service. The career of Sir James Lyall was spent in the Punjab, where he held in succession the posts of Settlement Officer of Kangra and Financial Commissioner, succeeding Sir Charles Aitcheson in 1887 as Lieutenant-Governor of the province. He did not possess the learning and literary skill of his brother, Sir Alfred Lyall; but his Settlement report of Kangra threw much light on the customs and sociology of the Hindus occupying the hill districts. His most important work of administration was the scheme for the Chenab Canal irrigation project, which brought a large area of waste land under the plough, and gave welcome relief to the more congested districts. After his retirement from the Service he was a member of the Opium and the Famine Commissions. Few men who have risen to the highest posts have been more universally esteemed by Indians and by their own countrymen, and few have displayed more constant kindliness and courtesy, combined with frankness and strength of character.

THE death is announced, in his eighty-sixth year, of Dr. Richard Norris, formerly professor of physiology in Queen's College, Birmingham. From an obituary notice in the *British Medical Journal* we gather the following particulars of his career. During the 'fifties of last century Norris made his first important discovery—the photographic dry plate. In 1862 he made his first contribution to the Royal Society, "Phenomena of Attraction and Adhesion in Solid Bodies, Films, Vesicles, Liquids, Globules, and Blood Corpuscles." In the same year he was appointed professor of physiology in his old medical school, a position he continued to hold until the absorption of Queen's College by the Mason College, now the medical faculty of the University of Birmingham. During the next few years he contributed papers to the Royal Society, chiefly on physiological subjects, with, however, one on "Certain Molecular Changes in Iron and Steel during Separate Acts of Heating and Cooling." At the meeting of the British Association in 1865 he read a paper demonstrating that the opinion then held that muscular contraction caused rigor mortis was fallacious. But what he regarded as his chief work was the discovery in 1877 of large numbers of "invisible corpuscles" in the blood. In 1882 Prof. Bizzozero, of Turin, claimed to have seen similar corpuscles, but Dr. Norris easily established priority. He maintained that these corpuscles were invisible in that they possessed the same refractive index as the liquor sanguinis. Later his contentions were challenged, but he maintained his own views.

DR. PETER QUIN KEEGAN, who died on August 10 at Patterdale, in Westmorland, where he had lived for many years, was keenly interested in the colouring matters in leaves and flowers, and published notes on the subject in various journals. In NATURE (vol. lxi., 1899) he described the results of some "Experiments on Floral Colours," indicating the effect of acids, alkalis, and salts on the anthocyanins of various flowers, and later, in NATURE (vol. lxix., 1903), discussed the relation between leaf decay, or loss of vitality in the leaf, and the appearance of autumn tints. He explained the greater brilliance of the American autumn tints as compared with those in England by the greater vitality of the leaf induced by the favourable conditions of the Indian summer, which favoured "the normal process of deassimilation (the development of coloured pigment from tannic chromogen)." He contributed notes on the same subject to the *Naturalist,* and also notes on the chemical analyses of some common plants. He approached the subject from a chemist's point of view, and does not seem to have been fully cognisant of the results of other workers nor to have appreciated the diversity of factors involved from the physiological point of view. In the *Naturalist* (1910, p. 226; see also *Knowledge,* 1911, p. 15) he summarised the results of his investigations on the colour of flowers thus: the production of pigment in the petal is a purely local action due to a process of deassimilation set up to supply the insistent demand for proteid for the development of pistil and ovules, whence he argued that, other conditions being equal, "those floral organs which habitually produce most ovules ought to exhibit the most vividly tinctured corollas."

DR. ROWLAND NORRIS has compared two methods for the preparation of anti-anthrax and other serums. In one the blood from the immunised animal is defibrinated by shaking with a coil of wire and then centrifuged; in the other the blood is mixed with potassium oxalate solution, which prevents coagulation, sedimented, and centrifuged; the plasma is then clotted by the addition of calcium chloride solution, and the serum separated. It is found that the oxalate method gives a much greater yield of serum, which is also clearer and of a better colour (Bull. 60, Agricultural Research Institute, Pusa).

THE meningococcus, the micro-organism of cerebro-spinal fever, frequently persists in the throat of "carriers" for long periods. Lieut.-Col. Gordon and Capt. Flack have tested the effect of sprays containing chloroamine T and zinc sulphate for freeing carriers from the meningococcus. When the infection is scanty both agents are generally quickly effectual, but when the infection is abundant the condition is far more difficult to "cure" and chloroamine only is of use (*British Medical Journal*, 1916, November 18, p. 673).

MISS L. H. HINE, in a paper on "The Bionomics of the Tiger-Beetle" (Proc. R. Phys. Soc. Edin., xx., part 1), describes for the first time the egg-laying habits of *Cicindela campestris.* The female insect bores into the soil with her ovipositor to a depth of 4 or 5 mm. "As the hole deepened, the beetle raised herself on her front legs till her body assumed an almost perpendicular attitude." The hole is afterwards filled up and the surface carefully raked over.

AN interesting divergence from the normal feeding habit of its family—the Cecidomyidæ, or gall-midges—is shown by the larva of an American fly, *Aphidoletes meridionalis*; instead of eating and deforming plant-tissues it attacks and devours aphids or "greenfly" on such diverse plants as garden pea, oats, and fruit-trees. A fresh account of the life-history and habits, with figures of the various stages, has lately been published by J. J. Davis (*Journ. Agric. Research,* vi., No. 23).

DRS. RAYMOND PEARL and M. R. Curtis continue their "Studies on the Physiology of Reproduction in the Domestic Fowl" with a memoir on "Dwarf Eggs" (*Journ. Agric. Research,* vol. vi., No. 25). In a period of eight years nearly 300 dwarf eggs were examined at the Maine Station—one "dwarf" to 1158

normal eggs. At least 65 per cent. of those studied "were initiated by an abnormal small yolk or by a part of a normal yolk." About a third of the shells proved yolkless; such "eggs" may be formed through "the stimulation of an active duct by some particle which is not yolk."

THE *American Museums Journal* for October contains an exceedingly interesting article on the common mussel (*Mytilus edulis*), primarily intended to awaken the American public to the fact that in this mollusc they have a source of most nutritious food, which has the further advantage of being practically inexhaustible, vast beds extending along much of the Atlantic seaboard. In his general survey of the life-history of this mollusc, the author, Mr. Irving Field, points out that the ill-effects of overcrowding are at least mitigated by the power of migration which, to a limited extent, even the adults possess in the sucker-like action of the foot. This activity is much more marked in young specimens, which, timed over a measured course, have attained a speed of one inch per minute. At this stage they can creep with ease up the vertical faces of piles and rocks. Further, they have been observed, like pond-snails, to creep along under the surface-film of still water. The almost incredible fecundity of this mollusc, and the number of its enemies, which is surprising, are also fully enlarged upon.

