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## CONTENTS

	PAGE
Centralisation of Anthropological Studies . . . . .	113
Social Planning. By R. B. . . . .	115
Elemental Chemistry. By E. F. A. . . . .	116
Éloges and Biographical Studies . . . . .	117
Classical Astronomy. By E. J. Webb . . . . .	119
Short Reviews . . . . .	120
Weed Destruction by Chemicals . . . . .	122
Annual Meeting of the Royal Society of Canada . . . . .	123
Obituary :	
Dr. E. E. Fournier d'Albe. By G. A. S.; A. P. T. . . . .	125
Mr. S. R. Whitley . . . . .	126
News and Views . . . . .	126
Letters to the Editor :	
Monetary Standards.—Prof. Henry E. Armstrong, F.R.S. . . . .	133
Photographic Sensitivity of Silver Sulphide.— Dr. K. Hickman and W. Weyerts . . . . .	134
An Inland Record of <i>Aedes detritus</i> , Haliday (Diptera, Culicidæ).—John F. Marshall . . . . .	135
Adaptations to Hydrostatic Pressure in Whales. —Alec H. Laurie . . . . .	135
Limnological Studies at High Altitudes in Ladak.—G. Evelyn Hutchinson . . . . .	136
Meteors and the 80–90 km. Layer of the Earth's Atmosphere.—V. Malzev . . . . .	137
Differential Cooling and the Origin of Continents. —Prof. G. F. Sleggs . . . . .	137
Macrophonic Speech.—Prof. E. W. Scripture . . . . .	138
Shadowless Lighting.—A. F. Dufton . . . . .	138
Absorption Effect in the <i>M</i> -Series.—Dr. V. Kunzl . . . . .	139
Non-Ritzian Nature of the $^3S$ Terms of Mercury. —Prof. I. Walerstein . . . . .	139
Research Items . . . . .	140
Astronomical Topics . . . . .	142
Biology in Education . . . . .	143
Educational Films . . . . .	144
Surface Currents in the North Sea . . . . .	144
University and Educational Intelligence . . . . .	144
Calendar of Nature Topics . . . . .	145
Societies and Academies . . . . .	146
Forthcoming Events . . . . .	148
Official Publications Received . . . . .	148

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## Centralisation of Anthropological Studies

IN extending to the University of London recently a welcome to Bloomsbury, the Trustees of the British Museum touched upon two aspects of the changed conditions in which the University will carry on its work in future, one being its relation to the Empire as a centre for humanitarian and scientific research, the other the increased opportunities for co-operation between Museum and University which will be afforded by proximity. In connexion with the latter, the Trustees referred more particularly to the work of the proposed Institute of Archæology. Had they not had in their immediate view this particular development in the organisation of teaching and research in the University, they might—and even more appropriately—have stressed the advantages which would accrue to the study of man generally, and not merely to that of his past, to the science of anthropology as a whole, and not to archæology alone. The ethnographical and cultural collections of the British Museum afford a field of demonstration in the study of man that is second to none, notwithstanding the fact that the method of arrangement has no specific relation to any scheme of teaching or training.

The foundation of an Institute of Archæology which the University has in contemplation marks the fruition of a long projected plan. In providing a centre of teaching, training and research, it will unify and extend archæological studies in the University. It is a question whether, in the interests of the science and of the University itself, a similar 'local habitation' is not equally desirable as a rallying point for the various branches of anthropological study. In fact, notwithstanding, or perhaps because of, the considerable amount of teaching in the subject which already goes on in the various constituent bodies of the University, the unifying influence of an Institute of Anthropology would open the way to progress in anthropology as a whole even greater than that now foreshadowed in archæology. This applies to essential preliminaries no less than to advanced studies. In neither subject has there been a recognised centre for instruction of a generalised character; while training in technique, such as, for example, in methods of excavation and in anthropometric measurement, has been difficult to obtain.

By long continued insistence on the importance of field-work and the urgent need of collecting and

recording the facts, anthropology, and more particularly cultural anthropology, has broken away from 'arm-chair' theory. There is danger that the pendulum may swing too far, if it has not already done so, and that by an over-insistence on the specialisation, which to a considerable degree is an inseparable concomitant of intensive field-work, the interests of the broader issues of academic study may be overlooked. The comparative study of religions and the investigation of the growth and development of races and institutions have not perished utterly with the explosion of the method of indiscriminate collocation of citations and facts, otherwise unrelated, from all ends of the earth. Well-founded criticism has pruned exuberance and called for modification in aim and method; but for a higher synthesis based on a critical examination of the methods and results of the various schools, and a general view of the problem of the science as a whole, as well as in all its branches, it is neither fair, reasonable, nor practical to look to anything but an institute which is in a position to take into account all schools alike.

Further, anthropology calls for much of its material from other disciplines, although these are concerned in part only with man—*anatomy, physiology, biology, genetics, geography, geology* and so forth; but this material is regarded at a particular angle, for which the specialised curricula of the other sciences do not, and indeed cannot, make provision. Study and research on the lines of inquiry which there concern the anthropologist call for their own special organisation and institution, through which the student may learn the aims and methods of these sciences in their adaptation to his own specific interests and point of view.

Nor must the needs of practical instruction and demonstration be overlooked. A central institute would obviate duplication of material and type series. It would then be possible to extend these according to the space available, while in any event their range could be more comprehensive than it would in a number of scattered centres, at best only loosely connected.

Without entering into technical details of organisation and administration, it may be said that a somewhat similar problem in the University of Paris has been solved through the Institut d'Ethnologie, which gives instruction of a generalised character and supplies the necessary element of unification in anthropological studies. A number of specialised courses are given in the constituent institutions of the University, such, for example,

as courses on the ethnography, native law and languages of individual French colonies at the *École Coloniale*, the *École des Hautes Études*, the *École des Langues vivantes* and elsewhere; on physical anthropology at the *Faculté des Sciences*, and so forth, these courses being recognised as leading up to the examinations of the Institut d'Ethnologie; while the courses given at the Institut itself, whether under the Faculty of Arts or of Science or of both, are the preparation for the diploma and certificates in ethnology of the Institut. Thus the courses of the University in "Ethnologie" during the past session have comprised, at the Institut, general courses on ethnology, linguistics, anthropology (physical) and racial physiology, 'préhistoire exotique', the ethnography of Africa and Asia, with special courses in zoological anthropology, geology and human palæontology; while in the constituent institutions there have been courses on each of the French African colonies, the sociology and religion of selected races—for the most part French colonial—human geography, prehistoric archæology, linguistics and phonetics, with courses in the languages of the colonial natives, physical anthropology, biology, physiology and palæontology.

A detailed comparison of the courses of instruction in anthropology offered in the Universities of Paris and London suggests that the advantage lies with the former. Not only does this appear in the greater coherence in the courses as a whole, but also in their number and variety. Further, in certain subjects, such as primitive economics, the treatment of selected topics is carried to an advanced stage. On the other hand, practical considerations have played a considerable part in giving a bias to instruction; with one or two exceptions, the detailed courses in ethnography and linguistics deal exclusively with peoples of the French colonies.

The distinctly colonial outlook of ethnological teaching in the University of Paris is all the more noteworthy, in view of the fact that the French system of colonial administration hitherto has neither required nor encouraged scientific knowledge of native custom in its higher officials. As was recently noted in *NATURE* (June 10, p. 831) efforts are being made to induce the French Government to bring trained ethnographers into the colonial service, while the system of administration itself is in process of being moulded by the logic of facts to take cognisance in a greater degree of native institutions and beliefs. It is

approaching more nearly the British system of 'indirect rule' as it obtains in British West Africa. For this the detailed and specialised university courses in native languages, law, social anthropology and primitive economics offer an excellent preparation; while the monographs published by the Institut d'Ethnologie form an admirable basis for the intensive study which is an essential condition of such a system of administration.

It would, however, leave an entirely wrong impression if such a comparison were to be taken as suggesting that the University of London is anything but alive to its responsibilities in relation to the problems of Imperial administration arising out of native affairs. Courses in the languages and laws of our backward peoples are available in London; and the recently established lectureship in colonial administration at the London School of Economics will take into account the relations of the administration and native peoples in our dependencies. It cannot be doubted that full advantage will be taken of these facilities by those officers of the administrative services who receive a grant for a year's course of study from the allocation of 60,000 dollars which has been made by the Carnegie Corporation of New York, and is to be expended for this purpose in the next three years, although they will have full liberty to choose the university in England or abroad at which they will study.

The University of London, through its constituent bodies concerned with the social sciences, has always maintained close touch with the actual conditions of working in existing social and economic institutions. The recognition, by the constitution of a lectureship, of the place of native affairs in the study of the methods and systems of administration in the dependencies, marks what may well be one, and not the least important, of future lines of development in anthropological studies. Changes both from within and without seem imminent. From within, these are already taking form in the development of a science of 'human biology' which, while in no way lessening, but rather increasing, the call for specialisation in research, will demand a higher degree of co-operation in the collation and synthesis of results, and at the same time ask more from the contributory sciences. But change will come not only as a result of an ordered development of thought and the evolution of theory from within: it will also be enforced by a more complete understanding of the raw material of anthropological

science, and a clearer perception of the dynamic element in native institutions and modes of thought and its reaction to extraneous influence. This will entail a widely extended scheme of intensive research covering many lines of inquiry such as could be organised and co-ordinated only with difficulty, if at all, by bodies so numerous as those within the University of London which are at present concerned with the various branches of anthropological study.

Recently, the French Minister of the Colonies appealed for something like a common policy in native administration among the European powers concerned (*NATURE*, loc. cit.). Should this appeal meet with the response it merits, sooner or later a comprehensive anthropological survey of the native peoples under European jurisdiction must be made. If, as is to be hoped, long views are taken, it will be appreciated that the administrator must have at his service something more than a knowledge of native institutions as they are. Native policy in a rapidly changing native society cannot rest on a knowledge of present conditions alone. It must have direction, and this in part, at least, must be based on a diagnosis of the probable trend, range and intensity of change in native institutions, native modes of life and ways of thought, such as an anthropologist of wide experience alone would be justified in making. Moreover, a thorough training in anthropology and its methods of investigation is an essential in the officer to whom will be entrusted the application of such measures and course of action as the diagnosis may demand.

### Social Planning

*World Social Economic Planning: the Necessity for Planned Adjustment of Productive Capacity and Standards of Living.* Material contributed to the World Social Economic Congress, Amsterdam, August 1931. Pp. lxiii+585. 3.50 Fl. Addendum. Pp. 587-935. 1 Fl. (The Hague: International Industrial Relations Institute, 1932.)

THE popularity of planning at the present time gives the publication of the proceedings of the World Social Economic Congress, held at Amsterdam in August, 1931, topical as well as historical interest. This collection of papers, covering the whole field of planning productive capacity in relation to consumption and standards of living, is inevitably an exposition of individual

views, to which not even the introductory analysis and review of the Congress contributed by Mary van Kleeck, chairman of the Programme Committee and associate director of the International Industrial Relations Institute, can give real unity. The value of the volumes lies rather in the material they afford for dispassionate study of the problem and the revelation they give of the various approaches to the subject as well as of the numerous points of view. No reader could put aside these volumes without realising that the problem of planning is infinitely more complex than might be imagined from the claims of some of its advocates, and if the matter contained in these volumes does not facilitate an easy decision on the methods of planning or even of the ends to be desired, it should assist in forming an intelligent opinion.

Special interest is attached to a group of papers dealing with aspects of planning in Soviet Russia, presented by members of the State Planning Commission, Moscow. V. Obolensky-Ossinsky, head of the U.S.S.R. delegation to the World Economic Conference in 1927, discussing the nature and forms of economic planning, gives an outline of the philosophy and development of the Five-Year Plan, while the results achieved are outlined by S. L. Ronin in "Planned Economy in Operation in the Soviet Union", by A. Gayster in "The Planning and Development of Agriculture in the Soviet Union", and by I. A. Kravel in "Labour in Soviet Planned Economy". This lucid and readable account of Soviet aims and results can be read in the light of Dr. Lewis L. Lorwin's criticism and Mr. Hugh Quigley's presentation of the developments under the Central Electricity Board as a characteristic example of planning in Great Britain.

To enumerate even the papers of outstanding merit would be tedious, but Dr. Max Lazard's analysis of the world unemployment situation, emphasising the unescapable facts and paradoxes of the present situation, was one of the features of the Congress and dominated much of its discussion. Characteristic contributions are those of the late Albert Thomas on the scope of international agreement on labour standards, Mr. E. A. Filene's exposition of his theory of mass production in relation to higher standards of living and Prof. Palyi's discussion of international planning by industries.

Noteworthy papers are those of Dr. H. S. Person on scientific management as a philosophy

and technique of progressive industrial stabilisation and of Dr. Lewis L. Lorwin on the problem of economic planning. In both these papers we find an attempt to formulate a philosophical basis for this attempt to extend the domain in which human action is determined by facts and not by opinion or guesswork. There is no attempt to understate the problem but rather an appeal to the spirit of adventure, to the spirit of science to conquer new fields for the benefit of mankind. The challenge to accept the consequences of power production, to seek to relate action and knowledge and to determine the laws and principles, the disregard of which is largely responsible for our present difficulties, is clearly sounded, and should make its own appeal to scientific workers.

This collection of papers unquestionably assists in the examination of these matters free from prejudice and as emphatically insists on the impossibility of a solution except on international lines. Important as national action and planning may be, by itself it is insufficient; the only way out is for the nations to come together to seek a better way of arranging the affairs of the world as a whole. If, however, the Congress was clear on this point, its deliberations equally indicate that, even more than in national planning, the means and the ends are still to be defined, much more to be agreed upon.

The papers collected here are published in the original languages—English, French or German—in which they were delivered, with many translations.

R. B.

### Elemental Chemistry

*A Text Book of Theoretical and Inorganic Chemistry.* By F. A. Philbrick and Dr. E. J. Holmyard. Pp. vii+803. (London: J. M. Dent and Sons, Ltd., 1932.) 10s. 6d.

THERE was a time when the main development of chemistry was on the organic and biological sides, but the alliance between physico-chemical principles and inorganic chemistry has given new vitality to this section, which may well be called 'elemental chemistry'. The very essence of it has been revolutionised by the newer conceptions of valency. The consequence is that it is now possible to compile a fascinating textbook on a subject which at one time was to a large extent burdened with detail and made dull reading.

The book before us is divided into three parts,

historical, general and special, the division of the elements in this last section being as usual into groups, according to the periodic system. The name of one of the authors is sufficient guarantee that the historical introduction at least will be found to be full of interest and written with charm. Chemists as a class are sometimes accused of being so engrossed in their own subject as to lack time for more general culture: if this is so, a study of the history of their subject, and the many side issues which can arise out of it, affords a ready means of broadening their interests.

The general section deals with atoms and molecules, matter, chemical change, solution, chemical equilibrium and energy, surface chemistry, radioactivity and the electron theory; in short, with all those subjects which to-day are in the forefront of interest. The new chemistry and the new physics are one and the same; the physicist only fails to become a complete chemist when he gives up the attempt with the molecule, frightened perhaps by the problems presented by its structure and by that formidable arrangement of carbon atoms in space by which we picture organic compounds.