THE forty-ninth annual report of the Fisheries Branch of the Canadian Naval Service, published this year, deals mostly with statistics of the fishery industries of the Dominion and with reports of surveys and inspections. One appendix gives an account of the rather extensive operations of the fish hatcheries in relation to the fresh-water fishes of the great lakes and rivers. Other appendices deal very briefly with the work of the biological stations at St. Andrews, in New Brunswick, and at Departure Bay, in British Columbia. Preliminary notices are made of some highly interesting investigations on the processes involved in the operations of fish-curing, and on the biochemistry of the extractives of cured fish and the organic fluids of various fresh fishes and other marine animals. Other fishery investigations are in progress, and their publication will be a matter of much interest.

THE observations on the sound of gun-firing in the south-eastern counties of England are collected and analysed in an interesting paper by Messrs. M. Christy and W. Marriott (Quart. Journ. Roy. Meteor. Soc., vol xlii., October, 1916, pp. 267–88). Mr. Christy's observations were made at Chignal St. James, near Chelmsford, which is about 125 miles from Ypres and 155 miles from Albert. The sounds which are attributed to firing in the neighbourhood of Ypres consisted of a rapid succession of dull thuds, almost more felt than heard. Those heard on June 24 last and afterwards, from the valley of the Somme, were more intense and so rapid that they formed a fluttering rumble. The sounds have been recorded from nearly the whole of Essex, Kent, Surrey, and Sussex, and from parts of the adjoining counties. The firing near Ypres was heard at Elmdon, in north-west Essex (about 151 miles), and that in the Somme Valley near Winchester and Ringwood, in Hampshire (about 200 miles), and at Wendling, in Norfolk (about 220 miles). Mr. Christy's observations show that the sounds were heard more readily the greater the elevation; in valleys they were seldom noticed. Their audibility also varies with the season. In the spring and summer they were heard nearly every day, in the early autumn very rarely, and never in the winter months. The meteorological conditions that favour the transmission of the sound are discussed by Mr. Marriott. He finds that the sounds were heard most frequently on days when there was a light or moderate breeze from between north and east, and when the sky was cloudy or overcast.

THE climate of Hongkong has recently been discussed by Mr. T. F. Claxton, director of the Royal Observatory, Hongkong. The observatory is not on the island, but is situated near the centre of Kowloon, a small peninsula in South China, separated from Hongkong by a harbour from one to three miles wide. Mean monthly diurnal inequalities are given of the principal meteorological elements, and the times of day at which different temperatures and wind velocities will occur on the average throughout the year. Numerous plates are given showing diurnal ranges of barometer, temperature, rain, cloud, and sunshine, and vector diagrams of wind are also given. At the commencement of the discussion five-day means are given of the principal meteorological elements throughout the year for the period of thirty years, 1884–1913; these values are also given graphically. The four seasons of the year are shown to be well marked in Hongkong. A comparatively cold, dry winter lasts from the beginning of December to the middle of March, followed by a damp, misty spring until May, and a hot summer from June to September, with occasional heavy rain from typhoons which pass mostly to the north and north-west of the observatory. The autumn is usually dry and pleasant. The typhoons are discussed, and especially their influence on the weather at Hongkong and on the basing of weather forecasts from their bearing and distance. Special attention is also given to the effect of variations in the solar activity on the meteorological elements. Greater details would be welcomed on some points; for instance, it is scarcely possible to obtain the recognised reduced barometer readings. The building of the observatory is said to be 103 ft. above sea-level, but the height of the barometer is not given, and clearly most of the readings are uncorrected for height. No mention is made of the correction for gravity.

THE Canadian Arctic Expedition under Mr. V. Stefansson is still at work, and only brief accounts of its progress have so far appeared in the Press. Some further details of the work of the expedition up to the autumn of 1915 now appear in the report of the Department of the Naval Service of Canada for the year ending March 31, 1916. Last year's issue of this publication contained the story of the drift and loss of the *Karluk* and the subsequent rescue of the greater part of her crew. The present volume has better news. In the summer of 1915 Mr. Stefansson, with three companions, explored and charted the west coast of Prince Patrick Island. At Cape McClintock they found one of McClintock's records from 1853. In 78° N. lat. 117° W. long. new land was sighted to the north. They reached this land and explored some miles of its coast-line, but the weather was unfavourable. However, there can be no doubt that this new island in Gustav Adolf Sea is one of considerable size. It seems to be connected with Prince Patrick Island by a chain of small islands or reefs. A further result of the expedition's work is the certainty of the absence of land in the Beaufort Sea, north of the Mackenzie River and west of Banks Land. The continental shelf extends fifty miles beyond Alaska and Banks Land, where the water rapidly deepens to more than 1300 fathoms.

VERY little attention seems to have been paid to the question of the mobility of iron in plants, probably because this element has ordinarily been considered of minor interest in plant nutrition. Pfeffer states that

iron, like potassium and phosphorus, may be removed from the older dying organs and transferred to new growth. This view is challenged by Messrs. P. L. Gile and J. O. Carrero, of the Porto Rico Experiment Station, in the *Journal of Agricultural Research*, vol. vii., No. 2. Working with rice plants grown normally in water culture and then transferred to iron-free culture solutions, these experimenters find that chlorosis is invariably noticed first in the new leaves, while the old leaves remain green, the plants dying from the top downwards. If iron were mobile in the plants after reaching the leaves, the phenomena should be different; iron should be transferred from the old to the new leaves, where growth is most active, and the old leaves become chlorotic first. Analyses of the ash from old and new leaves of young rough-lemon trees (*Citrus limonum*), grown in four different soils, show that the percentage of iron in the old is almost twice that in the young leaves. The authors carefully avoid any claim that the non-translocation of iron is a general rule for all plants, since their experiments were chiefly made with rice and pineapples. They suggest, however, that in respect to mobility in the plant iron should be grouped with silicon and calcium, and not with nitrogen, phosphorus, potassium, and magnesium, which are generally considered mobile.

THE current number (December, 1916) of the *School World* contains an interesting account by Canon J. M. Wilson of a thirteenth-century MS. in the Worcester Cathedral Library. Written in Latin, it is the translation of an Arabic text containing the definitions, postulates, and axioms of Euclid's "Elements," Book I., together with a rhetorical abstract of props. 1–20. There are no figures, and, what is still more remarkable, there are no symbols for points. Thus, in English, the summary of prop. 1 is:—"To describe an equilateral triangle on a given straight line. From the two extremities of the given line, setting off its length with the compass, describe two intersecting circles. Then from the common point of the circles draw straight lines to the extremities of the given line. Then deduce the proof from the definition of a circle." One of the greatest of modern works on pure geometry is v. Staudt's "Geometrie der Lage"; here there are no figures, but the author uses symbols for points, planes, and lines. In its absence of symbols for elements, as well as its omission of figures, this geometrical fragment is very peculiar, and possibly unique. Canon Wilson says that there is room for figures on the margin, but he does not say whether any special spaces are reserved for them. Judging from the facsimile (p. 448), we should say that there were not. It may be added that the assumption used in the theory of parallels appears as a postulate and not as an axiom.