The discoveries of Rutherford and the more popular writings of Eddington and Jeans have made a wide public take a serious interest in atoms and their structure, and though perhaps fantasy has sometimes outrun fact, when the subject is viewed through the more sober spectacles of the chemist accustomed to weigh and to measure, the stimulation given by the theorists is encouraging an immense amount of fruitful experimental work with corresponding progress in our conception of the atom. Less interest is taken at the moment in the molecule and its dissociation; indeed, there is evidence of mental apathy amongst teachers, so long as they continue to rest on the ionic hypothesis alone and ignore all else in their teaching: dogma and science must surely be regarded as incompatible.

To criticise a book of this kind in detail is of no value, even if it were possible; one can but open it haphazard, confident of being rewarded with informative matter written in a smoothly flowing style.

There was a time when many of the substances in an inorganic textbook had little interest outside the laboratory: it is significant of the progress which has been made in the application of chemistry to the arts and manufactures to find how large a proportion of the elements have now

some industrial significance. The rare earth elements, the individual metals of the platinum group, selenium and tellurium, may be cited as examples; curiously enough, gold is of very slight industrial importance.

We have indicated enough to show that we find the book highly stimulating. The fact that it emanates from two of our public schools raises high hopes in regard to the quality of the scientific teaching there, more particularly the giving of a bias towards the idea, which must also be the ideal, that science is a subject of interest in itself, and hence that every educated schoolboy should grasp its rudiments and carry this knowledge with him into his political, bureaucratic or business life.

E. F. A.

### Éloges and Biographical Studies

- (1) *Éloges et discours académiques*. Par Émile Picard. Pp. vii+398. (Paris: Gauthier-Villars et Cie, 1931.) 50 francs.
- (2) *Figures de Savants*. Par Alfred Lacroix. Tome 1. Pp. x+326+32 plates. Tome 2. Pp. iv+358+26 plates. (Paris: Gauthier-Villars et Cie, 1932.) 150 francs.

IT is one of the duties of the secretaries of the Paris Academy of Sciences to deliver addresses on the work of their confrères. It also frequently falls to their lot to be the official representatives of science at notable gatherings, at home or abroad, and to pronounce eulogies suitable for the occasion. The addresses given are often of permanent value and can be read with profit long after the event which led to their delivery, and fortunately in many cases they are afterwards published in book form. Amongst the most recent of these addresses are those contained in these three volumes of M. Picard and M. Lacroix.

The volume of M. Picard is a successor to his "Discours et Mélanges" (1922) and his "Mélanges de Mathématiques et de Physique" (1924). It contains eleven addresses in all. Four were delivered in connexion with the celebration of the centenaries of Pascal, Abraham Breguet, Newton, Laplace and Huygens, one in connexion with the inauguration of the monument at Annonay to the engineer, Marc Séguin, while two others were given before the Academy of Sciences in 1925 and 1927 respectively on the life and work of the mathematician, Jules Tannery (1848-1910) and of Jean-Baptiste Biot (1774-1862), one of the most picturesque figures in the history of French

scientific circles. These, together with M. Picard's address at his reception into the French Academy, on his predecessor Charles de Freycinet (1829-1923), the distinguished engineer and statesman, all contain much interesting biographical matter.

Of a different character are the short discourse at the inauguration of the Institut Henri Poincaré in 1928, the address delivered at the commemoration of the jubilee of the Bureau international des Poids et Mesures, and the lecture given before the Academy of Sciences in 1929 on the history of science and of physical theories, from the days of the Egyptians and Chaldeans down to the present time.

(2) While there is little connexion between the various addresses of M. Picard, those contained in the two volumes by M. Lacroix, which with one exception are all biographical, have a common thread running through them, for as he says, it was his desire to recall some of those men who have contributed to the study of the constitution of the earth and have been among his masters. French men of science alone are dealt with. A distinguished mineralogist himself, in his first volume, M. Lacroix reviews the life and work of all those who have occupied the seat in the section of mineralogy in the Academy of Sciences, which he himself held before being chosen a permanent secretary.

The ten studies begin with that of Desmarest (1725-1815) one of the founders of geology, of whom Geikie wrote so entertainingly, and conclude with the notice of Émile Haug (1861-1927). Vol. 1 also contains biographies of Dolomieu, Bournon, Haüy, Lévy, Des Cloiseaux, Beudant and Bory de Saint-Vincent, while the second volume contains twelve other notices, including those of Milne-Edwards, Damour, Lapparent, Michel-Lévy and Pasteur. In nearly all instances the notices are accompanied by a good photograph and a specimen of handwriting. It will thus be seen that the volumes of M. Lacroix are of especial interest to geologists, mineralogists and crystallographers.

M. Picard in one of his addresses says that there is in general a monotony about the lives of men of science, whose whole careers are often bound up with study. There are, of course, many exceptions to this rule, two very notable ones being those of Dolomieu and Bory de Saint-Vincent. Genevieve Jean Baptiste Marcellin Bory de Saint-Vincent was born at Agen in the department of Lot-et-Garonne on July 6, 1778, and died at

his lodgings in the rue de Buci, Paris, on December 22, 1846. Into those sixty-eight years was crowded sufficient of adventure and excitement, of good and ill-fortune and, it may be added, hard work, to satisfy the most critical of readers. His father being imprisoned early in the Revolution, Bory de Saint-Vincent was taken care of by an uncle and from him he imbibed a love of natural history which formed the mainspring of his life. Conscripted at the age of twenty-one years, he served with the army of the West, at the age of twenty-two years accompanied Capt. Baudin on a voyage of discovery, as a captain served with the army in many parts of Europe, became a deputy, was prosecuted and exiled and afterwards spent some time within the walls of Sainte-Pélagie. It mattered little, however, whether he was on the field of battle or within the prison walls, his interest in Nature never flagged, and towards the end of his career he was able to take part in expeditions to the Morea and Algeria. Always something of a Bohemian, as a collector and writer he was indefatigable, and M. Lacroix gives a vivid account of his life and an estimate of his work as a botanist, zoologist and geologist.

The notice of Bory de Saint-Vincent was read to the Academy of Sciences in the middle of the War; that of Dolomieu on December 2, 1918. Both accounts gained in interest owing to circumstances. Especially appropriate was the review of the life of Dolomieu, for nowhere had the struggle been carried on with greater heroism than among the mountains which perpetuate his name. His biography rivals in interest that of Bory de Saint-Vincent. Born on June 23, 1750, Dieudonné Sylvain Guy Tancrede de Gratet de Dolomieu, to give him his full name, was the son of a nobleman, and began his strangely eventful career at the age of fifteen years as a cadet in the Order of Malta. While still a youth he served in the galleys of the Order, fought a duel killing his opponent, lost his rights and was sentenced to perpetual imprisonment. Set at liberty through the representations of the King of France and the Pope, he joined the French army, began the study of chemistry and physics, had a love affair, entered political and scientific circles in Paris and travelled incessantly. Later he was given an official post under the Order of Malta, but he fell out with his superiors, was exiled, abandoned himself to geological excursions, played a part in the Revolution and was one of the earliest members of the National Institute. Embarking with

Napoleon for Egypt, he unwillingly took part in the events leading to the capitulation of Malta, with Fourier, Monge and others founded the Institut d'Égypte, and on his way home—his ship putting into Tarento—he was imprisoned.

Dolomieu's career is perhaps better known than that of Bory de Saint-Vincent, but even those who are familiar with it will read with emotion the extracts given by M. Lacroix from his manuscripts written during the two years of his solitary confinement. Recalling the passion with which he had previously contemplated the changing seasons and the grandeur of Nature he wrote: "Maintenant, enfermé dans un espace de douze pieds de longueur, dix de largeur et de hauteur, je n'ai à contempler que ma propre misère, et à réfléchir que sur les jeux de la fortune et sur le bizarrerie de ma destinée." His ultimate release was largely due to persistent efforts by men of science, among them Sir Joseph Banks, and to the representations of the King of Spain. After the battle of Marengo, Napoleon stipulated that those taken prisoners on their return from Egypt should be released, and especially mentioned "Le citoyen Dolomieu". Unfortunately, he was already broken in health, and though received with open arms in Paris, he died a few months after gaining his freedom, passing away on November 16, 1801, at the early age of fifty-one years.

### Classical Astronomy

- (1) *Greek Astronomy*. By Sir Thomas L. Heath. (The Library of Greek Thought.) Pp. lvii+192. (London and Toronto: J. M. Dent and Sons, Ltd.; New York: E. P. Dutton and Co., 1932.) 5s. net.
- (2) *Early Astronomy and Cosmology: a Reconstruction of the Earliest Cosmic System*. By C. P. S. Menon. Pp. 192. (London: George Allen and Unwin, Ltd., 1932.) 10s. net.

IT would be difficult to find two books more unlike than these in method and, as it appears to us, in value. We may, though we very seldom do, disagree with Sir Thomas Heath's interpretation of the evidence that he produces, but there is no denying that the evidence exists. Mr. Menon's brilliant imaginative work we can only regard as a fabric of guess-work erected upon a substructure of dreams.

(1) Two-thirds of Sir Thomas Heath's book are made up of extracts from Greek astronomers or ancient historians of astronomy, ranging from

Thales to Ptolemy. His own introduction, though worthy of the author of "Aristarchus of Samos", is rather disappointingly short. We wish we had his reasons for accepting the modern view that the Babylonians Naburiannu and Kidinnu were of far earlier date than the Seleucid astronomers with whose names Strabo mentions theirs. It seems difficult to maintain that they were, and also that the Greeks were, from the first, acquainted with and receptive of their teaching. Sir Thomas Heath himself is a little surprised by the well-known passage in the Platonic "Epinomis" in which the Greeks are said to bring everything which they take from the barbarians to a higher perfection. It is certainly not easy to see how this could have been written if the writer had known that the contemporary Chaldeans were compiling solar and lunar tables much more accurate than any which they themselves had yet constructed.

If we have any other complaint to make of Sir Thomas Heath, it is that he has scarcely done full justice to Ptolemy. "It is questionable," he writes, "whether Ptolemy himself added anything of great value [to Hipparchus] except a definite theory of the motion of the five planets." Surely a very considerable exception, even if it were, as it is not, the only one. Though extracts from Ptolemy are given to elucidate the career of Hipparchus, under his own name he is represented only by the introductory chapters of the "Almagest", in which the movement and rotation of the earth are denied. These indeed remind us how small reason there was before Ptolemy for preferring a heliocentric system to a geocentric; but one would have liked to see the great astronomer represented by passages which have better stood the test of time. The extracts generally are well chosen and well translated.

(2) It has generally been held that the reason why men divided the sun's path into twelve signs is that they had long been used to divide the year into the twelve months which are really a rough measure of its length. Also that the reason why several ancient nations had lists of 27 or 28 moon-stations is that the moon does actually take between 27 and 28 days in making a complete circuit of the heavens. It has also been accepted as an historical fact that Callippus proposed a luni-solar period of 76 years to correct the error of one quarter of a day which he attributed to the 19-year cycle of Meton. According to Mr. Menon, all this is wrong. The choice of the "pet

numbers" 12, 28 and even 76 was due to a natural appeal made by them to the sentiment of primitive man, and the happy accident that they proved adaptable to astronomical facts only "strengthened the faith of the people" in their magical efficiency. Some slight support for this strange theory might be found if it were true that "the important Jupiter cycle" of 60 years—which, as a fact, would not work—was, as we are told, "known to all the nations". But was it?

The genesis of the "pet numbers" is ingeniously explained, but with what bearing on astronomy it is difficult to see. It seems possible that the first cosmographer may have conceived the world as a square, each of its sides bisected by one of the cardinal points. But such a world would surely consist only of the visible hemisphere, and

the subdivision of the four sides into 12 and 28 would not give 12 signs of the zodiac and 28 moon-stations, as neither signs nor stations can all be above the horizon at once. In truth the simplest zodiac implies the knowledge that the heavens encompass the earth on all sides, and such a conception is not primitive. The notion, which pervades Mr. Menon's book, that the zodiac has been a possession of all races from the dawn of history, is as fallacious as the evidence he offers for it. The passage cited from the "Rig-Veda" implies no more than a recognition of years, months and days. That it should still be possible, after writing the names of the Akkadian months and the zodiacal names in parallel columns, to suppose that the former list is connected with the latter, seems scarcely credible. E. J. WEBB.

### Short Reviews

Open-Air Library. *Afoot in England*. By W. H. Hudson. Pp. xvi+239. *The Mirror of the Sea: Memories and Impressions*. By Joseph Conrad. Pp. xv+244. (London and Toronto: J. M. Dent and Sons, Ltd., 1933.) 3s. 6d. net each.

THE editor, Dr. Eric F. Daghish, clearly has a happy knack of choosing the right material every time for the "Open-Air Library". The author of each volume is well known and the actual subject matter has already been well read. Nevertheless, that is no reason why such titles, brought under the common heading of "Open-Air" topics and published in an attractive form at a price within everybody's reach, should not have a very wide appeal; especially at the present time.

(1) For example, W. H. Hudson, a naturalist with the inborn genius of interesting others in Nature, scarcely needs any introduction. Much of "Afoot in England" has already appeared in various journals and newspapers; and the complete volume first appeared in 1909. But now that many of the heartiest of English people spend their holidays and week-ends afoot, republication of this collection of essays, in an easily portable form, is opportune. In a way similar to "The Open Road", it should either take you or go with you to the West Country, Bath and Wells, Stonehenge, Silchester, Salisbury, etc., and will surely open up new vistas of interest—natural history, archaeology, history, etc.—which are calculated to make a holiday not only more pleasurable, but also more profitable.

(2) Conrad's "Mirror of the Sea" also needs little introduction. He, alone, can tell in this way how the sea's "cruelty may repel, its immensity appal, and its fury distress the mind; but its grandeur, the variety of its moods, its permanent freshness, and even its fickle inconstancy" are bound to fascinate in the long run the most dubious

of land-lubbers. This little volume reveals the true character of the sea. Its hydrographical, biological and meteorological characteristics are never once mentioned in any academic manner; yet having read the book, you feel you know something about all these, and an insatiable desire to know more.

*The Saga of Fridtjof Nansen*. By Jon Sörensen. Translated from the Norwegian by J. B. C. Watkins. Pp. ix+372+8 plates. (London: George Allen and Unwin, Ltd., 1932.) 18s. net.

In this study of Nansen's personality, the author has had access to various private diaries that help to explain Nansen's success in all he attempted and at the same time show the apparent contradictions of the man. He had an extraordinarily wide range of interests and found it difficult to keep to any one line of activity. A dreamy melancholy would give way to buoyant enthusiasm and he would see clearly his path and go forward indifferent to any form of discouragement. He had the capacity for solitude and the steadfast pioneering spirit that are so characteristic of his race.

Mr. Sörensen, who knew Nansen intimately, tells his story well, and though there is no full estimate of Nansen's scientific work in oceanography, indications of its importance are given. His activities as a statesman speaking on behalf of Norway in the dissolution of the union with Sweden, and later at Geneva in the name of Armenian refugees and Russian famine sufferers, are fully treated, and show the outstanding example of a great man of science who used his talents in the wider sphere of statecraft. There is a full bibliography of Nansen's writings. The book is a fine memorial to one of the outstanding figures of his day.

R. N. R. B.



The Children's Nature Series. (1) *How to see Plants*. Pp. xii+111. 2s. 6d. net; School edition, 1s. 6d. (2) *How to see Flowers*. Pp. x+141. 2s. 6d. net. (3) *How to see Beasts*. Pp. x+110. 2s. 6d. net. Written and illustrated by Eric Fitch Daglish. (London and Toronto: J. M. Dent and Sons, Ltd., 1933.)

THE author of these three volumes, part of the "Children's Nature Series", is well known as a keen naturalist and his wood-engravings have already adorned several previous publications. In this case, however, we cannot suppress a feeling that the volumes have been used more as a vehicle for Dr. Daglish's very attractive art, rather than as a means of cultivating an appreciation of Nature in children.

The choice of material is not altogether a happy one, and the diagrams—apart from the wood-engravings—are poor. Too many facts are stated with too few explanations. In any event, it is difficult to decide for what type of child these books have been written. There appears to be no set scheme for study, so they can scarcely form the basis of a course in natural history; and certainly not biology. Apart from being useful as prizes and presents, they would seem to have a very limited appeal.

*Colorimetry: its Application in Analytical and Clinical Practice*. By Dr. Hugo Freund. Authorised English translation by Frank Bamford. Pp. 255. (London: E. Leitz (London), 1932.) 10s.

A RAPID glance through this book might lead one to consider its comprehensive title justified; a more complete perusal causes some disappointment. The only colorimeters described are (1) the ordinary Duboscq, (2) the Bürker, and (3) the compensating modifications of the Duboscq, all as made by Leitz of Wetzlar.

The book is essentially a description of these instruments, followed by an account of many analytical processes that can be performed with them. How many of these processes could be used without those instruments, it is difficult to say; but it is certain that the majority need either the Bürker or the compensating model.

The book, in itself, is well printed and has few typographical errors. The bibliography is comprehensive although one wonders why the *Journal of Biological Chemistry* is always referred to as "Journal Biol. Chemie".  
S. G. S.

*The Psychological Register*. Vol. 3. Edited by Carl Murchison. (The International University Series in Psychology.) Pp. xii+1269. (Worcester, Mass.: Clark University Press; London: Oxford University Press, 1932.) 56s. 6d. net.

THIS book is a big contribution to a big scheme, a scheme which is at present meant to run to five volumes, and to register the names and works

of all the important psychologists that have ever lived. The 1929 edition of "The Psychological Register" will hereafter be known as vol. 2. The volume now in preparation, which will include psychologists who died before this register was started, and will extend right back to the early Greek psychologists, will be known as vol. 1. The present volume represents forty countries, and contains the names of 2,400 psychologists. We note that about 45 per cent of the entries relate to American psychologists.

The labour involved in compiling these data must have been prodigious, but the result will be a boon to the army of research workers in the psychological field. The names of the co-operators in this vast enterprise are such as to inspire confidence in its accuracy and general utility. We have tested it at many points, and with entire satisfaction.

*Elementary Qualitative Analysis: for College Students*. By Prof. J. H. Reedy. (International Chemical Series.) Second edition. Pp. x+163. (New York: McGraw-Hill Book Co., Inc.; London: McGraw-Hill Publishing Co., Ltd., 1932.) 9s. net.

THIS excellent manual has been much improved in the new edition by the inclusion of procedures based upon reagents recently developed. It covers the ground very thoroughly and in a clear and well-arranged fashion. The notes on the methods bring out innumerable details which make all the difference between success and failure in analysis. The book is suitable both for Intermediate B.Sc. and Honours B.Sc. students, since it will be equally intelligible both to those beginning qualitative analysis and those who have made some progress in such work. It is commendably free from freakish methods and follows the well-established group separations. The tests for the anions are carefully given, and there is a complete list of reagents. The notes will save much of the time of the demonstrator, and the book is one which can be recommended with confidence.

*Chapters in Modern Inorganic and Theoretical Chemistry*. By Dr. Ernest S. Hedges. Pp. vii+279. (London: Edward Arnold and Co., n.d.) 12s. 6d. net.

THE aim of Dr. Hedges' book, as stated in the preface, is to enable a student to dispense with reading original papers and larger treatises. Since this forms a valuable part of the training of a student, anything which leads him to think that it can be omitted is of doubtful value. The treatment is generally rather superficial and does not go far enough for the honours candidate, and much of it is to be found in the regular textbooks used by students.

The book will probably serve as a companion to lecture courses in which the subjects are more adequately covered.

## Weed Destruction by Chemicals

AMONGST the many burdens which beset the farmer may be included the spread of weeds, owing mainly to the high cost of keeping the land clean by hand in relation to the value of the crop. It is therefore of wide interest that a new method of weed destruction by spraying with sulphuric acid is under trial on a considerable scale, which promises a cheap remedy for the evil, at all events so far as such plants as charlock (*Brassica sinapis*) and a few other prevalent weeds are concerned. In the past, sulphates of copper and of iron have been used for this purpose with effect, but the ideal conditions for their use, namely, twenty-four hours of fine weather following a humid day for the application, were too difficult to realise in practice. When using sulphuric acid, only an hour or so of dry weather at the time of spraying is essential.

Spraying with sulphuric acid originated in

from a suitable machine, either horse- or motor-drawn, with acid-resisting parts. It is preferable for the spraying to be done by contract and thus with men used to handling acid, the farmer supplying the necessary traction. About 100 gallons per acre is the normal amount to spray, but the quantity depends upon the size of the charlock and it is increased up to 150 gallons per acre when advisable.

The time of spraying depends on the size of the plant and not on the actual time of year. The most favourable moment is when the charlock is in its four-leaf stage, all the seeds having well germinated, but it is effective even when the charlock is several inches high. In a normal year some five to six weeks are available for spraying, so that a contractor can organise his operations so as to keep his machines occupied by moving them from early to late growing regions.

The object of the spray is to kill the charlock, which may turn completely brown within twenty minutes of its application, without harming the cereals. The spray is not selective in its action, which is due entirely to the difference in the physiology and morphology of the two plants. The outer skin of the cereal is thick and not easily penetrated by the acid, which slips off the smooth vertical leaves, except at the tips of the leaves which turn brown, whilst the tender growing point is protected by the leaves wrapping round it. The skin of the charlock is easily penetrated as the acid adheres to the open, broad, hairy and more or less horizontal leaves, and the tender growing

point is exposed so that the tissues are plasmolysed by the acid and eventually destroyed. In sunshine the action takes place so quickly that within an hour of spraying, the whole field turns brown, a quite alarming sight: in a few days the cereal recovers and it soon presents the healthy and luxuriant appearance which normally follows a top dressing of a nitrogenous fertiliser. Fig. 1, showing a field in which, for the purpose of demonstration, a strip has not been treated, brings out very clearly the effect of spraying, so that no further words are required here as to its efficiency.

The cost of spraying is of the order of 12s. 6d.-15s. per acre, depending on the acreage treated on any one farm: it will be even less when a contractor is fully occupied in a particular district, as much of the cost is occasioned by the transport of the machine. Some 30 per cent of the cost is due to the sulphuric acid, the carriage of which is also costly. The actual benefits of spraying in the way

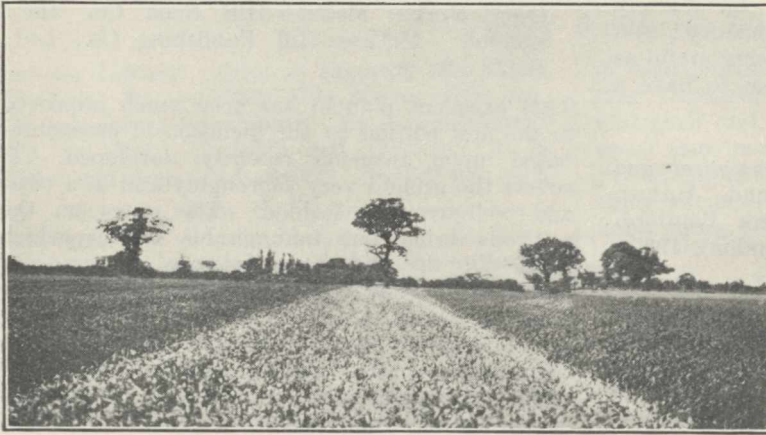


FIG. 1. Field at Doggets Farm, Rochford, one stitch not sprayed. Sprayed April 19, photographed June 2.

France, being largely due to the pioneer work of Rabaté, begun in 1911, and it has developed so rapidly that at present several hundred thousand acres are treated annually, involving in 1931 the use of 27,000 tons of acid, whilst some twenty French manufacturers produce suitable spraying machines for its application.

The work in England has been fostered by the National Sulphuric Acid Association with the co-operation of the School of Rural Economy in the University of Oxford, and it has now reached a stage when it has been handed over to the acid-making industry for practical development. This summer several thousand acres have been sprayed with uniform success and the farming fraternity has evidenced a considerable interest in the novel process.

The method of application is a simple one; commercial brown oil of vitriol is mixed with water to give a solution varying from 7 to 10 per cent in strength, which is sprayed over the land

of increased crop have not yet been fully established: they are claimed to amount in value to so much as £2-£3 per acre in the most favourable cases. The weeds themselves remove nutrient matter from the soil and they crowd the cereal plant, reducing the crop; when killed by acid, their organic matter is returned to the soil, whilst it is probable that the acid itself may have some effect in increasing soil fertility by accelerating nitrification, though there is no positive evidence on this point.

There is both the immediate gain of an increase in crop and also a reduction of weeds which renders future cultivation more easy: it is stated that, on the Continent, spraying for three or four seasons in succession has resulted in periods of definite freedom from weeds.

The high labour costs of farming, which are bound to persist in Great Britain even when mechanical appliances are more largely adopted, can only be countered by an increased yield of the crop. The production of cheap fertilisers has enabled the requirements of the plant in nitrogen and minerals to be satisfied up to the economic point and interest has been transferred to methods of cultivation, in particular the preparation of the soil and subsoil, as most likely to increase further

yields. The ill-effect of weeds has assumed an important aspect and their prevention becomes imperative. Until now this has been largely a question of cultivation and it is still the case with the grasses among cereals, but the discovery that a chemical treatment may eliminate charlock and its like, which have been known to lower a crop of oats by one-third, is a definite step forward, particularly at a time when the wheat quota is once more encouraging the British farmer to produce wheat of good millable quality.

The control of weeds in the garden is not subject to the same economic requirements as on the farm, with the consequence that the use of chemicals for this purpose has been widespread. The old favourites, the poisonous arsenicals, have obvious disadvantages, and the alternative tar products have the drawback of being caustic. It is of interest, therefore, to note the success which is attending the use of ten per cent solutions, applied at the rate of one gallon to twelve square yards, of the chlorates of sodium and calcium, which appear to be particularly deadly to weeds and grass.

The foregoing at least provides evidence that chemical science is finding new ways of proving its utility to agriculture and horticulture.

#### Annual Meeting of the Royal Society of Canada

THE Royal Society of Canada held its annual meeting on May 18-20, at Queen's University, Kingston.

The president, Prof. Francis E. Lloyd, Macdonald professor of botany in McGill University, delivered his address on the evening of May 18. His subject was "The Carnivorous Plants" and it included not only an interesting review of the principal types, illustrated by beautiful slides and motion pictures, but also many original contributions regarding the structure and function of their traps. At the same meeting, the Flavelle medal was presented to Dr. J. B. Tyrrell for his great contributions to the geography and geology of Canada, and the Tyrrel medal to Judge F. W. Howay in recognition of his literary and historical work.

The Society passed a resolution urging the Government to give liberal support to the National Research Council of Canada in virtue of the results which it has achieved and of the still greater benefits which, if supported, it will in the future bring to the country.

At the meetings of Section 1 (French Literature, History, etc.) nineteen papers, and of Section 2 (English Literature, History, etc.) twenty-six papers were presented.

In his presidential address to Section 3 (Mathematical, Chemical and Physical Sciences), Prof. C. A. Chant dealt with the inception and constructional progress of the new 74-in. telescope at the University of Toronto. After paying tribute to the generosity of the donor, Mrs. David Dunlop,

Prof. Chant told how the project is being carried out. The administration building is nearly completed and the great dome will be erected during the summer. The mirror is to be made of pyrex glass of especially low expansion coefficient, which is expected to be of great advantage. Delivery for grinding is promised by the makers in September.

The programme of papers was very crowded, one hundred and forty-three papers being presented. Consequently, only a few typical papers can be mentioned even briefly here.

There was a number of papers on geophysical prospecting by Prof. W. L. Miller and by Prof. L. Gilchrist and his co-workers, using gravitational, electrical and magnetic methods. A portable Geiger counter has been developed by Shrum for detecting radioactive ores. Several papers dealing with hyperfine structure and other spectroscopic problems by M. F. Crawford, Mackay and others of the Toronto school were presented by Prof. E. F. Burton. An interesting application of polar front methods has been made by Thomson to a typical Canadian winter weather situation. An oscillographic study of reflection of wireless waves from the Kennelly-Heaviside and Appleton layers by Ross has yielded valuable information, particularly regarding multiple reflections (up to tenfold). A report on Canadian radio experiments during the 1932 eclipse was presented by Rose. The results taken as a whole are strongly against the idea of a corpuscular eclipse.

In mathematics and astronomy, Prof. C. F.

Gummer proposed and discussed a new type of minimal problem relative to spreading equivalently in its smallest parts a given area upon another. A. E. Johns and Prof. Beatty gave further significance to the conformal points in a projective transformation. Prof. C. T. Sullivan completed an essential point by showing that Euclidean methods do not suffice to construct the unit angle. Prof. N. Miller continued his work on generalising mean-value theorems. Miss Fisher and Prof. Beatty detailed a new method in algebraic functions. Prof. Stewart gave the theory of the oscillations of a free pendulum. Papers by Profs. Plaskett, Harper and Pearce dealt with various phases of the important work being done at Victoria. Miss Douglas discussed the absolute magnitudes of  $A$  stars.

The theoretical helium line  $2p-4f$  calculated from observed Stark effects on the  $d$  line 4471 (Victoria plates by Drs. J. S. Foster and A. V. Douglas) agrees well with the relatively weak outer violet portion of the complex line 4470 previously interpreted by Struve as wholly  $2p-4f$ . Mr. A. H. Snell reported a complete analysis of Stark effect in molecular hydrogen with a 30-ft. stigmatic concave grating, including displacements and patterns for lines in the so-called  $H_\alpha$  bands, of theoretical interest. A new canal-ray source with cathode of small effective area was described by Mr. R. L. Thornton. As the hydrogen pressure rises to the present upper limit of 0.6 mm., one finds the Stark intensities approaching close to the theoretical values previously observed in Lo Surdo sources. In an examination of the Stark effect in mercury, Mr. R. N. H. Haslam has made an initial resolution of the fine structure of diffuse and combination lines from a Lo Surdo source with fields of 90,000 v./cm. Most lines show an abnormal Stark effect.

A paper describing experiments having an important bearing on theories of heterogeneous catalysis was presented by Dr. E. W. R. Steacie and E. M. Elkin. The rate of decomposition of methanol at a zinc surface shows no discontinuity at the melting point of zinc. It is therefore not justifiable to assign the whole catalytic activity to a limited part of the surface.

The isolation of several alkaloids, including cryptopine and hydrastine, from a number of native fumaraceous plants was reported by R. H. Manske.