IN his repetition of Fizeau's experiment on the drag exercised by moving matter on the ether, Prof. Zeeman used water flowing with a mean speed of about 500 centimetres a second through two parallel tubes 300 centimetres in length and 2 centimetres in diameter. As the two beams of light traversing the tubes pass along their axes it is necessary to know the speed of the water along the axes. In the first instance Prof. Zeeman calculated this speed from the mean speed as given by a water meter, but more recently, according to two communications made to the Academy of Sciences of Amsterdam, which appear in vols. xviii. and xix. of their Proceedings, he has measured the axial speed directly. His method depends on the observation of small air-bubbles introduced into the stream and illuminated by a narrow beam of light sent along the axis of the tube. These bubbles are viewed through windows in the side of the tube by reflection in a mirror rotating rapidly about an axis parallel to the tube. The slope of the line of bubbles as seen in the mirror gives their speed if the angular speed of the mirror is known. He finds that the mean speed in his short pipes is 0·844 of the speed at the axis, while, according to the measurements of Stanton and Pannell at the National Physical Laboratory, the mean is 0·82 of the axial speed for water moving at the same speed in long pipes of this diameter.

MESSRS. CONSTABLE AND CO., LTD., announce the early publication of a translation, by J. H. Johnson, of Jean Rey's "The Range of Electric Searchlight Projectors." The work will embody the investigations and tests carried out by the author in various parts of the world under actual working conditions. It will contain a number of diagrammatic illustrations.

TO those who are interested in Russia, Catalogue No. 370, just issued by Mr. F. Edwards, 83 High Street, Marylebone, should appeal, for it is largely composed of particulars of works relating to the Russian Empire. Another section deals with books concerning the United States, Canada, the West Indies, Central and South America, and a third with those on the western counties of England.

OUR ASTRONOMICAL COLUMN.

THE LONGITUDE OF WASHINGTON.—The first direct determination of the longitude of Washington, referred to Paris, has lately been made by American and French astronomers with the aid of wireless signals between the Eiffel Tower and the naval station at Radio, Va. Full details of the extensive observations are given in Appendix to Publications of the U.S. Naval Observatory, second series, vol. ix. The antennæ at the two stations were adapted for the use of practically the same fundamental wave-length, namely, 2150 metres. Notwithstanding the great distance of 3840 miles between the two stations, the signals received at Paris are stated to have been very clear, though those received at Radio were rather feeble. The final result Washington–Paris is given as 5h. 17m. 36·653s. ±0·0031s.; and for Washington–Greenwich as 5h. 8m. 15·721s. ±0·014s. The value of the latter previously derived by the U.S. Coast and Geodetic Survey, and quoted in the Nautical Almanac, was 5h. 8m. 15·78s. It is interesting to observe that the mean double-transmission time was 0·0429s. ±0·0029s., corresponding to a velocity of transmission of 179,000 ± 12,000 miles per second.

A number of American observatories also made arrangements to receive the time signals from Radio and to utilise them for determinations of their longitudes from Washington.

THE VARIABLE NEBULA N.G.C. 2261.—Another case of a nebula of variable form has been found by E. P. Hubble in N.G.C. 2261 (*Astrophysical Journal*, vol. xliv., p. 190). The nebula in question is the finest known example of the rare "cometic" type, and is situated in R.A. 6h. 32m., declination +8° 51′. Its form is nearly that of an equilateral triangle with a sharp stellar nucleus at the extreme southern point, this nucleus forming the irregular variable star R Monocerotis. A photograph taken during last winter by Mr. Hubble with the 24-in. reflector of the Yerkes Observatory showed decided changes in the nebula when compared with a plate taken eight years earlier by F. C. Jordan with the same instrument. Confirmation of the variability was found in a photograph taken by Isaac Roberts in 1900, and in

another taken at the Lick Observatory in 1913; also in a photograph taken at Allegheny at Mr. Hubble's request. The most striking change was what at first appeared to be a transverse shift of a bright patch just north of the nucleus, but further examination suggested that this was more probably due to the sudden appearance of a mass of bright nebulosity. There are several other differences between the photographs which appear to be due to real changes in the nebula. In particular, a small mass a little south-east of the nucleus exhibits a decided irregular movement, having moved in towards the nucleus when the above-mentioned new mass appeared. This small mass moved not less than 0·5″ per year between 1908 and 1913, and it seems likely to have a measurable parallax.

Rotation of the entire nebula would not account for the variations observed, but some of the changes may be explained by local brightening and fading of stationary matter. Actual motion of portions of nebulosity relative to the nebula as a whole, however, is regarded by Mr. Hubble as the probable explanation of most of the changes observed. The spectrum of the nebula has been found to be continuous.

THE STRUCTURE OF THE RED LITHIUM LINE.—The complex structure of the red line of lithium, λ 6708, has been further investigated by Dr. A. S. King at the Passadena Laboratory (*Astrophysical Journal*, vol. xliv., p. 172). It is shown that the line may appear with two distinct sets of components, either as an unsymmetrical doublet, or as a triplet of variable separation. In a third stage the side components of the triplet change into an ordinary reversal within which the central component can still be seen. All three conditions of the line may be produced either in the arc or electric furnace, and the controlling agency appears to be the amount of vapour in the source. The variable interval of the components suggests an electrical resolution, which would most likely be due to the action of interatomic fields. The observations have proved that the line at 6708 which commonly appears in calcium spectra is due to lithium impurity. Also, it may now be considered certain that the strong line appearing at this position in the spectra of sunspots should be attributed to lithium. It is remarkable that this should be the only direct proof of the presence of lithium in the sun, there being no representatives of this element in the Fraunhofer spectrum.

PLANTATION RUBBER.

THE *Trade Supplement* of the *Times* for December is devoted almost entirely to plantation rubber. The editor has drawn upon some of the best authorities in the plantation world for his contributions, and without exaggeration has achieved a pronounced success. The articles deal with the development of the plantation rubber industry throughout the Middle East, the physical, biological, and chemical problems involved in the preparation of the raw material, and the importance of the supplies to the manufacturing industry in this and every other country.

The large number of contributors has resulted in repetition of the same facts, but this was scarcely avoidable in such an issue. Much of the information has already been disseminated in text-books and technical journals, but the matter has been rendered in this supplement in a form which will appeal to all interested in the industry either financially or technically.

In one of the most important articles Prof. J. Bretland Farmer outlines the risks of tropical agriculture, the efforts which have been made by Government and private individuals, and the need for still greater precaution and the placing of the industry on a better scientific foundation. It is already known that the Imperial College of Science has sent a number of scientific officers to the Middle East, and we know from personal contact with them that they have felt the necessity of periodically spending a part of their time in first-rate laboratories in Europe or America. It is impossible for the scientific officers in charge of plantations in the Middle East to be conversant with all the advances made in plant sanitation, biological problems, and testing apparatus of value to the plantation industry

A brief survey of the article on "Pests and Diseases," by Mr. J. Mitchell, satisfies one that there is every reason why the many diseases affecting the roots, bark, stems, and fruits of *Hevea brasiliensis* should be carefully watched. The necessity for independent scientific officers to be put in charge of such work is quite apparent even to the ordinary investor, who has but little knowledge of mycological and entomological problems

With regard to the physical and chemical researches in the laboratories of the manufacturers, some very useful information is contributed by Mr. W. A. Williams, Dr. Joseph Torrey, and Dr. Philip Schidrowitz. There is a great lack of uniformity in cultivated rubber, which materially affects processes of manufacture and the finished article. It is suggested that the difficulties consequent on variation of plantation rubber can be reduced by standardisation of methods of preparation on the estate and by closer co-operation with manufacturers in this country. The lack of co-operation between plantation growers and manufacturers is emphasised by Mr. Alexander Johnston.

A review of this supplement cannot be completed without reference to the very strong article by Mr. E. Stevenson, chairman of the Rubber Trade Association of London. Mr. Stevenson points out the absolute need of organisation, and shows that the growers themselves are very largely responsible for the competitive system which they have set up. Organisation is apparently as necessary among producers, manufacturers, and dealers in raw rubber as it is on the plantations, and the supplement before us will serve a good purpose if it results in any definite advances being made in this direction. H. W.

MARINE ISOPODA FROM THE NORTH ATLANTIC.[1]

THE papers before us form two of the valuable series of reports now being issued by the Danish Government, through the Zoological Museum at Copenhagen, on the results of the exploration of the deep sea in the neighbourhood of Greenland, Iceland and the Faröes. They constitute a monograph of the Isopoda and Tanaidacea of that region, and their importance may be judged from the fact that, whereas previously only fifty-three species of Isopoda were known from the area surveyed, Dr. Hansen records 242 species, of which 125 are described for the first time, and establishes eighteen new genera. This satisfactory result is due to the methods of collecting introduced by the author during the expedition. The mud brought up in the trawl and dredge was carefully sifted through fine bolting silk, and the results of the sifting preserved for future examination. In this way hundreds of small animals, which could not have been collected by any other means, were discovered. This method may be recommended to naturalists in charge of future expeditions for the ex-

[1] "The Danish *Ingolf*-Expedition." Vol. iii., No. 3, "Crustacea Malacostraca," II. By H. J. Hansen. Pp. 145+12 plates. (1913.)
"The Danish *Ingolf*-Expedition." Vol. iii., No. 5, "Crustacea Malacostraca," III. Pp. 262+16 plates (Copenhagen: Printed by Bianco Luno, 1919.)

ploration of the deep-sea fauna. We can speak from personal experience of the efficacy of a modification of Dr. Hansen's methods which has been used with great success in the exploration of the deep water to the west of Ireland, where the use of fine silk townets attached to the dredge and trawl has revealed a wealth of species undreamt of by earlier British marine biologists.

Dr. Hansen prefaces his reports by a critical account of the literature relative to the area surveyed by the *Ingolf*, and a valuable summary of the geographical and bathymetric distribution of the species in the collection.

Of special interest is his conclusion that the Wyville-Thomson ridge does not form an absolute line of separation between the deep-sea fauna of the cold and warm areas. Evidence is submitted of several species which have been found in both areas, and the author rejects the hitherto accepted explanation of this distribution, that these species were taken pelagically and not actually on the bottom.

Dr. Hansen has a valuable chapter on sexual differences among Tanaidæ, in which he comments on the rarity of adult males, and makes the interesting suggestion that the development of the marsupium and eggs in the female is accompanied by a reduction in size. His remarks on the nomenclature of segments and joints and on generic and specific characters in Tanaids will prove of the utmost service to students of this difficult order of Crustacea, which is marked by great uniformity of external form and the absence of tangible characters upon which species and genera may be distinguished.

The most important morphological feature brought forward in these reports is the evidence in favour of the author's theory, advanced some twenty-three years ago, that the sympod of all biramous appendages in Crustacea was primarily three-jointed. Hitherto no evidence in support of his case could be brought forward as regards the thoracic limbs of the Malacostraca (with the exception of Nebalia), but Dr. Hansen has now produced evidence of the existence of a præcoxal joint in the maxillipeds of two species of Isopoda.

The new species and genera are clearly described and illustrated by a series of beautifully drawn figures. The wealth of material at the disposal of the writer and his clear and critical insight into the true value of characters for systematic purposes have led him to suggest several modifications in the minor classification of the families and genera of Isopoda, which tend to a better understanding of the group and to a restoration of order out of the chaos into which it was rapidly falling.

Students of Arthropoda have been indebted to Dr. Hansen in the past for a series of illuminating papers elucidating the structure and classification of many obscure and difficult groups. Their obligations are considerably increased by the publication of these valuable papers, which workers on Isopoda will find indispensable to the successful prosecution of their studies. W. M. T.

GROWTH FACTORS OF FOODS.

THE *Biochemical Journal* more than maintains its increasing and well-deserved reputation in the current number (vol. x., No. 3). The articles of most general interest are two on feeding experiments, which were carried out at the Cambridge Biochemical Laboratory under Prof. F. G. Hopkins's direction. These experiments are a continuation of the very careful and elaborate series which Prof. Hopkins has been making for several years past upon the growth factors of foods. In all of them young albino rats of uniform origin, sex, and weight are employed. They are fed and treated in an exactly similar manner, except with regard to the essential factor with which the investigation is concerned. The food consists of starch, cane-sugar, fat, suitable salts, and various protein products, together with the alcoholic extract of 1·5 c.c. of milk per diem, as this extract contains an unknown "vitamine," which is absolutely essential for the normal growth of the rats. In the first series of experiments, carried out by G. Totani, it was found that rats fed on the hydrolysed products of caseinogen from which all but 0·2 per cent. of the tyrosine had been removed, and to which a small quantity of tryptophane had been added, grew just as rapidly as on a similar diet to which tyrosine was added in addition. Other experiments made with a diet of hydrolysed gelatin—which contains no tyrosine or tryptophane—showed that whilst the rats lost 18 per cent. in weight in a month, they lost little, if any, weight if tryptophane were added. The addition of tyrosine as well was without influence, and so it seems highly probable that the tissues of the mammal have the power of synthesising tyrosine. They form it from phenylalanine, but the small amount of this substance present in gelatin suggests the possibility that they can synthesise the benzene ring from non-aromatic substances.