Further calculations of equilibrium constants from spectroscopic data were presented by A. R. Gordon and Colin Barnes. The calculated values are in agreement with the experimental values in so many cases that the spectroscope has come to be recognised as the most useful tool for computing chemical equilibria.

Direct determinations of density and surface tension in the neighbourhood of the critical temperature in one- and two-component systems were reported by Prof. O. Maass and Winkler. The interesting result is obtained that at temperatures as much as  $10^\circ$  above the temperature at which the meniscus disappears there is a

measurable difference in density above and below the place of disappearance of this meniscus. We must speak of a critical region rather than a critical point.

Thirty-two members of Section 4 (Geology and Allied Subjects) registered for the meeting. The several sessions were all well attended and usually in addition to members there was a number of visitors present, including several graduate and undergraduate students of Queen's University.

The papers presented embraced a wide variety of topics and included practically all phases of the geological sciences. Many of them were of exceptional interest and were followed by much informative discussion. It may be said indeed that the discussion following papers was a conspicuous feature of the meetings this year and added greatly to their interest and value.

Perhaps the outstanding item on the programme was the report of the National Committee on Stratigraphical Nomenclature, presented by Prof. F. J. Alcock. This report represents the results of a vast amount of arduous work by the members of the Committee in an endeavour to arrive at a nomenclature that will be generally acceptable to geologists, not only of Canada, but also of the whole world. After considerable discussion the nomenclature as tentatively proposed was referred back to the Committee.

Guests of the Section included Prof. G. B. Barbour of the University of Cincinnati, and formerly of the University of Yenching, China, who, by invitation, presented a paper, illustrated by lantern slides, on the geology of Jehol Province.

Altogether there were thirty-one papers on the programme and all but a few of them were presented and discussed.

The presidential address to Section 5 (Biological Sciences) was delivered by Dr. J. G. FitzGerald, his subject being "The Nature of Antigens". It was a valuable review of the subject, dealing with the biological and chemical features of antigens proper and of conjugated and partial antigens. The latter include those carbohydrates on which the specificity of strains of certain species of micro-organisms depends. Doubt was cast on the view that adsorption of non-antigenic substances on a colloid may render them antigenic.

Prof. B. P. Babkin and his colleagues presented several papers on gastric secretion. They have found that the secretion in pouches made from the lesser curvature of the stomach is predominantly nervous in type. In the frog they showed that gastric secretion is mediated through sympathetic nerves to that organ. Prof. C. H. Best demonstrated that the administration of choline prevents fatty changes in the liver of depancreatized dogs. Studies on the anterior pituitary hormones were presented by Prof. J. B. Collip and his co-workers. Of interest was their announcement that the thyrotropic fraction has been highly purified and found to be active in normal and hypophysectomised rats. Dr. L. C. Simard discussed argemophil cells in the periglandular nervous

network of the intestine. Dr. Beattie demonstrated changes in living lachrymal gland cells during activity. Dr. Irwin found evidence of migration of the 'fixed' cells of the reticulo-endothelial system of the liver after the administration of thorium dioxide. Dr. F. G. Banting and his collaborators presented a series of papers on silicosis. It was shown that silica can be absorbed from the intestine and excreted in the urine. Dr. Wylie showed that two injections of 'T.A.B.' vaccine produced maximum agglutinin content. Further injections caused no change in the titre. Prof. Reed found that *Ps. pyocyaneus* can be separated into several types of colony form not distinguishable by differences in virulence nor by antigenic reactions.

An interesting paper by Prof. A. G. Huntsman on the herring and Archimedean forces in the water explained the migrations of those fish as mainly passive and due to currents, some of which are caused by influx of fresh water into the sea.

The botanical list included a number of phyto-geographical studies by Frère Marie-Victorin and his associates. An ecological map of Quebec was shown. In a brief report of their work on the physiology of stomata by Prof. G. Scarth and his associates, it was announced that shortage of oxygen in the leaf causes opening of stomata in the dark. The lumeniferous mycelium and unique gemmæ of *Omphalia flavida* were described by Prof. A. H. R. Buller. From Prof. R. B. Thomson's laboratories came a careful cytological study of teliospore development in *Hyalospora aspiliotus* by S. M. Pady, and other mycological and physiological papers as well as further support of Thomson's theory of heterothally in contradistinction to heterospory as a characteristic of seed plants. A number of papers by Prof. C. L. Huskins and his collaborators dealt with the mechanism of reduction of chromosomes, the formation of chiasmata and the origin of meiosis.

## Obituary

### DR. E. E. FOURNIER D'ALBE

THE death occurred on June 29 at his home at St. Albans, Hertfordshire, at the age of sixty-five years, of Dr. Edmund Edward Fournier d'Albe.

Dr. Fournier d'Albe was known for his work on the properties of selenium. In a paper published in the *Proceedings of the Royal Society* in 1912, he gave the results of his work on the dependence of the electrical conductivity of selenium on voltage. He showed that the 'potential effect'  $(R_0 - R_v)/R_0$  (where  $R_0$  is the resistance at infinitesimal voltage and  $R_v$  the resistance at voltage  $v$ ) is proportional to the logarithm of the voltage. A later paper (*Proc. Roy. Soc.*, 89, 75; 1913) dealt with the efficiency of selenium as a detector of light. The experiments described show that a selenium 'bridge' is far more sensitive than the human eye, being able to detect illumination of the order of  $10^{-5}$  metre candle. These experiments also led him to the conclusion that the change of resistance is proportional to the square root of the illumination. Struck by this sensitiveness, he made an unsuccessful attempt to demonstrate the discontinuity of the wave front of light.

The practical application of the properties of selenium was ever before Dr. Fournier d'Albe and he devised an ingenious instrument, which he named the "Optophone", by means of which it was possible by moving an aperture over a line of printed type to produce sounds in a telephone, each letter giving a characteristic sequence of musical chords. In this way it was shown to be possible for a blind person to recognise the various letters by their sounds, and so to read the type by ear. The instrument was described in the *Proceedings of the Royal Society* (90, 373; 1914). The idea was developed commercially but the costliness of the

apparatus was a serious obstacle to its use as a means of mitigating the disabilities of the sightless, and he spent many years in his attempts to overcome this limitation.

Dr. Fournier d'Albe also made early experiments on television with some success.

It was announced on July 14 that Dr. Fournier d'Albe had been granted a Civil List pension of £125 a year "in recognition of his contributions to the science of physics and his invention of the optophone and other scientific appliances".

G. A. S.

DR. E. E. FOURNIER D'ALBE began his contributions to scientific journalism by supplying abstracts of scientific publications to the *Electrician* in about 1893. These developed into a weekly column under the title "Contemporary Electrical Science" from 1897 until 1905. The "Science Abstracts" of the Physical Society began in 1895, and after forty years of such work the initials "E.E.F.d'A." appeared regularly until the number issued for last month. In April last he wrote: "I live in retirement since a 'stroke' six years ago deprived me of my right hand. Nevertheless, I am otherwise in perfect health, and typewrite my own letters and literary work. . . . I amuse myself with photoelectric astronomy and riding about the country on an invalid motor tricycle".

In December 1895 Dr. Fournier d'Albe wrote an article on "The Classification of Physical Experiments" (*Electrician*, 36, 781). His object was to specify and to suggest a classification and notation for the broad types of experimental work in physics by means of symbols capable of international use, and the discovery of gaps in the series which remained yet to be filled up. His system showed ingenuity and a tidy mind, but

the interest of the article lies in the attempted computation of the total number of possible types of experiments. Of these he roughly estimated that about two thirds had been performed and that about one third remained to be tried. He concluded, "In the immediate future it may, of course, be expected that the greatest share of novelty in discoveries will fall to electro-magnetic waves and vacuum phenomena, but problems concerning transformations of energy will always be of paramount importance to science in its practical application".

Reminded of this article recently, Dr. Fournier d'Albe said that he "had forgotten that juvenile letter". The computation seemed at the time to be bizarre and of little importance, but at the end of 1895 there was something of the nature of a lull in Victorian physical science. Hertz's work was still in the lecture room stage, Marconi's name first appeared in September 1896. Röntgen's preliminary announcement of his "New Form of Radiation" was made in January 1896. Zeeman's discovery, looked for by Faraday and predicted by Lorentz, appeared in NATURE of December 24, 1896. The electron named and imagined by Johnstone Stoney in 1880 was discovered by J. J. Thomson in 1897. The old physics was practically coming to an end, the new physics was soon to appear and Fournier d'Albe's prediction may be said to be justified.

A. P. T.

#### MR. S. R. WHITLEY

SAMUEL RINDER WHITLEY, of Rookwood, Reading, whose death occurred on June 25, after a year of illness, was the son of Nathan Whitley of the well-known Halifax family, and brother to the Right Hon. J. H. Whitley, the former speaker of the House of Commons, and to Sir Edward Whitley. He was educated at Clifton, and after a short business career he took up with characteristic energy the advancement of agricultural science, practice and craftsmanship, and the development of dairy science in particular. He was elected a member of the council of the British

Dairy Farmers' Association in 1901, and in 1915-32 he was director of the annual dairy show held in London in October, the continued success of which has been due in large measure to his enthusiasm and personal hard work.

Mr. Whitley always gave much thought and able support to the scientific and educational side of the Association's work, and had been for many years before his death a member of the committee of the British Dairy Institute. He was a councillor of the old University College of Reading, and became a life member of the Court when the University gained its charter in 1926.

In 1923 Mr. Whitley was elected to the Governing Board of the National Institute for Research in Dairying, Shinfield, and shortly afterwards became honorary treasurer. By example, persuasion and invitation, he worked whole-heartedly for the success of the Institute. He was a convinced believer in the value to the nation, especially to the younger generation, of an ample supply of clean milk, and the basis of his earnestness on the subject was his conviction that all children who are to be worthy citizens should have the best of wholesome foods to aid them. He believed ardently in the immense importance for the future of humanity of clear thinking, straightforward action and widespread education. The loss of his devoted nature will be keenly felt by many friends at home and abroad.

We regret to announce the following deaths:—

Sir James Craig, professor of medicine in Trinity College, Dublin and M.P. for the University of Dublin in the Dail Eireann since 1921, formerly president of the Royal College of Physicians, Ireland, on July 12, aged seventy-one years.

Mr. Clive E. Lord, Director of the Tasmanian Museum and Art Gallery since 1922, known for his work on the natural history of Tasmania and part author of "The Vertebrate Animals of Tasmania", aged forty-three years.

### News and Views

Temperature of  $0.085^{\circ}$  Abs. reached at Leyden

IN our issue of May 20 (p. 719), Prof. W. J. de Haas and E. C. Wiersma of Leyden, and Prof. H. A. Kramers of Utrecht, announced that they had reached a temperature at least as low as  $0.27^{\circ}$  K. The method used was the adiabatic demagnetisation of a paramagnetic salt, cerium fluoride ( $CeF_3$ ), and the extrapolation of the susceptibility curve in the region of temperatures usually reached with liquid helium. The Rotterdam correspondent of the *Times*, in a message dated July 14, stated that Profs. de Haas and Kramers had reached a temperature "only

eight-hundredths of a degree above absolute zero". In response to an inquiry, Prof. de Haas has informed us by telegram that they have obtained a temperature of  $0.085^{\circ}$  absolute, using the same method as was employed earlier, namely, the demagnetisation of a paramagnetic salt.

Commercial Production of Petrol from Coal

PETROL production from British coal formed the subject of an important statement made in the House of Commons by the Prime Minister on July 17. The Government has decided to stimulate the manu-

facture of home-produced motor spirit by guaranteeing for ten years a preference at the rate of fourpence a gallon in respect of light hydrocarbon oils manufactured in Great Britain from indigenous coal, shale, or peat, or from products derived from these substances. The guarantee period will be subject to certain reductions if the Customs and Excise duties differ by more than the sum stated. Mr. MacDonald estimates that about 7,000 men will be directly, and a slightly smaller number indirectly, employed. The plant which he has in mind will, he stated, be capable of producing about 30,000,000 gallons of petrol annually, and will consume 350,000 tons of coal a year. Any manufacturer may avail himself of the guarantee, and the petrol may be manufactured by any method from the specified raw materials.

THAT such a scheme should be possible with prospect of commercial success and with small cost to the Treasury is a high tribute to the scientific and industrial research which has been applied at no little cost and with well-founded faith in a successful outcome of the experimental work. It is generally stated that the production contemplated is not more than about one-fortieth of the present requirements of Great Britain in motor spirit, but should the undertaking justify further development, this fraction will doubtless be increased, especially if concurrent researches indicate the possibility of further improvements and economies in the process of manufacture. Imperial Chemical Industries Ltd., whose experimental hydrogenation plant at Billingham has given such promising results, are to be congratulated on their enterprise in this field of chemical industry. Sir Harry McGowan, chairman of Imperial Chemical Industries Ltd., announced on July 18, that in view of the Prime Minister's statement referred to above, the directors have authorised a scheme for the erection of a large commercial plant at Billingham. The capital required, about £2,500,000, will be provided by the company.

#### Chemistry and the Textile Industry

DR. R. H. PICKARD's presidential address to the Society of Chemical Industry, delivered at Newcastle-on-Tyne on July 11, on "The Industrial Uses of Textiles" provided a striking illustration of the extent to which the attack on industrial problems is breaking down the division between different classes of scientific workers. Textile research provides a notable example of the extent to which co-operation between the physicist, the chemist, the mathematician, the plant genetist, and the technologist is essential if the problems presented are to be solved. The emphasis laid by Dr. Pickard in this address on the contribution of the physicist, for example, was fully in keeping with the diminishing emphasis which is now being placed on the chemical side in the meetings of the Society of Chemical Industry, and it is undoubtedly true that recent developments of the Society in the formation of such groups as the Food Group and the Plastics

Group have accentuated a definite tendency of the Society to become representative of scientific industry and not chemical industry alone or in the narrower sense.

DR. PICKARD referred in particular to the possibility of quantitative data on the properties of fibres being utilised for the building of fabrics more suited to the purpose for which they are intended, and suggested that there is a wide field of investigation to exploit more fully the unique characteristics of textile fabrics. Discussing the ways in which both academic and technical research may aid in developing the more advantageous use of textile fibres for specific purposes, Dr. Pickard referred to the possibilities of the new technique of electron diffraction, the little-used technique of molecular rays. With a general revival of trade, there may arise an all-round demand by industry for well-trained chemists whose technique is not limited to that required in investigations of atomic structure.

#### Chemistry of Combustion

PROF. W. A. BONE's address, "Forty Years of Combustion Research", delivered on July 12 on the occasion of the presentation of the medal of the Society of Chemical Industry, was a brilliant review of experimental research in this field, and the clarity of its delivery no less than the lucidity and felicity of exposition which characterised it made the occasion one which will be long remembered by those present. A skilful picture of the position unfolded by Dixon in his lectures at Owen's College, Manchester, when Bone entered the College in 1888, was followed by an account of the development of the theories of detonation, down to the development of the new technique for the investigation of 'spin' in detonation which enables us to measure with precision periodic flame movements occurring with frequencies up to a million a second. Discussing research on the combustion of hydrocarbons, Prof. Bone referred to the recent quantitative proof of the 'hydroxylation' theory, suggested by H. E. Armstrong in 1874, offered by D. M. Newitt and A. M. Bloch's recent pressure-oxidation experiments on ethane and acetylene. Surface combustion, ignition phenomena and initial flame movements were touched upon in the same masterly manner, and a brief review given of the results obtained in gaseous combustion at high pressure, leading to the discovery of 'nitrogen activation' in carbon monoxide-air explosions, with the investigation of which Prof. Bone commenced his researches. Direct and cumulative evidence, chemical and spectrographic, all appears to lead to the conclusion that carbon monoxide can burn in two ways, directly, without any intervention of steam, and indirectly, either through steam or as a result of its intervention, pressure favouring the former. In concluding, Prof. Bone emphasised the need for the elaboration of an adequate technique, and the dependence of progress on accurate and completely analytical operations under experienced guidance.