The second series of experiments relates to the synthesis of tryptophane in the body. It is known that some of the tryptophane of the food is excreted in the urine in the form of a quinoline derivative, kynurenic acid, and C. Asayama investigated the capacity of the tissues to carry out the reverse change. He found that rats fed on the amino-acids formed by the prolonged acid hydrolysis of caseinogen—a treatment which destroys all the tryptophane originally present—rapidly lost weight and died in eight weeks, though they grew moderately if tryptophane were added. If kynurenic acid were substituted for the tryptophane they lost weight and died at almost exactly the same rate as when no kynurenic acid was added at all, so we must conclude that whatever the synthetic powers of the tissues for tryptophane may be, they do not extend to this substance.

EDUCATIONAL REFORM.

THE Education Reform Council, which was founded last April at a conference called by the Teachers' Guild, has issued a programme of education reform. The work of the council is as yet incomplete, and it is hoped to publish the full report early next year. Among other important recommendations enumerated in the programme the following deserve special mention. The Ministry of Education should hold a higher place in the hierarchy of the offices of the State, and the salary of the Minister should be equivalent to that of other principal Secretaries of State. Progressive organisation is hindered by certain statutory distinctions between higher and elementary education. Local authorities for higher education should be obliged to supply or aid the supply of higher education, and the limit of 2*d.* to the higher education rate in the county areas should be removed. For the purpose of co-ordinating the activities of local education authorities with those of the universities and institutions for higher education, the country should be divided into educational provinces, the areas of which should be larger than those of the existing local authorities.

The number of efficient secondary schools of varying types should be increased. The Consultative Committee has advised the strengthening of the higher work of secondary schools, and the Reform Council considers that schools taking the lower grant should receive grants for this purpose. Pupils at any school

recognised as efficient by the Board of Education should be eligible for State scholarships for prolonging secondary education, or tenable at the universities. Many capable students will continue to be debarred from the universities, with consequent loss of national efficiency, if these scholarships are limited to "aided" schools. In secondary schools pupils should remain as a rule until the end of the term in which the seventeenth birthday occurs. Financial provision should be made to enable suitable pupils to continue at school until they enter the university. The Reform Council expresses complete agreement with the view advanced by the Consultative Committee that large additional funds should be provided by the State for scholarships for higher education. The amount suggested—329,500*l.* per annum—is not too large. The selection of students for scholarships to the universities and institutions for higher education should be based upon an expert review of the relevant qualifications rather than upon a central competitive examination. Such relevant qualifications are the school record, examination record, probable career, and general personal fitness. The amount of assistance given should be such as to enable the scholar to live in a manner befitting a university student during the normal course required for graduation, and for the necessary post-graduate preparation for professional practice.

The opinion is expressed that for most professions, and for research in pure science, at least one year of post-graduate preparation is necessary. In determining the number and incidence of the awards, the main consideration should be the national need to strengthen the learned professions (including teaching), and to further industry, commerce, and agriculture. The Board of Education should allocate grants for higher scholarship purposes to the provincial boards; the provincial boards should make the awards, their action being co-ordinated by the Board of Education or by a special national board.

THE WORLD'S SUPPLY OF PHOSPHATES.

PROF. J. W. GREGORY, in his presidential address to the Geological Society of Glasgow, gave an account of the chief sources of the world's supply of phosphates, in the course of which he pointed out that an instructive lesson in the conservation of mineral resources was to be learnt from this subject. He showed that Britain has but limited supplies of natural phosphates, and these were being left unworked owing to the introduction of cheaper and richer products from foreign deposits. Prof. Gregory dealt only with the natural phosphates, but he could well have strengthened his argument by reference to the artificial phosphates; that is to say, to basic slag, which has been such a very important source of phosphorus supply to the agriculturist during recent years.

The world's production of natural phosphates in 1913 was approximately six million tons (of which the United States produced one-half), whilst that of basic slag was approximately three million tons. Great Britain is now producing considerable quantities of low-grade basic slag, a by-product from the basic open-hearth steel process, and is likely to produce much more in the near future, but much of this valuable material is being wasted to-day owing to the insistence of the authorities upon the citric acid solubility test, a test devised in Germany, and adopted without proper investigation in this country; its real object was, of course, to favour the slag produced by the Basic Bessemer, or Gilchrist-Thomas, process, a process to which German iron ores are well adapted, to the prejudice of slag produced in the basic open-hearth process, which latter suits British iron ores better. Many of our best agricultural authorities hold that, in spite of the above empirical test, our slags are quite as efficient as manurial agents as are the Basic Bessemer slags, and if we had in this country a department charged with the care of the proper utilisation of our own mineral resources, this subject would no doubt have received the attention that its importance merits.

Prof. Gregory has done valuable service in again directing attention to our supply of phosphates, and it is clear that, from the point of view both of the natural and of the artificial phosphate supply, the question is one of vital importance to our great agricultural interests.

AGRICULTURE AT THE BRITISH ASSOCIATION.

WITH the continuance of the state of war it is inevitable that where agriculturists forgather for discussion the central theme should be the problem of the more efficient utilisation of British soil. The task of British agriculture is the dual one of securing on one hand a more efficient, and on the other a more economical, utilisation of our resources in land and labour. The prolongation of the war renders more and more difficult the task of extending cultivation, and it becomes all the more necessary to devote attention to the consideration of economy.

It was thus timely and desirable that such considerations should bulk largely in the proceedings of Section M at the recent meetings. The topics discussed may be roughly grouped under the three heads of "Economy in Crop Production," "Economy in Meat Production," and "Economy and Reform in Timber Production."

The first group of problems received a fitting introduction in the presidential address, in which the possibilities of securing increased output of crops and the directions in which economies can be effected in existing practice were aptly summarised. In subsequent discussions more detailed consideration was given to the possibilities of motor cultivation and of the practice of ensilage.

Mr. C. B. Fisher introduced the former subject with a critical consideration of the possibilities of the extended application of steam and other mechanical tractors in the cultivation of the soil. His own experience led him to advocate warmly the extended use of motor tractors, although conscious that existing models left much room for improvement, and that more extensive and precise tests under experimental conditions are urgently needed. The general trend of the discussion substantially confirmed these views, although a disappointing experience in Scotland related by Mr. Alex. McCallum served to emphasise the need for caution under existing conditions.

In introducing the subject of ensilage for discussion, Mr. A. Amos gave the results of experience on Norfolk farms with this method of preserving green crops, which led him to advocate warmly its merits, not the least of which was the possibility of reducing or eliminating the costly root crop. Further testimony to the valuable results obtained in East Anglia was given by Messrs. Oldershaw and Wilson.

The importance of climate as a limiting factor in crop production was discussed by Mr. T. Wibberley, who once more urged the advantages of a rational system of continuous cropping as a means of securing increased output and greater economy.

A further contribution to the subject of economy in crop production was made by Mr. E. H. Richards in his summary of studies made at Rothamsted of the economy of the manure-heap, which demonstrate

clearly how the lamentable waste of nitrogen involved in present practice may be most effectively reduced. Passing reference may also be made to his further discovery that under certain conditions an actual gain of nitrogen may be secured. The communication by Dr. T. Goodey of an experimental verification of the view advanced by Messrs. Russell and Hutchinson as to the *rôle* of protozoa in controlling the activities of soil bacteria is also worthy of note, and must have given special satisfaction to the president.

The subject of "Economy in Meat Production" was introduced by Messrs. T. B. Wood and K. J. J. Mackenzie by the contribution of interesting and valuable data as to the food requirements of animals under various conditions of feeding. The differences in the economy of utilisation of fodder for the supply of the different forms of animal produce used for human consumption prove to be most striking. Whereas the good milch cow will yield, in the form of milk, energy equivalent to one calorie for every $5\frac{1}{2}$ calories consumed in the form of fodder, the production of mutton requires practically double, and the production of steer beef nearly three and a half times, the expenditure of energy.

The subject was further discussed from quite different aspects by Prof. D. A. Gilchrist. Experience in the familiar experiments at Cockle Park led him to urge the possibility of securing considerable economies in meat production by reforms in manuring and cropping. On many farms the cost of production of meat and milk could be sensibly lowered by an increased use of basic slag or other phosphates and a reduced expenditure on oil-cakes.

Brief reference only can be made to the further interesting contribution by Mr. Mackenzie on "The Inheritance of Mutton Points," in which a summary of interesting investigations at Cambridge was given.

Much of the land of Great Britain is naturally incapable of yielding high returns to agriculture, and for such the respective claims of agriculture and sylviculture must be duly weighed. In an interesting survey of the past and future of British forestry Prof. Somerville directed attention to the fact that nearly twenty million acres of land in the United Kingdom are used as rough mountain grazing or as deer forests, some $15\frac{1}{2}$ millions being less than 1500 ft. above sea-level. This land, which produces no more than $15\frac{1}{2}$ lb. of meat (chiefly mutton) per acre per annum, would, if rationally afforested, produce a crop of one ton of timber, besides providing employment for ten times the population occupied with pastoral farming. Our forest practice in the past has been seriously defective in many respects. Our woods have been much understocked; there has been little appreciation of specific individual requirements in respect of crowding, and ground game has taken a heavy toll of young trees, or has in other ways been a serious charge on profits. Government action in the past has led to some improvement in education, management, statistics, etc., but has not prevented a marked shrinkage in our wooded area. If a large extension is to be secured, State action will be necessary, and, in the opinion of those who have given most thought to the subject, such extension on a scale commensurate with the nation's requirements can only be attained by purchase.

A further feature of interest in forest economy was dealt with by Mr. S. H. Collins. For some time Mr. Collins, in association with Mr. J. F. Annand, has been examining the possibility of economic utilisation of branch wood and other forest waste by distillation in a portable plant, whereby charcoal, tar, and acetate of lime are obtained as saleable products. Under their guidance members of the Association had an opportunity of seeing the experimental plant in operation in the Crown Woods of Chopwell. Shortage of labour has hampered the experiment in its preliminary stages, but the results so far obtained promise well for future success. The inspection of the woods under the guidance of Mr. Annand added further to the interest of the excursion.

It is gratifying to note that despite the exceptional difficulties of the times an excellent attendance was obtained throughout the sectional meetings, and adequate discussion thereby secured.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

WITH the desire to encourage the study of Russian, in view of the commercial intercourse between Russia and Hull, Capt. H. Samman has expressed to the Hull Chamber of Commerce his willingness to start an endowment fund for the purpose with a sum of 10,000*l*.

THE annual meeting of the Mathematical Association will be held on Friday, January 5, 1917, at the London Day Training College, Southampton Row, London, W.C., under the presidency of Prof. A. N. Whitehead. The subjects of papers are:—The school syllabus in geometry, T. P. Nunn; Some of the work of the Teaching Committee, Mr. A. W. Siddons; Technical education and its relation to literature and science, Prof. A. N. Whitehead; An accuracy test set in some public schools, Mr. A. W. Siddons; The place of mathematics in educational reconstruction, Mr. P. Abbott. A joint meeting of the Mathematical and the Geographical Associations will be held on Saturday, January 6, at 10.30 a.m., when Prof. T. P. Nunn will read a paper on "Map Projections." Mr. H. J. Mackinder, M.P., will take the chair.

IN October last an invitation was extended by the Universities of Leeds and Sheffield to the Circle of Scientific, Technical, and Trade Journalists to form a party of journalists to visit these two cities. A similar visit to the Universities of Liverpool and Manchester took place on December 10–13. In the absence, through indisposition, of the Vice-Chancellor of Liverpool University, the party was received by Prof. Gonner, the deputy-chairman of Senate, and Mr. Carey, the registrar. Prof. Herdman gave an address, in which he referred specially to the departments of modern languages and geography, the School of Tropical Medicine, and the researches being undertaken in connection with sea-fishery. These departments, together with those devoted to chemistry, engineering, etc., were visited by the party in the course of the day. The University of Manchester and the Manchester Municipal School of Technology were visited on Tuesday. Sir Henry Miers, Vice-Chancellor of the University, addressed the party, and in the course of the inspection of the laboratories short lectures were delivered by Prof. Harold Dixon on "Explosives" and Sir Ernest Rutherford on "Radium Emanations." At the Municipal School of Technology the work was of a very varied and comprehensive character, including special departments for cotton spinning, printing and paper manufacture, organic chemistry and dyeing, engineering and electrometallurgy. The visitors were entertained by the Lord Mayor of Manchester to luncheon, when an address on the work of the Municipal School of Technology was delivered by Principal Garnett. At a dinner and reception in the evening speeches were made by Sir Henry Miers, several of the professors, and some of the visitors, the hope being expressed that such visits would lead to closer relations between the scientific and technical Press and the universities, and to a more general appreciation among manufacturers of the benefits of scientific research. The proceedings were concluded by a visit to the works of the British Westinghouse Electric and Manufacturing Co., Ltd.

SOCIETIES AND ACADEMIES.

LONDON.