### African Natives and Imperial Citizenship

IN his presidential address on "Imperial Citizenship" to the sixth Imperial Social Hygiene Congress on July 7, Sir Basil Blackett made some extremely pertinent remarks on the need for recreating the spirit of obligation towards backward peoples formerly expressed in now obsolete phrases such as 'the white man's burden'. He added point to his remarks by drawing on his own experience of only a few weeks ago when visiting a native tribe in South Africa and contrasting the friendly attitude of the natives and their recognition of the fact that they were, with himself, full subjects of the King-Emperor, with what would have been his fate had he visited them only two generations ago. He went on to point out, however, that while the British forces of law and order in Africa are combatting witch-craft, cannibalism and superstition, and the African is becoming accustomed to a law-abiding life such as he never experienced before, our task to-day is changed. No longer should an attempt be made to thrust a western civilisation down the throats of native races. While trying to give them the best of our civilisation, we should help them to develop along their own lines without making them tribalised Africans or imitation Europeans. Sir Basil went on to point out that the world-wide distribution of the British Empire gives a peculiar value to an imperial conference such as the Social Hygiene Congress in relation to the study of world problems. On the other hand, he deplored the apparent disinclination of Britain to take the lead as she did in the nineteenth century. Such a lethargy is apparent throughout the whole of Africa to-day. By doing her duty to the Empire, he maintains, Britain would at the same time give a lead to the whole world.

### Centenary of William Wilberforce

ON July 23-30, Hull will commemorate the centenary of the death of William Wilberforce and the abolition of slavery within British possessions. William Wilberforce, Hull's most distinguished citizen, was born in 1759 in the house which is now the Wilberforce Museum, and represented Yorkshire in Parliament from 1784 until 1812. He died in 1833 a few days after the Act for the abolition of slavery had been passed. The commemoration will open on July 23 with a civic commemoration service at Holy Trinity Church, to which the Lord Mayor and Corporation, members of the Wilberforce family and representatives of the public bodies of Hull will go in procession. On July 24, exhibitions of autograph letters and books relating to Wilberforce at the Public Library and the Wilberforce centenary exhibition at the Mortimer Galleries will be declared open and will remain open throughout the week. The exhibition at the Mortimer Galleries will include a number of slave relics and paintings. In the evening a civic reception of the Wilberforce family will be held in the Guildhall. Other features of the commemoration will be "William Wilberforce", a radio chronicle play by Edwin Lewis and Albert

Dunning, performed by the Hull Playgoers Society; a ceremonial civic tribute at the Wilberforce Monument, City Square, and an address by Prof. R. Coupland, professor of Colonial history at the University of Oxford, on "The Life and Work of Wilberforce", to be delivered at a luncheon at the Guildhall on July 25. The arrangements have been in the hands of an executive committee of which the Lord Mayor, Alderman J. Malcolm Dossor, is chairman, and a programme has been prepared by Mr. T. Sheppard, curator of museums.

### Coloration in Lizards

CAPT. INGRAM has just returned from Round Island, Mauritius, bringing with him a collection of lizards made there. These he has presented to the Zoological Society of London. It is perhaps not surprising to find that they are all new to the Gardens, for very little collecting has ever been done on this island. The most interesting species included in this gift is a small and very beautiful jewelled gecko, having the upper surface of a greenish hue, and the lower white. But this background is enlivened by some strikingly vivid colouring. The head has a ground-colour of peacock-blue with scarlet markings and cross-shaped bars on the forehead, while stripes and spots ornament the back. This suggests a 'warning' coloration. Some years ago its very opposite was to be seen in the Reptile House. This was the lichen-bark gecko, *Uroplates fimbriatus*, wherein the markings on the body afforded a most convincing illustration of 'protective coloration'. Even when seen in a glass case, from a distance of a few inches it could scarcely be distinguished from the bark on which it was resting, the patches of lichen-grey on a black background completely breaking up the solid appearance of the body. The illusion was made the more complete by a large outstanding pleat of skin running down each side of the body and tail, which caused an insensible transition between the animal and its resting place, the fold of skin being closely applied to the bark.

It is not only on account of their coloration, which changes almost as readily as that of the chameleon, that the geckos claim our interest, for all the species, save those which have become adjusted to a desert life, have peculiar expansions on the under-surface of the toes whereby they can climb, even up panes of glass, or along the ceiling of a room, with as much facility as a fly. These pads are formed of compressible, vertical folds which, on pressure, form vacua furnishing secure adhesion even to a body more than five inches long. These creatures, like many other lizards, also have the tail so modified that when seized by this organ it at once breaks off, thereby enabling the intended captive to escape; later, it grows a new tail.

### The Buckston Browne Research Farm

ON July 12 the Buckston Browne Research Farm, at Downe, Kent, was formally opened by the president of the Royal College of Surgeons of England, Sir



Holburt Waring. The Farm is intended to provide young surgeons with opportunities of extending our knowledge of the biological processes which underlie the art of surgery. Already a series of experimental inquiries has been set on foot to determine how far surgical methods can be employed for the cure or relief of the graver forms of pulmonary tuberculosis. In his opening address, Sir Holburt Waring outlined some of the clinical conditions which require experimental elucidation. He cited particularly the grave mortality which still attends intestinal obstruction and the need for further study of the condition known as surgical shock. The Research Farm, which is 16½ miles from Charing Cross, is the gift of Sir Buckston Browne, a distinguished London surgeon and a fellow of the Royal College of Surgeons. Rather more than two years ago he gave £100,000 to his College in order that it might be able to add a research station in the country to the experimental laboratories already established in connexion with the Hunterian Museum in Lincoln's Inn Fields.

As is well known, John Hunter, the celebrated surgeon of the eighteenth century, carried on his experimental work at his farm at Earl's Court. Sir Buckston Browne wished to present a modern representation of Hunter's Earl's Court Farm to his College and chose a site in the parish of Downe, Kent, adjacent to the home of Charles Darwin. It will be remembered that in 1928 Sir Buckston purchased Darwin's home, Down House, and after restoring and endowing it, presented it to the British Association. The Research Farm is built on land which adjoins the gardens and grounds of Down House. Sir Buckston Browne has thus established side by side in Darwin's parish two bodies which encourage research, namely, the British Association for the Advancement of Science and the Royal College of Surgeons of England. Dr. O. J. R. Howarth is resident officer at Down House, while Sir Arthur Keith is in charge of the Buckston Browne Research Farm.

#### Cancer Research

THE tenth annual report of the British Empire Cancer Campaign notices a considerable variety of investigations into the nature, cause and treatment of cancer, which are being carried on under its auspices in different parts of the world. Three of the results obtained especially are of general interest. At the Cancer Hospital, Prof. E. L. Kennaway, Dr. J. W. Cook and their colleagues have now isolated the substance (or one of the substances) to which tar owes its peculiar carcinogenic properties: it proves to be 1:2-benzopyrene. No evidence was obtained of the presence of the dibenzanthracene which the same workers have synthesised and shown to be nearly equally active, and, along with Prof. E. C. Dodds, to have a remarkable influence on the sexual cycle in animals. It remains to be discovered whether these or similar substances are ever produced in the body and so form the intermediaries whereby chronic irritation and injury give rise to tumours. At the Middlesex Hospital, Prof. J.

McIntosh has made the notable discovery that some at least of the connective tissue tumours produced in fowls by tar can be transmitted by a filtrable agent. The experimental growths thus come into line with the natural bird tumours which have been so much studied. No clear mammalian tumour has yet been shown to be certainly filtrable.

#### A Virus from Influenza Patients

The causation of epidemic influenza has proved a perplexing problem for the bacteriologist. Of the bacterial organisms associated with the disease, Pfeiffer's influenza bacillus, the most frequent, and others do not appear to be capable of reproducing the cardinal features of the disease, but only some of the secondary symptoms. Another difficulty encountered is the insusceptibility of most animals to human influenza, the so-called influenzas of animals being distinct from the human. Latterly, attempts have been made to detect a virus in the disease, hitherto with little or no success, but in a recent communication, Smith, Andrewes and Laidlaw describe results obtained with ferrets (*Lancet*, July 8, p. 66). A febrile disease is produced in ferrets by the intranasal instillation of filtrates of throat-washings obtained from influenza patients, which is transmissible serially in ferrets either by contact or by intranasal instillation of virus material from infected ferrets. Filtration was conducted through 'Gradocol' membranes so that the filtrate is bacteria-free. Throat-washings from healthy persons and influenza convalescents caused no illness in ferrets. The disease in ferrets has some likeness to human influenza, with nasal and pulmonary catarrh and occasionally a relapse. The blood-serum of a ferret that has recovered, and also that of recovered human cases, neutralises the virus. The virus of swine influenza, described by Shope, has a close antigenic relationship with the influenza virus, and induces a disease in ferrets very like that produced with the influenza virus. A *prima facie* case has indirectly been made out for an attempt to transfer the ferret disease back again to man, and a technique has been discovered which can be exploited fruitfully when the next human epidemic occurs.

#### Massive Radium Unit for Treatment

IT may be recalled that the Radium Committee decided last year to withdraw and dismantle the four-gram radium 'bomb' used for massive radiation at Westminster Hospital. Some doubt was expressed at the time of the wisdom of this step, but a conference called by the Royal Colleges of Physicians and Surgeons endorsed the policy, at the same time appointing a committee of experts to reconsider the case for mass radiation. After visits to radium treatment centres abroad, the committee reported that it is desirable that a radium unit of not less than five grams should be established, so that research can be undertaken on the value of what is best termed 'beam' therapy. For this purpose, a representative governing body with Sir Frederick Gowland Hopkins as chairman was constituted. After negotia-

tion, the Belgian organisation, the Union Minière du Haut-Katanga, offered the loan of five grams of radium for two years free of cost except for insurance, with an additional five grams at a later date if considered necessary. An executive research committee has been formed with Prof. J. C. McLennan as chairman. The place for the research is the London Radium Institute, Ridginghouse Street, Portland Place, London, W.1, which has generously placed the whole of the accommodation necessary at the disposal of the governing body.

#### Alcoholism in Medieval England

AT a meeting of the Society for the Study of Inebriety and Drug Addiction on July 11, a paper on alcoholism in medieval England was read by Dr. J. D. Rolleston, who said that the chief sources of information concerning the prevalence of alcoholism in the Middle Ages were lay writers, especially poets, historians and ecclesiastics, whereas little was to be gleaned from contemporary medical works. In the Middle Ages, distilled liquors were unknown as a convivial beverage and alcoholism was due mainly to indulgence in ale and to a less extent in wine. Inebriety was widely spread in all classes of society, but predominated among the clergy, in spite of the protests of leading ecclesiastics such as Anselm, Bede, Boniface, Dunstan and Wycliffe, and among the university students. The medieval publican had a bad reputation for fraud and dishonesty, while the tavern was often regarded as a place of ill-repute. Alcoholism during the Middle Ages in England, as elsewhere, resembled in many ways the alcoholism of classical antiquity, which Dr. Rolleston discussed in a previous paper before the Society (see *NATURE*, Oct. 23, 1926, p. 601). Legislation dealing with drunkenness or control of the liquor trade was practically unknown in the ancient world, whereas taxation of drink, reduction in the hours of sale and the number of taverns and other restrictions were introduced in the Middle Ages. The absence of syphilis in both ages was noteworthy in view of the fact that alcohol was such a frequent incentive to exposure to infection and was liable to aggravate the disease when once it was acquired.

#### Atmospheric Pollution in Great Britain

IN a paper read before the National Smoke Abatement Society on July 14, Sir Frank Baines, the well-known architect, dealt at some length with the effects of atmospheric pollution on buildings, vegetation and public health. While he was Director of Works and Buildings at H.M. Office of Works, Sir Frank had exceptional opportunities for studying the effects on national buildings of the various impurities in the atmosphere due to the burning of coal, and for estimating what it costs the nation in deterioration of buildings and repairs due to this cause alone. He gave this cost for the last twenty-five years as a minimum of 55 million pounds sterling, and contrasted this with the niggardly parsimony of H.M. Treasury in its provision of funds for the investigation of the problem and the institution of

methods of prevention. All legislation hitherto devised to cope with the contamination of the atmosphere has failed to deal with sulphur gases, the greatest destructive agents of all. To these agents Sir Frank attributed the rapid deterioration of the stonework of the Houses of Parliament, Westminster Abbey and other great national buildings. Sedimentary stones are peculiarly subject to the attack of atmospheric sulphuric acid formed by the action of moisture on sulphur effluents: but even the surface of granite in buildings is completely destroyed by this acid. Bricks, cement, lime mortars, metal, paints and composite materials of all kinds, vary in susceptibility to this attack, but the general effect is to make it probable that the readings of history in all our national monuments will be rendered unintelligible. The mass of evidence collected by Sir Frank Baines will be invaluable to the serious student of the problem of atmospheric pollution and it is gratifying to know that the National Smoke Abatement Society proposes to make this important paper available to the public.

#### Memorials in Westminster Abbey

JUST after the commemoration on April 22-24 of the centenary of Richard Trevithick, to whom there is a window in Westminster Abbey, Eng.-Capt. E. C. Smith, in a letter published in the *Times* of April 29, directed attention to the removal some time ago, from the north aisle, of three memorial windows, to Joseph Locke, Robert Stephenson and Sir William Siemens respectively. It came as a surprise to many unfamiliar with the memorials in the Abbey to learn that these three windows were no longer in place and further correspondence on the matter has since appeared in *Engineering*. It is known that it is a good many years since the windows were removed to make way for others, and in a letter in *Engineering* of July 7, the Dean of Westminster, the Rev. W. Foxley Norris, writes: "The windows in question were removed before my time and I know nothing of the circumstances, and we are at this moment taking the necessary measures for their replacement, which was, I understand, intended by my predecessor." As the windows to Locke, Stephenson and Siemens were erected mainly through the efforts of contemporary engineers and men of science, in recognition of their high professional standing, it is most desirable from every point of view that the windows should be re-erected, and we trust the Dean and Chapter will be able to find a reasonable solution of the problem with which they are faced.