Linnean Society, November 30.—Sir David Prain, president, in the chair.—J. **Small**: The floral anatomy of some Compositæ. The vascular supply of various bilabiate or ray-florets was discussed, and it was shown that in these the vascular supply varies more or less with the size of the anterior lip of the corolla. The floral anatomy of *Senecio vulgaris* was described in detail. The corolla in the Cichorieæ has a very constant type of vascular supply, similar to Senecio, but with the posterior upper peripheral bundle dividing into three to supply the edges of the ligule and the posterior stamen. *Taraxacum officinale* is described in detail. The ray-florets of *Calendula officinalis* and *Tussilago Farfara* show a very simple type of anatomy. The peculiar homogeneousness within itself of the Cichorieæ and its isolation from the rest of the Compositæ are extended to the floral anatomy.—J. **Small**: Wind dispersal apparatus. The purpose of the apparatus is to determine the exact velocity of the wind required to blow the fruits of the Compositæ a sufficient distance to secure proper dispersal. It has been found that the following minimum winds are necessary for the dispersal of the fruits of the species named below:—*Senecio vulgaris*—1·6 m.p.h.= a light air; *Senecio vulgaris*, var. *radiatus erectus*—1·89 m.p.h.=a light breeze; *Ursinia speciosa*—2·6 to 2·94 m.p.h.=a light to gentle breeze; *Taraxacum officinale*—1·5 m.p.h.=a light air; *Tussilago Farfara*—0·62 to 0·65 m.p.h =less than a light air; *Centaurea imperialis*—7·7 m.p.h.=a moderate breeze; *Leontopodium alpinum*—4·78 m.p.h.=a gentle breeze.—T. A. **Dymes**: A note on the seed of *Iris Pseudacorus*, Linn. There are two forms of seed in each capsule:—(1) Flat seeds in the straight portion; (2) more or less rounded seeds at the curved top and bottom of the capsule. The seeds drop or are blown from the placenta after the capsule dehisces. They lie over until the late spring. Those that fall on to the mud and remain there appear to perish from decay. The loose, light testa enables the seeds to float for a period of at least four months. Seeds that have not sunk germinate on or near the surface of the water in the latter half of May. The flat seeds germinate before the rounded. The cotyledon remains within the endosperm. The radicle elongates and branches freely; it does not curve downwards, but grows along the surface of the water. Adventitious roots are formed close up against the seed, and they also branch freely. The unbranched upper portion of the radicle secretes chlorophyll. The plumule grows slowly; it, too, lies along the surface of the water. When the root system is well developed the leaves begin to curve upwards and the seedling gradually assumes a vertical position, after which the leaves grow much more rapidly. The fate of those seeds, if any, that sink before germination has not yet been determined. The dispersal agents are, in the first instance, the wind, and afterwards water. Even on a slow stream the seeds may drift many miles during the four months of the floating period.

Aristotelian Society, December 4.—Dr. H. Wildon Carr, president, in the chair.—Dr. B. **Bosanquet**: The function of the State in promoting the unity of mankind. The essence of the Greek and German theory of the State has been mistaken, by recent critics, although it has been rightly explained by English thinkers. The so-called absolutism of the State is merely a caricature of the unique relation between a man and the community with which his will is united, especially in so far as it provides an adjustment of all practical relations. Essentially, according to the theory, as having the same task in different territories, States are co-operative. Their function is the organisation of rights. The State, then, is a moral being with a conscience, and when its conscience is perverted it will fight for the wrong as its right. It is true that the moral position of the State is not comparable to that of a private individual, and this view is described as absolutism from unintelligence of what constitutes a moral situation and duty. As to wider loyalties and units than that of the nation-State, there *is* no being like the "humanity" of the Comtists, and humanity as a quality belongs chiefly to exceptional communities. Wider communities than the nation-State may be possible, but only if they fulfil the same condition of unity—namely, a general will. Without this, all leagues, federations, etc., are mere force and dangerous, and with it, scarcely necessary. The true outlook for peace is to the removal of causes of discontent by organisation at home, especially by freedom of human intercourse and absence of privilege. World-wide human relations are no reason for world-wide political units. A system of States, each well organised at home, might be just as peaceful as, and much more valuable than, a world-State.

PARIS.

Academy of Sciences, November 20.—M. Camille Jordan in the chair.—C. **Richet**: The alternating use of antiseptics. It has been shown by the author in earlier communications that micro-organisms can acquire immunity towards certain antiseptics, and this immunity can be transmitted. In the treatment of wounds by antiseptics this fact should be taken into account, and the conclusion is drawn that in the treatment of a wound the same antiseptic should never be used on two consecutive days.—P. **Vuillemin**: The supposed heterotaxy of nasturtium flowers.—E. **Borel**: The approximation of incommensurable numbers by rational numbers.—G. **Julia**: Some properties of the Fuchsian group formed from modular substitutions which do not change an indefinite Hermite form.—E. **Kogbetliantz**: Series of ultra-spherical functions.—G. **Koenigs**: Properties of the second order of plane movements with two parameters.—H. **Vergne**: A method of calculating perturbations of a known movement.—L. **Roy**: The problem of the wall in electrodynamics.—M. **Russo**: Geological notes on the region of Bou Laouane (western Morocco).—C. **Galaine** and C. **Houlbert**: The Hermelles reefs and the drying up of the bay of Mont Saint-Michel.—G. **Lardennois** and J. **Baumel**: Gangrenous infection of wounds by anaerobic germs.—H. **Bierry**: The detection of tubercle bacilli in expectorations and various animal fluids. Isolation and detection of elastic fibres. The technique for sputa consists in the addition of very dilute alkali and sodium hypochlorite at 35°–40° C. The liquid is just rendered acid with acetic acid, and the resulting precipitate, which contains the tubercle bacilli and elastic fibres, separated by the centrifuge. Details are given of the modifications suitable for the examination of blood, pleural secretions, and cephalo-rachidian fluid.

BOOKS RECEIVED.

Opere Matematiche. By L. Cremona. Tomo iii. Pp. xxii+520. (Milano: U. Hoepli.) 30 lire.

A Bibliography of British Ornithology. By W. H. Mullens and H. Kirke Swann. Part iv. (London: Macmillan and Co., Ltd.) 6*s*. net.

The Earliest Voyages Round the World, 1519–1617. Edited by P. F. Alexander. Pp. xxiii+216. (Cambridge: At the University Press.) 3*s*. net.

The Scientist's Reference Book and Diary, 1917. Pp. 134+Memoranda. (Manchester: J. Woolley, Sons, and Co., Ltd.) 2*s*. 6*d*.

The Standard Cyclopedia of Horticulture. By L. H. Bailey. Vol. v. Pp. 2423–3041. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd.) 25*s.* net.

Mechanisms of Character Formation. By Dr. W. A. White. Pp. 342. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd.) 7*s.* 6*d.* net.

Morphology of Invertebrate Types. By Dr. A. Petrunkevitch. Pp. xiii+263. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd.) 6*s.* net.

A Text-Book of Botany for Colleges. By Dr. W. F. Ganong. Pp. xi+401. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd.) 8*s.* 6*d.* net.

The Supervision of Arithmetic. By W. A. Jessup and L. D. Coffman. Pp. vii+219. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd.) 5*s.* net.