#### Thermal Convection Air Currents and Gliding

THE recent spell of hot sunny weather in England made possible a series of experiments concerning the existence and magnitude of thermal convection currents in the air, arising from the reflection of heat from the sun-baked earth. Mr. G. E. Collins, instructor at the British Gliding Association's Summer School at Huish Hill, near Marlborough, using a two-seater glider of the B.A.C.VII type, was towed

up to 500 ft. height, and then succeeded in soaring up to a height of 2,150 ft. He remained in the air for 27 minutes and travelled about 10 miles altogether. Upon another occasion he ascended with a passenger, and reached a height of 1,300 ft. under very similar conditions. These are the first properly observed and recorded flights of any magnitude made in Great Britain under meteorological conditions in which there were probably no vertical air currents other than those set up by thermal convection. There were no cumulus clouds to produce the normal up currents beneath them, and there was practically no wind from which energy for soaring might have been derived. It is fair to assume that the lift necessary to raise the machine to these heights was obtained principally from currents of air rising from the heated earth. Knowing the aerodynamic characteristics of the machine, and having observed the speeds and rates of climb during such a flight, it should be possible to make fairly accurate estimations of the magnitude of these currents. Such data will have their value in meteorological statistical records.

#### Early Culture in Northern Iraq

At the close of the season's excavations at Arpachiyah, near Nineveh, the results obtained by the joint expedition of the British Museum and the British School of Archaeology in Iraq had further justified the selection of this site as a possible source of information relating to the early cultural history of northern Iraq. The report on the work of the latter half of the season in the *Times* of July 14 opens up an enticing prospect for speculation until further discovery supplies links in the chain which now appears to connect Arpachiyah and Minoan Crete. The outstanding feature in a record of finds, which in other respects is by no means devoid of the element of surprise, is the occurrence of the double axe in the sixth level of occupation, a thousand years before it appears in Crete (where indeed Sir Arthur Evans has regarded it as intrusive from western Asia) and the discovery in the seventh level, immediately below, of beehive structures in clay and stone, similar to the beehive tombs of Crete and Mycenaean Greece. It is scarcely necessary to stress the importance of the first occurrence of such structures in Mesopotamia. These discoveries were made in excavating the summit of the mound to which operations were confined in the latter half of the season. Here no less than ten superimposed village settlements have been brought to light, all belonging to a cattle-keeping agricultural population. It is remarkable that in a community of this character the sixth settlement, nearly 20 ft. below the surface of the ground, should have yielded in one dwelling, which had been sacked and burned, a rich treasure-trove of objects, mostly, it would appear, of domestic type, and including magnificent specimens of painted polychrome pottery. The suggestion that this was the home of a vase painter is made more than plausible by the block of red paint found in one of the rooms.

#### Broxbourne 'Finds' at the British Museum

A SERIES of small temporary exhibitions of special prehistoric material is contemplated by the British Museum, to fill a table-case near the top of the main staircase. Following Mr. J. P. T. Burchell's exhibit of the flint sequence from Swanscombe and Northfleet in Kent is a small collection of flints from Broxbourne, Herts, all from a sealed deposit on the Pleistocene gravel. The discovery was made by Mr. Hazzledine Warren, who is about to publish it in collaboration with Mr. Grahame Clark. The material is sharp and barely patinated, consisting of cores and end-scrapers, large and pygmy graters, raw material in the form of blades, and two picks, the predecessors of the neolithic axe. The occupation site was covered by peat of the Boreal period, as determined by pollen analysis, and the industry may safely be referred to that cool and dry period of pine and hazel forest which followed the arctic spell at the close of the Palaeolithic. This Boreal period corresponds to the Ancyclus stage of the Scandinavian Stone Age, and may be dated about 6000 B.C. This exhibition will continue through July and August, and will be followed by others dealing mainly with the Stone Age of Britain.

#### Uses of Coal and its Products

THE appearance of the first half-yearly summary of progress in research and technical development of the utilisation of coal and its by-products, issued by the Utilisation of Coal Committee of the Institute of Mining Engineers, directs attention to the change which adversity has produced in the coal industry. Until recently, it was substantially true to say that the industry was indifferent and left such matters to the consumer. The consumer has, however, reduced his consumption of coal either by greater efficiency, or by the use of substitutes, until the point has been reached when it is seen that coal consumption must be cultivated if coal production is to exist. The Institution is now issuing frequent bulletins which direct attention to new developments and ideas respecting the use of coal and its products. They are interesting and informative documents and reveal a departure from the 'raw coal' mentality which has been an obsession with the coal producer. Coal will only survive in face of competition by the use of methods which are efficient and convenient, and frequently this is not the case with the use of crude lump fuel. The bulletin reports that the outstanding development during the last six months has been in the use of compressed coal-gas for driving public service vehicles. For these engines, coal-gas is an almost ideal fuel, and the disadvantages of compressed gas are least felt when the vehicles ply within a limited radius.

#### Grasshopper Plague in the United States

ACCORDING to a Wire Report of Science Service, Washington, D.C., dated June 9, grasshoppers are likely to be a more serious plague in the north-

western United States, to so far south as Arizona, than at any time in the past fifteen years. A survey just completed by field men of the United States Bureau of Entomology shows that the eggs have survived the winter to a remarkably complete degree and now, with the sudden onset of hot weather, hatching is taking place with rapidity. The grasshoppers can be controlled by the proper distribution of bran baits poisoned with arsenic—a method that is usually adopted by farmers with monetary aids from the respective States or counties. With the fiscal affairs of the States none too good and some of them desperate, supplies of the necessary ingredients may be lacking in localities where infestation is greatest—especially in South Dakota. Minnesota, on the other hand, with a lighter attack, has still funds in hand for financing a properly organised campaign.

#### Genetical Society's Fund for Displaced Scientific Workers

THE Genetical Society is raising a fund for the benefit of genetical workers, regardless of nationality, who have lost their positions as a result of racial or political discrimination, to be administered by the Society's committee, in co-operation with relief organisations. Grants will be made to as many individuals as the sum subscribed will warrant, in order to assist them to carry on research work in the British Empire. Subscriptions should be sent to Miss E. R. Saunders, 10 Newnham Terrace, Cambridge.

#### A New Meteorite

THE Tass Agency has recently reported from Archangel that a new meteorite has fallen in the northern area of the U.S.S.R., 15 kilometres from the River Mezeni, in the vicinity of the village of Koslail. A piece of the meteorite weighing approximately two and a half tons was discovered near the meteorite itself. The Soviet Academy of Sciences (Meteorite Department) is making arrangements to investigate the new meteorite.

#### Announcements

It is announced in the *Times* that Prof. Gilbert Murray has been elected chairman of the International Commission on Intellectual Co-operation and Mme. Curie and Prof. Rocco have been elected vice-chairmen.

THE following have been elected officers of the Institution of Electrical Engineers for the year 1933-34: *President*, Mr. P. V. Hunter; *Vice-President*, Mr. R. P. Sloan; *Treasurer*, Mr. P. Rosling.

It is announced in *Science* that Prof. James Franck, who recently resigned the chair of physics in the University of Göttingen, has been appointed for the coming academic year to be Speyer guest professor at the Johns Hopkins University.

PROF. D. P. D. WILKIE, professor of surgery in the University of Edinburgh, has been appointed

a member of the Medical Research Council in succession to Mr. Wilfred Trotter, who retires in rotation on September 30 next, after four years' service.

MR. E. J. ELFORD, borough engineer and surveyor of Wandsworth, past president of the Institution of Municipal and County Engineers, and chairman of the Building Divisional Council, has been elected to succeed Mr. M. F. G. Wilson as chairman of the General Council of the British Standards Institution for the ensuing year.

IN NATURE of July 15, p. 96, the date of the London session of the International Congress of Anthropological and Ethnological Sciences is wrongly announced as 1933. It should be 1934, as it is arranged so as to divide the interval between the Prehistoric Congresses of 1932 and 1936, and to fall in the same year as the European session of the International Congress of Americanists, namely at Seville in 1934.

REFERRING to the article entitled "New Science Laboratories in Aligarh" in NATURE of July 15, Messrs. Adam Hilger Ltd. inform us that they have, in the past few years, supplied to the Aligarh Muslim University quartz spectrographs, an infra-red spectrometer, a Michelson interferometer and other apparatus, and that they have now under construction for the Physical Laboratory a 2-metre vacuum grating spectrograph of high dispersion in which the grating is used at nearly grazing incidence.

THE Institution of Electrical Engineers has published an index to vols. 60-69 (1922-1931) of its *Journal*. This is the sixth ten-yearly index it has published since 1872. These indexes are of great value for reference.

APPLICATIONS are invited for the following appointments, on or before the dates mentioned:—A chief lecturer, and a lecturer in mechanical and civil engineering at the Rotherham College of Technology and Art—The Director of Education, Education Offices, Rotherham (July 29). An assistant science and mathematics master at the Exeter Junior Technical College—The Secretary for Education, 39, Southernhay West, Exeter (July 29). A head of the Department of Electrical Engineering and Physics at the Leeds Technical College—The Director of Education, Education Offices, Calverley Street, Leeds (July 31). A demonstrator in zoology at the University of Leeds—The Registrar (Aug. 5). A reader in physics at the University of Dacca, India—The Registrar, University of Dacca, P.O. Ramna, Dacca, East Bengal (Aug. 31). A university reader in pharmaceuticals at the College of the Pharmaceutical Society—The Academic Registrar, University of London, S.W.7 (Sept. 14). A teacher of science and a domestic science mistress at the Chatham Day Technical School for Girls—The District Education Officer, 15, New Road Avenue, Chatham.

### Letters to the Editor

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, nor to correspond with the writers of, rejected manuscripts intended for this or any other part of NATURE. No notice is taken of anonymous communications.]

#### Monetary Standards

No surprise will be felt at the failure of the World Monetary and Economic Conference. The task undertaken was beyond the powers of a body so incongruously constituted: almost without any 'scientific' element: most of the delegates not knowing where we stand; all seeking the impossible—to reconcile the entirely conflicting interests of a vast body of competing industrialists, selfish in their outlook. For the time being, man has ceased to be the master of things and is in the grip of the machine. Meanwhile, mass opinion is changing very fast: we have the examples before us of Russia, of Italy, of Germany—most startling of all, perhaps, of the United States, where insidiously State direction of industry is being undertaken, because of the intense selfishness of the private control hitherto exercised by the trading interests. It is so impossible for the lower to appreciate the higher, that the danger is great that ignorance may seek to take control.

When I look back, across sixty years, to the introduction of the Education Act and ask myself what the effect has been, I cannot see any uplift of general intelligence. It is true that most have learnt to read but what has been put before them to read? More and more the Press is becoming but the means of securing bold and often shameless advertisement of competing commercial interests: it has no moral influence; no ideals. The prophets of the past, Bunyan, Carlyle, Disraeli, Huxley, Ruskin, are all written down. The Church has no place as a moral influence. Probably, the downfall began in petroleum, almost an unknown quantity in my youth: when only candles and colza oil were used. The present impasse is clearly traceable to unrestricted, unscientific squandering of the world's resources: this cannot go on: some halt must be called. In some way, science must be made to prevail: some element of scientific thought must be introduced into world affairs generally, some element of altruism, far more understanding of the limitations. It is essential that we learn to measure all things, so that we have a check upon their production and use.

Scientific workers hitherto have taken no part in the struggle. As a class, we are as selfish as any other section of the community, even narrower in our outlook. Still, it is our business to weigh and measure and we know what is involved in these operations—that standards are indispensable.

Standards we must have, both moral and monetary. The world is so wonderful, so full of beauty, that the clear duty is before us to fit ourselves to it, not to fill it with strife and reduce it to ugliness in a speculative struggle over gold. The term *standard* has no meaning for people generally; the way in which it has been bandied about of late in connexion with gold is clear proof that it has no meaning in the commercial mind nor even within the Bank of England. Presumably tables of weights and measures are taught at every school. How many know upon what

standards they rest? How many know that every yard measure in use is but a copy of an agreed length, defined as the yard, marked upon a bar of metal kept in the Standards Office? That pound weights are equally but copies of a particular lump of metal similarly guarded which we have agreed to call a pound weight. The measures of the metric system are in like manner derived from a standard metal bar kept in the French Bureau of Weights and Measures. All the world over, measurements are made in accordance with either the English or the French standards: the tendency is growing to prefer the French system. If, to-morrow, the world could agree that the metric system should be used generally, measurements—whether of length, area, volume or mass—would everywhere be made in terms of one primary standard, the metre.

Changes in supply and demand, consequently of the value of the goods measured, however great, have no effect upon the standards used in measuring. The housewife would be very much surprised and indignant, if from day to day she had different lengths served out to her as a yard or metre. This, however, is precisely what is being done with money. The world at present has no defined standards of money value.

So accustomed are we to the variation in price of things we buy and sell that many seem to think it is impossible to fix any standard by which relative values may be measured, that can be used just as a yard or metre is used in assessing length. Years ago we nominally fixed a standard of value, when the composition of gold coinage alloy was fixed and also the weight of the sovereign: it was such that the declared value of gold became £4 4s. 11½d. per oz. Although the melting down of gold coinage then became illegal at the time there was no enactment to prevent traffic or trading in gold *otherwise than at this price*. As you cannot have your cake and eat it, *de facto*, immediately gold was sold at an enhanced price, the standard was besmirched and set at nought: latterly, gold has been sold at about 12s. instead of 84s. This, however, is a visionary value, in terms of the standard we once had when the shilling was declared to be the twentieth of a sovereign. Gold having no defined value, the shilling in which it is now customary to value it equally has no defined value.

In fact, we are living in 'looking-glass land', victims of financial speculators: it is they who are creating much of the present difficulty, not only profiting at the expense of the community but also an ever-present cause of unrest.

What is commonly spoken of as 'going off the gold standard', which happened in September 1931, has nothing to do with our departure from a standard or fixed value for gold. It is a departure from honesty: from the obligation the Bank of England was under to back its issue of paper notes by gold. Dr. W. Cannan, in a letter in the *Times* of July 5, very rightly objects to the Government acquiring 500 tons of gold for the Bank at the expense of the taxpayer, inasmuch as the purchase must have been made at a price far higher than the legal, assuming that the original definition of the sovereign still rules. He also objects to the gold being stored away, not seeing that it is there as a solid and permanent sign of our honesty and solvency. Although stored, it is actually in use, as it is the cover of notes that are in circulation. Paper can be printed upon by anyone—it is impermanent; without cover, notes carry no guarantee of value.

There is yet a third gold problem: the use that is to be made of it: the amount of cover to be maintained. Clearly, to say the least, it is undesirable to cart so heavy a material about the world. Much of the commerce of the world is on credit; complete organisation of a credit system seems to be an indispensable step.

By nature, man is a gambler and has no great sense of honesty. In some way we have to suppress the gambling and speculating instinct. It is already overcome in large sections of the population. Speculation in gold is confined to a few. The greater difficulty is to overcome our mental lethargy and be intelligent. At present, it is clear that the world is only organised on lines of travel and intercommunication, not for the purpose of using its intelligence. It is led almost entirely by mass suggestion, not by rational scientific ordinance: it is not merely that people are unprepared to face the facts: they are unaware of their position and of the growing danger to society of ignorance.

The only possible scientific close of the Conference will be a recommendation that the nations forthwith take steps to establish a gold standard unit of monetary value for international use. The establishment of the standard will necessarily entail the fixation of the price at which alone gold may be sold and bought.

"The worship of the Golden Calf dies hard," is the remark made by Sir William Dampier (*Times*, July 11), who, strangely enough, passes by the problem of a standard. It should never cease. If and when the world becomes honest, gold will be graven as an image of honesty and a ritual all can rightly follow be ordained for its worship.

HENRY E. ARMSTRONG.

### Photographic Sensitivity of Silver Sulphide

SILVER sulphide is sensitive to light electrically, exhibiting both photo-conductive<sup>1</sup> and photo-emissive<sup>2</sup> effects, but it has not been considered sensitive photographically. It thus differs markedly from the silver halides, which exhibit all three effects<sup>3</sup>.

Silver sulphide is recognised, however, as a powerful catalyst for the deposition of silver, and is known to play important accessory rôles in photography<sup>4</sup>. Recently, during a study of these auxiliary functions, it was found that accurate density measurements could not be made of certain silver sulphide suspensions because these began to darken in the photometer. The particular samples of colloidal sulphide were suspended in solutions containing the double thiosulphate of silver and sodium together with some sodium sulphite. Left to themselves, such mixtures grow darker in the course of a few days with the deposition of metallic silver. Ultimately, a heavy precipitate settles which leaves the solution clear and without further tendency to darken unless more colloidal sulphide is added. It was thought at first that the heat of the photometer lamp was accelerating decomposition, but it was soon evident that the light was responsible; the mixture was photographically light sensitive.

It is well known that the silver halides are darkened by light in the presence of excess silver ion, and the reaction is the basis of most photographic print-out papers. That silver sulphide exhibits the same effect is interesting and worthy of

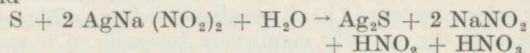
note, for it places the sulphide in line with the halides and also permits the study of the sensitivity of a substantially *black* silver salt.

The darkening of the sulphide is found to occur best in solutions of silver sulphite in an excess of alkali sulphite, and in solutions of silver nitrite in an excess of alkali nitrite. In double silver tartrates, formates and ammonia-silver complexes, etc., the sulphide is slightly sensitive.

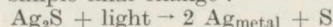
The darkening is due to the deposition of metallic silver on the sulphide surface or in its immediate neighbourhood. With sodium silver nitrite the reaction is comparatively simple and involves, ultimately:



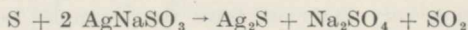
and



The sulphite reaction is by no means simple, but involves a simple final change:



and



In both cases the reaction appears to concern ions adsorbed to the silver sulphide and the 'speed' is nearly proportional to the silver ion concentration. Whether the silver sulphide is continuously decomposed and regenerated, as suggested by the equation, or whether electrons rather than atoms are interchanged at the surface of the sulphide lattice, has not yet been settled, but it has been found that so many as 16 molecules of  $\text{Ag}_2$  metal can be reduced by one molecule of  $\text{Ag}_2\text{S}$ . The limiting factor appears to be the exclusion of light from the active surface by the reduced silver.

The spectral sensitivity extends from the violet well into the infra-red, with an apparent maximum, to uncorrected tungsten, at  $1.1\mu$  and a limit at  $1.4\mu$ , probably determined by the optical absorption of the aqueous silver solution. The reaction is roughly independent of alkalinity between  $\text{pH}$  11 and  $\text{pH}$  5 (more acid solutions decompose); is depressed by gelatin and is then sensitive to changes of  $\text{pH}$ ; and shows a negative temperature coefficient with nitrite and a positive coefficient with sulphite.

Applied to photographic materials, the reaction affords a kind of image building which, in general, can be called *optical intensification* and, in particular, *sulphide intensification*. Any silver image is amenable to treatment, although fine-grained films and slow bromide or chloride papers respond most easily.

The silver image is bleached in the usual manner, converted to sulphide, and, after a wash in water or a rinse in sodium bisulphite solution, is placed in a silver sodium nitrite solution and rocked for 2-10 min. close under a 100-watt tungsten lamp. The solution may be cooled if necessary.

Excessive contrast, amounting to an increase in gamma of ten times, can be secured by bleaching in a dilute acetic acid-sodium acetate-permanganate-bromide solution, clearing in bisulphite, sulphiding in a bath containing a silver halide solvent and a soluble sulphide, and, after a bisulphite rinse, intensifying under the light in sodium silver sulphite solution. The image 'fog' is left substantially untouched, but the significant tones are enormously increased, original densities above 0.4 often becoming opaque.

The combination of a physical intensifier and light activation allows great latitude in the choice of shape for the intensified characteristic curve. The lighter

densities receive super-proportional activation and it is possible so to raise the *toe* of the curve that the useful intensified densities lie on a straight line.\*

The photographic effect here recorded concerns only the 'silver body' of silver sulphide. It is possible that the ordinary sulphide body is equally sensitive but resists decomposition because of rapid recombination of the atoms. More detailed account of this work will appear shortly in the *Journal of the Franklin Institute*.

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W. WEYERTS.

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Eastman Kodak Company.  
June 10.

\* The commercial applications of the matter contained in this communication are the subject of patent application by the Eastman Kodak Company.

- <sup>1</sup> C. Tubandt, *Z. Electrochem.*, **26**, 358; 1920.  
<sup>2</sup> G. Chaperon and C. Mercadier, *Compt. rend.*, **106**, 1595; 1888. G. Athanasiu, *Compt. rend.*, **183**, 786; **189**, 460; 1929.  
<sup>3</sup> W. W. Coblenz and W. B. Emerson, *J. Wash. Acad. Sci.*, **7**, 525; 1917. F. C. Toy, H. A. Edgerton, J. O. C. Vicks, *Phil Mag.*, (7), **3**, 482; 1927.  
<sup>4</sup> S. E. Sheppard, *Phot. J.*, **49**, 380; 1925.

#### An Inland Record of *Aedes detritus*, Haliday (Diptera, Culicidae)

AN investigation was recently carried out by our Institute in the neighbourhood of Droitwich (Worcestershire), where annoyance due to mosquitoes has been experienced from time to time. The trouble proved to be due to the existence of a local breeding area of the two British 'coastal' mosquitoes, *Aedes detritus*, Haliday, and *Aedes caspius*, Pallas.

Both *Aedes detritus* and *Aedes caspius* are extremely common in low-lying seaside districts, the presence of larvæ of one or both of these species in collections of stagnant salt, or partly salt, water being probably the rule rather than the exception. Larvæ of *Aedes caspius* have also been found occasionally in inland, non-salt, waters—notably at Wimbledon, Mitcham, East Ham and other London suburbs. No instance, however, of *Aedes detritus* breeding in an inland locality has previously been recorded in Great Britain.

In the present case, the breeding area consists of a series of parallel ditches in which water, released at intervals from the settling tanks of a sewage works, gradually evaporates and soaks away. Owing to the brine springs for which the district is noted, and to the consequent infiltration of brackish water into the sewers, the water which passes through the settling tanks is more or less saline. While standing in the ditches, this water increases in salinity, partly by evaporation and partly by taking up salt previously deposited in the ground. On the day when the ditches were inspected, the water (which was teeming with larvæ and pupæ of both of the above-mentioned species) was about one quarter as salt as the sea.

The ditches are narrow and easily accessible, so that the prevention of further mosquito breeding by means of oil or larvicides is a comparatively simple matter.

It is perhaps reasonable to assume that *Aedes detritus* was at some time introduced into the Droitwich area from a coastal district, but no evidence is available to indicate how or when such introduction can have occurred. It is interesting, however, to note (a) that the eggs of this species are able to survive long periods of desiccation, and (b) that, up

to comparatively recent times, salt-carrying barges plied continuously between Droitwich and the Bristol Channel.

Although this case is a unique one so far as Great Britain is concerned, larvæ of *Aedes detritus* have been found inland in northern Germany on two occasions—at Oldesloe and at Lüneburg. In both these districts, as in Droitwich, extensive salt deposits exist.

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June 30.

#### Adaptations to Hydrostatic Pressure in Whales

INVESTIGATIONS into the circumstances of respiration in Southern Blue Whales have been carried out in South Georgia and on board a floating factory. Photomicrographs of the lungs, suitably stained, show each alveolus to be encased in elastic tissue. Cartilage is found in the smaller bronchioles. Placental arteries and veins are reinforced in spongy tissue so that the thickness of the walls is more than twice the internal diameter of the vessel.

Gas analyses of urine and allantoic fluid indicate that slight supersaturation is chronic. The volumes of dissolved carbon dioxide, which is found in great quantity, postulate various partial pressures of this gas from 220 mm. to 480 mm. of mercury. No appreciable amounts of dissolved oxygen have been detected.

The blood of a freshly killed whale would be expected to show supersaturation with nitrogen. This is scarcely ever the case. Of 110 samples of adult and fetal blood, one only contained more nitrogen than was soluble in the blood at atmospheric pressure; the majority contained less. Whale's blood takes up slightly more than two volumes per cent nitrogen from the air; human blood, about 1.2.

Further examination shows the presence of small organisms (diameter, 0.5–3  $\mu$ ) in the blood of all Blue Whales and their fetuses to the extent of approximately 20 million per c.mm. These organisms are motile and reproduce in blood kept *in vitro* and in nutrient solution. They have been shown to adsorb nitrogen, thus accounting for the extra solubility of nitrogen in blood mentioned above. Nitrogen which has been taken up is recoverable only by immediate evacuation. After a few minutes the nitrogen disappears and is not recoverable by evacuation. This points to some form of fixation such as occurs in certain free-living bacteria. The rate of fixation of nitrogen has been measured by a method which does not allow of continuous mixing of the gas with the blood. Various rates up to 2.8 volumes per cent in 40 minutes have been observed at room temperature. No fixation occurs in whale's blood in the absence of oxygen. The organisms have been seen, in whale's blood which was almost devoid of oxygen, to attack the erythrocytes and burst their envelopes.

This mechanism, which removes from the blood the excess nitrogen naturally resulting from compression of the lungs in deep diving, seems appropriate to an aquatic mammal of the whale's habit of life. In the absence of this defence, a whale would be liable to conditions which cause caisson sickness on returning to the surface after a deep dive.

In whale's blood which was brought from the antarctic at  $-10^{\circ}$  C. the organisms are still active,

and experiments on this blood are in progress at Cambridge. It is hoped that a full account will be published shortly in "Discovery Reports".

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### Limnological Studies at High Altitudes in Ladak

IN his studies of the Alpine lakes of Central Europe, Pesta<sup>1</sup> has characterised the smaller lakes at the highest altitudes as pan-oligotrophic. Such lakes, despite their small size, show a very high oxygen content in the hypolimnion and have a poorly developed bottom fauna and plankton. Recently, during the work of the Yale North India Expedition under the leadership of Dr. H. de Terra, it has been possible to make limnological studies on a number of lakes in Ladak lying at altitudes between 4,267 m. and 5,274 m. In waters more than 10 m. deep at

limits of those derived for some of the lakes of north-eastern Wisconsin from the data of Juday and Birge.<sup>2</sup>

In two other small lakes, Khsagar Tso and Mitpal Tso, considerable oxygen deficiencies were also observed in the hypolimnion. Since the water is brackish and no bathymetric maps are available for these lakes, it is not possible to use the chemical data obtained so completely as in the case of Yaye Tso.

A fourth glacial lake, Ororotse Tso, lies at 5,274 m., and is apparently the highest lake yet studied limnologically. When visited on July 11, 1932, Ororotse Tso was still covered with ice save at the extreme edge and it seems doubtful if it ever becomes entirely clear. The water was probably being disturbed by convection currents from the margin, but a bottom sample from 14 m. showed a slight oxygen deficit. The lake contains, moreover, considerable amounts of plankton and has a quantitatively rich bottom fauna, approximately 8,900 animal organisms, all chironomid larvæ, occurring per square metre in 14 m. of water. This number is considerably greater than the estimate for the Yaye Tso, in which lake there were approximately 4,800 organisms per square

metre, mostly chironomid larvæ and tubificid worms. Such figures may be compared with that for the oligotrophic Tso Moriri, in which but 450 organisms per square metre, all chironomid larvæ, were found at a depth of 50 m.

Since the area studied is largely semi-desert, the Ladak lakes might be expected to resemble those of other semi-arid regions. This expectation is to some extent fulfilled in that lakes in such regions frequently lack outlets and accumulate large quantities of electrolytes. The Ladak lakes, however, differ markedly from those of other semi-arid regions<sup>3</sup> in that they show no trace of a paratrophic condition. It appears, therefore, that the smaller high altitude lakes of Ladak have more in common with the less extreme eutrophic or mesotrophic lakes of the lowlands

of Europe and North America than they have with the pan-oligotrophic lakes of the Alps or with the lakes of less mountainous semi-arid regions.

I have great pleasure in expressing my thanks to Dr. de Terra for continual opportunities for prosecuting these studies and for his never-failing help and encouragement in the field. A full account of the limnological work of the expedition will be published as soon as taxonomic studies have been completed by various specialists.

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May 19.

<sup>1</sup> *Die Binnenquässer*, 8. "Der Hochgebirgsee der Alpen", Stuttgart, 1929.

<sup>2</sup> *Trans. Wisc. Acad. Sci. Art. Lett.*, 27; 1932.

<sup>3</sup> Decksbach, *Verh. Int. Ver. theor. angew. Limnol.*, 2; 1924. Stanković, *ibid.*, 5; 1931. Hutchinson, Piekford and Schuurman, *Arch. Hydrobiol.*, 24; 1932.

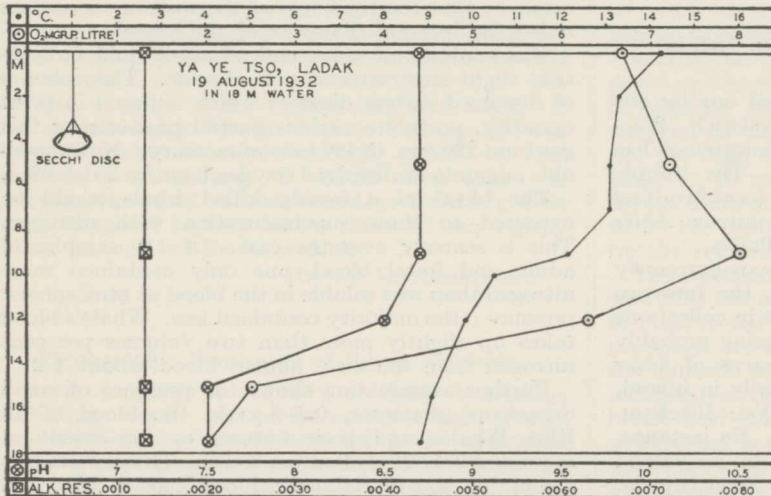


FIG. 1. Thermal and chemical stratification in Yaye Tso, Ladak.

such altitudes the surface temperature in August and the beginning of September lay between 11-73° C. and 14-19° C., that is within the ranges recorded for the pan-oligotrophic type by Pesta.

Two types of basin are to be found in the region studied. The first type comprises the tectonic depressions containing the Panggong Tso, Tso Moriri and Pangur Tso. The first two of these, though lacking outlets and therefore rich in accumulated electrolytes, are comparable to normal oligotrophic lakes. Pangur Tso is very shallow, is not thermally stratified and appears to be entirely carpeted with flowering plants.