The Fundamentals of Psychology. By Prof. W. B. Pillsbury. Pp. ix+562. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd.) 8*s.* 6*d.* net.

Elementary Qualitative Analysis. By Dr. B. Dales and Dr. O. L. Barneley. Pp. vii+205. (New York: J. Wiley and Sons, Inc.; London: Chapman and Hall, Ltd.) 5*s.* 6*d.* net.

A Handbook for Cane-Sugar Manufacturers and their Chemists. By Dr. G. L. Spencer. Fifth edition. Pp. xv+529. (New York: J. Wiley and Sons, Inc.; London: Chapman and Hall, Ltd.) 15*s.* net.

A Manual of Fire Prevention and Fire Protection for Hospitals. By Dr. O. R. Eichel. Pp. v+69. (New York: J. Wiley and Sons, Inc.; London: Chapman and Hall, Ltd.) 4*s.* 6*d.* net.

David Gill, Man and Astronomer. Memories of Sir David Gill, K.C.B. Collected and arranged by G. Forbes. Pp. xi+418. (London: J. Murray.) 12*s.* net.

Aérodonétique. By F. W. Lanchester. Translated by Commandant C. Benoit. Pp. xvii+478. (Paris: Gauthier-Villars et Cie.) 14 francs.

Intégrales de Lebesgue, Fonctions d'Ensemble, Classes de Baire. By Prof. V. Poussin. Pp. viii+154. (Paris: Gauthier-Villars et Cie.) 7 francs.

Poverty and its Vicious Circles. By Dr. J. B. Hurry. Pp. xiv+180. (London: J. and A. Churchill.) 5*s.* net.

DIARY OF SOCIETIES.

THURSDAY, DECEMBER 14.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—Colonial Telegraphs and Telephones: R. W. Weightman.

MATHEMATICAL SOCIETY at 5.30.—Orbits Asymptotic to an Isosceles Triangle Solution of the Problem of Three Bodies: Prof. D. Buchanan.—Diffraction of Waves by a Wedge of any Angle: Prof. H. S. Carslaw.—(1) Proof that almost all numbers n are composed of about $\frac{1}{2}\log n$ prime factors; (2) An Asymptotic Formula for the Number of Partitions of a Number: G. H. Hardy and S. Ramanujàr.—Two Theorems of Combinatory Analysis and Two Allied Identities: Prof. L. J. Rogers.—The Harmonic Functions associated with the Parabolic Cylinder (second paper): C. N. Watson.—(1) The Internal Structure of a Set of Points in Space of any Number of Dimensions; (2) The Inherently Crystalline Structure of a Function of any Number of Variables: Prof. W. H. Young and Mrs. Young.—The Efficiency of a Surface of Pressure Discontinuity regarded as a Propeller: Prof. W. Burnside.

ROYAL GEOGRAPHICAL SOCIETY, at 5.—(*Discussion*): British and Metric Measures in Geographical Work: opened by the Secretary.

OPTICAL SOCIETY, at 8.—The Refractometry and Identification of Glass Specimens—especially Lenses: L. C. Martin.—A Workshop Method of Determining the Refractive Index of a Piece of Glass having one Flat Surface: Dr. R. S. Clay.

ROYAL SOCIETY OF ARTS, at 4.30.—The World's Cotton Supply and India's Share in it: Prof. J. A. Todd.

LINNEAN SOCIETY, at 5.—Observation on the Root System of *Impatiens Roylei*, Walp.: Miss Isabel McClatchie.—The Teeth of some Palæozoic Sharks: Dr. A. Smith Woodward.—Sex Distribution in *Myrica gale*, Linn.; Miss A. J. Davey and Miss M. Gibson.

FRIDAY, DECEMBER 15.

INSTITUTION OF MECHANICAL ENGINEERS, at 6.—Variable-speed Gears for Motor Road-vehicles: R. E. Phillips.

ILLUMINATING ENGINEERING SOCIETY, at 5.—Suggestions regarding War Economies in Lighting: L. Gaster.

MONDAY, DECEMBER 18.

ARISTOTELIAN SOCIETY, at 8.—The Organisation of Thought: Prof. A. N. Whitehead.

ROYAL GEOGRAPHICAL SOCIETY, at 8.30.—New Caledonia and the Isle of Pines: R. H. Compton.

FARADAY SOCIETY, at 8.—A Precision Method of Uniting Optical Glass—the Union of Glass in Optical Contact by Heat Treatment: R. G. Parker and A. J. Dalladay.—The Effect of Pressure on the Equilibrium Constant of a Reaction in a Dilute Solution. A Simple Proof of the Expression: Dr. W. C. McC. Lewis.—Do Equiatomic Solutions in Iron possess Equal Resistances? E. D. Campbell.—Grain Growth in Deformed and Annealed Low Carbon Steel: R. H. Sherry.

TUESDAY, DECEMBER 19.

ROYAL STATISTICAL SOCIETY, at 5.15.—The Reorganisation of Official Statistics and a Central Statistical Office: G. Drage.

INSTITUTION OF CIVIL ENGINEERS, at 5.30.—Further discussion:—Experiments on Earth-pressures: P. M. Crosthwaite.

INSTITUTION OF PETROLEUM TECHNOLOGISTS, at 8.—Notes on the Subject of Geological Mapping: S. Lister James.

WEDNESDAY, DECEMBER 20.

ROYAL METEOROLOGICAL SOCIETY, at 5.—The Measurement of Rainfall Duration: C. Salter.—Discontinuities in Meteorological Phenomena. III.: Prof. H. H. Turner.

ROYAL MICROSCOPICAL SOCIETY, at 7.—Certain Sessile Forms of Foraminifera: Prof. S. J. Hickson.—Note on the Relation between the Hatching and Development of the Larvæ of the Yellow Fever Mosquito, *Stegomyia fasciata*, and the Presence of Bacteria and Yeasts: A. Bacot.

GEOLOGICAL SOCIETY, at 5.30.

ROYAL SOCIETY OF ARTS, at 4.—Classical and Scientific Education: A. C. Benson.

THURSDAY, DECEMBER 21.

CHEMICAL SOCIETY, at 8.—Studies on the Walden Inversion. V. The Kinetics and Dissociation Constant of α-Bromo-β-phenylpropionic Acid: G. Senter and G. H. Martin.—The Alcohols of the Hydroaromatic and Terpene Series. III. The Isopulegols corresponding with *l*-Menthol and *d*-Neomenthol: R. H. Pickard, W. Lewcock, and H. de Pennington.—Lead Sub-iodide with Details of the Preparation of Lead Suboxide: H. G. Denham.—Note on the Solubility of Lead Iodide: H. G. Denham.—Chromium Phosphate: A. F. Joseph and W. N. Rae.

INSTITUTION OF MINING AND METALLURGY, at 5.30.—The Economic Geology of the Insizwa Range: W. N. Goodchild.

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