The second class of basin is of glacial origin and includes a number of small lakes in kars and kettle holes. Of these, Yaye Tso, a freshwater lake lying at 4,686 m. and draining into the Indus just south of Mahe, was most intensively studied. It is clear from Fig. 1 that this lake has a quite well-developed eutrophic oxygen curve. Calculations based on a bathymetric map made from two lines of soundings indicate that on August 11, 1932, the lake had an actual oxygen deficit of 1.1 mgm. per square cm. of hypolimnion surface. This figure lies within the



Meteors and the 80-90 km. Layer of the Earth's Atmosphere

IN a recent valuable paper entitled "A Study of Meteor Light Curves"<sup>1</sup>, Miss Dorrit Hoffleit has studied the relative changes in brightness along the paths of fifty meteors, photographed at the Harvard College Observatory. In the course of this investigation it was found that "a statistical relation exists between the fraction of the photographed path at which maximum brightness occurs and the velocity at which the meteor strikes the earth's atmosphere, namely, the greater the velocity, the nearer to the vanishing point does the meteor become brightest".

It seems to me that this fact may be easily interpreted as follows:

It is established by many authors that a very definite connexion exists between the heights of appearances and disappearances of meteors and their geocentric velocities. In the accompanying table these data are given for those geocentric velocities for which Miss D. Hoffleit gives the positions of maximum brightness. The data for fireballs were taken from the smoothed curves based on the mean heights given in my discussion<sup>2</sup> of 400 fireballs of the Niessl-Hoffmeister's Catalogue and for meteors less bright than Jupiter, but brighter than mag. 1 from similar unpublished data, based on Denning's observations. These two groups of meteors have been chosen as their brightnesses are, probably, nearly equal to those of meteors photographed at Harvard.

path, that is, upward. I think that the true height of this layer is close to 85-90 km. Indeed, the existing direct determinations of the heights of these outbursts indicate a nearly constant height<sup>4</sup> of about 85-89 km. Therefore it is very probable that the sudden increases of meteor brightness (corresponding to Miss Hoffleit's second type curves) occur at the same height.

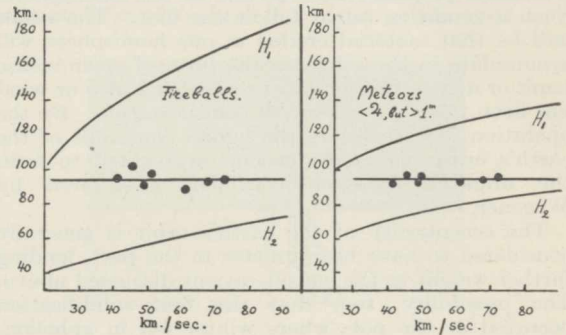


FIG. 1.

In 1926 I pointed out the peculiar properties of the layer lying at the altitude of 80-90 km. above the earth's surface<sup>5</sup>. Since then I have found other confirming evidence and it seems to me that the interesting dependence found by Miss Dorrit Hoffleit for the positions of maximum brightness of meteors, also confirms this statement.

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April 21.

<sup>1</sup> Proc. Nat. Acad. Sci., 19, 212; 1933.  
<sup>2</sup> Mon. Not. Roy. Ast. Soc., 90, March, 1930.  
<sup>3</sup> See, for example, C. Hoffmeister, Ast. Nachr., 221, 367; 1927.  
<sup>4</sup> J. Sykora, Ast. Nachr., 186, 111; 1910. E. Hertzsprung, Ast. Nachr., 200, 201; 1915.  
<sup>5</sup> NATURE, 118, 14, July 3, 1926. Mirovèdenjè, 15, No. 2; 1926.

Geo- centric vel. km./sec.	Mean position of maximum (Hoffleit)	Fireballs		Height of maximum brightness km.	Meteors		Height of maximum brightness km.
		H <sub>1</sub>	H <sub>2</sub>		H <sub>1</sub>	H <sub>2</sub>	
41.5	0.51	139	53	95	114	71	92
45.5	0.46	144	54	103	117	73	97
49.0	0.62	148	56	91	120	75	92
50.1	0.54	148	56	98	120	75	96
61.0	0.72	159	62	89	127	80	93
68.1	0.75	167	64	90	129	82	94
72.5	0.74	170	66	93	131	84	96

Mean 94.1 ± 1.3 km. 94.3 ± 0.5 km.

In the fifth and eighth columns the heights corresponding to the maxima of brightnesses of meteor paths are given (it is evident that in this case the inclination of true path has no significance). The examination of these heights leads us to the conclusion that the maxima of meteor brightness are observed at a nearly constant height above the earth's surface. Thus it is very probable that the positions of maximum brightness depend not so much on their geocentric velocities but are observed when meteors are passing through a certain layer of constant height (see Fig. 1).

The 94 km. height of this layer, obtained above, seems to me somewhat greater than the true one. In the paper mentioned above, I have pointed out already that the mean meteor heights deduced from the great number of observations are somewhat greater than the true heights. In this case the deduced height of the layer is also overestimated. Besides that, it is probable that the maximum of brightness caused by the meteor evaporation only (supposing the atmosphere has constantly increasing density), would be observed near the middle of a path<sup>3</sup>. In this case the positions of maximum brightness should be slightly displaced to the middle of

Differential Cooling and the Origin of Continents

I AM unaware whether attention has been directed to the probable effects of the differential cooling of the earth's surface in relation to the eccentricity of the orbit. The first precipitation of water is likely to have occurred at the pole where the winter falls in aphelion; and for a period of geological time this may have been the only region of the earth cool enough for water to exist in the liquid form. The first rains are not likely to have involved the condensation of more than a small fraction of the water present in the atmosphere. The deluges would spread out from the polar region in a shallow sheet to be evaporated upon reaching latitudes where the temperature was too high for water to lie (the heat of the earth's crust and solar heat being the determining factors). Thus the initial stage in the formation of the hydrosphere will involve the existence of violent shallow currents in one hemisphere during the winter.

The crust is likely to have maintained irregularities (through volcanic action or otherwise) which will furnish elevations for the deluges and currents to erode. Sedimentary material will be washed outwards from the pole, to be deposited by evaporation and probably transported farther by wind-action, which may have been very violent. The polar region, it is true, will suffer a very hot summer in

perihelion; but it is likely to retain lakes or shallow seas which will retard the rise in temperature in respect of insolation. The hottest region may actually be the opposite pole, during its arid summer; and into this region winds will blow, depositing large amounts of sedimentary dust. It is possible, alternatively, that a powerful circulation of water-sheets or streams might cover the whole globe, maintained by a marked preponderance of rain in one hemisphere. Such a condition might follow the first. The result will be that material eroded in one hemisphere will accumulate in the other, in the form of an immense bank or dune, according as to whether water or wind has been the main agency of transportation. By the operation of such forces the lighter materials of the earth's crust may have become segregated to form the original unbroken continent postulated by Wegener.

The eccentricity of the earth's orbit is generally considered to have been greater in the past, lending further weight to the considerations discussed above. The possibility, too, that the first solidification occurred at the pole where winter fell in aphelion, and that the precipitation of water may have been concurrent, will also deserve consideration.

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### Macroscopic Speech

WHEN a shred of cotton-wool is held close in front of the face during speech, it is blown about by the currents of air issuing from the mouth and nose. If it is held only a few centimetres away from the face, it remains quiet. Such observations show that physical speech includes currents of air from the mouth and nose that are dissipated immediately in front of the face. These currents can be captured and registered by the graphic method. The current

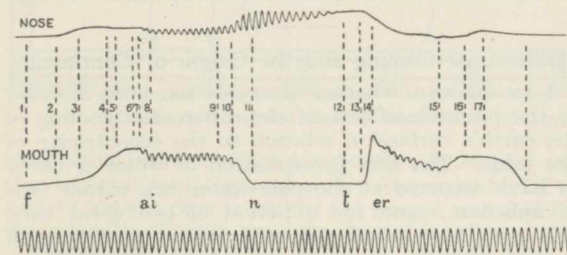


FIG. 1. Mouth and nose registrations of the word "fainter" (macroscopic speech).

from the mouth is conducted to an oil-silk membrane, the movements of which are enlarged by a straw lever and registered by a fine metal point on a moving smoked surface. A rubber tube with an olive-shaped glass end inserted into a nostril carries the nasal current to a similar small recorder with a rubber membrane.

Mouth and nose registrations of the word *fainter* are reproduced in Fig. 1. Corresponding points are indicated by vertical lines. The mouth record begins with a rising line that indicates increasing emission of breath. The emission becomes slower and slight irregularities appear. Later the breath current becomes slightly less and small waves appear. The membrane of the recorder responds only to mass movements; the waves register a series of jets of air that issue from the mouth. These are, in fact,

jets of air produced by opening and shutting the glottis. The vibrations that are aroused in the vocal cavity by these jets would be registered on a sound film; they are not registered here. There is a marked decrease of breath and wave height as the vowel passes over into *n*. For this sound there are waves but no breath from the mouth. From *t* the waves are lacking. Suddenly the line shoots up and registers an explosive impulse of breath. Later the breath decreases with waves and finally rises and falls as a puff of air. The nose registration shows a faint issue of breath during *f*, then faint waves during *ai*, strong waves and breath during *n*, no waves but breath during *t*, faint waves and diminishing breath during *er* and a final explosive puff.

Registrations of this kind show that the currents of air form a system of speech activity of the completest kind. To express its nature it may be termed *macroscopic speech*.

Macroscopic speech is the immediate result of the muscular action of the speech organs. Muscular activity produces air vibrations only indirectly. The jet of air passing between the lower lip and the upper teeth produces the irregular vibrations that are heard as *f*; each jet from the glottis sets the vocal cavity in vibration in the vowels. The vibrations that constitute *microscopic speech* are the results of macroscopic speech.

Although the graphic method has been the chief one employed in phonetic laboratories, the records have been interpreted in terms of muscular action and the existence of the speech system itself has been overlooked. It has, moreover, not been understood that muscular movements do not and cannot produce vibrations of the air particles directly. Even when rapidly repeated, they push the mass of the air back and forth and do not move the particles around the positions of equilibrium. The stage of macroscopic speech is required between muscular activity and microscopic speech.

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### Shadowless Lighting

THE baleful effects of glare are not generally apprehended, and although illuminating engineers have notably advanced the art of lighting, it cannot be said that they have succeeded in illuminating the rooms of an ordinary house satisfactorily. It is of

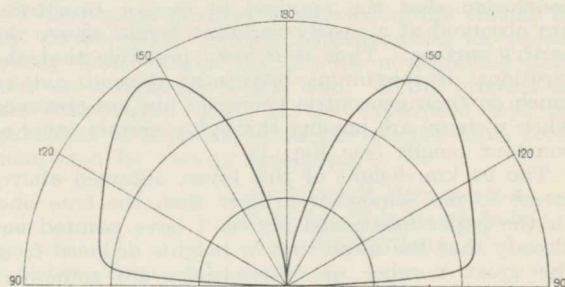


FIG. 1. Polar curve of silvered lamp.

prime importance, however, that good illumination should be available in every home.

Two years ago, after experiments with various fittings round an electric lamp in my own home, I became convinced that the only way to achieve satisfaction was to eliminate completely all glare

from the lamp. This was conveniently effected by using a pendent, 100 watt, clear, gasfilled lamp with a deposit of silver upon the hemispherical end. The polar curve of such a silvered lamp is shown in Fig. 1. This lamp exceeded my expectations: the source was obscured but the room was pervaded with light: not only was the room better lit than by any other device I had tried but also the lighting was shadowless. The pupils of the eyes were not contracted by glare from the lamp and the eyes were able to make full use of the illumination provided.

It may be of interest to state that in my own house we use such lighting in rooms with walls of buff, of green and of white and also in a room with oak walls and a ceiling painted light stone colour. The effect in the living room, which has white walls and ceiling, is particularly pleasing as the walls appear neutral grey in contrast with the directly illuminated frieze and ceiling.

Greenbank, Garston,  
Hertfordshire.

A. F. DUFTON.

### Absorption Effect in the $M$ -Series

WHEN studying absorption phenomena with the help of a low-tension ionic tube, which I have constructed with Prof. Dolejšek<sup>1</sup>, the discharge of which has been described by K. Dráb<sup>2</sup>, some new structures of the absorption edges of the  $M$ -series were discovered, which, so far, had not been observed. From the results so far obtained, it is shown that it is possible to use the anticathode directly, instead of the absorption screen for obtaining spectra.

As the result of the study of  $M$ -absorption by the elements tungsten (atomic number 74) and tantalum (atomic number 73), I have obtained the following results: The most prominent absorption edges  $M_V$ ,  $M_{IV}$  and  $M_{III}$ , were not found; on the contrary, in the places of the energy values of  $M_{II}$  and  $M_I$ , white absorption lines without absorption edges were observed.

The  $M_I$  absorption line is, for tungsten as for tantalum, a sharp white line, with a weak, diffuse and white satellite on the side of the short wave-lengths.

The  $M_{II}$  absorption line is also a sharp white line, for both elements, but accompanied on the short wave-length side by a complicated structure of weaker, broader and whiter lines. On the long wave-length side, close to the  $M_{II}$ -absorption strong line, there lies a further weaker line. This structure of the  $M_{II}$  absorption line is shown in Fig. 1 for the element tantalum. The width of the absorption structure is more than 150 v., which is similar to that found for the structure of the absorption edges of the  $K$ -series by Lindsay and others.

It is important to note that, under the same experimental conditions, it has not been possible to show with certainty any trace of normal absorption edges or white lines, observed for  $M_I$  and  $M_{II}$ , in the places for  $M_{III}$ ,  $M_{IV}$  and  $M_V$ . For  $M_V$  and  $M_{IV}$ , for which edges the values measured directly do not coincide with those calculated from the Bohr-Coster scheme, it has been looked for in both positions corresponding to both possible values.

That the phenomenon is not the same if absorption occurs on the anticathode simultaneously with the emission due to electrons, or somewhere else, is

clear from comparing my own results with the results of  $M$ -absorption edges, found by using the absorption screen by Rogers<sup>3</sup>, Johnson<sup>4</sup>, Lindberg<sup>5</sup>, Zumstein<sup>6</sup> and the results of Whitmer<sup>7</sup>. That this effect is not due principally to the difference in the excitation of our ionic tube and electronic tube, is manifest from the results obtained by Dolejšek and Kubiček<sup>8</sup>, who obtained with barium oxide wire traces of absorption  $L_I$  line, whereas no absorption edges, whether absorption lines of  $L_{II}$  and  $L_{III}$ , could be observed.

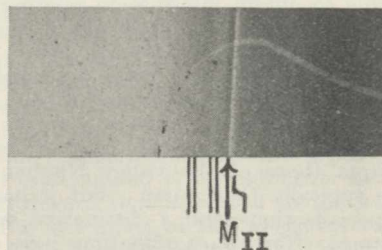


FIG. 1. Tantalum  $M_{II}$  line and structure.  $\times 2$ .

Whether this effect has a connexion with the optical term system, or is in its nature atomic—which seems to be highly probable from the similarity of above-mentioned absorption fine structure of  $M$ -edges of both elements—will be shown by the study of neighbouring elements.

V. KUNZL.

Spectroscopic Institute,  
Charles University, Prague.  
May 27.

<sup>1</sup> V. Dolejšek and V. Kunzl, *Z. Phys.*, **74**, 564; 1932.

<sup>2</sup> V. Dolejšek and K. Dráb, *C.R.*, **196**, 334; 1933.

<sup>3</sup> R. A. Rogers, *Phys. Rev.*, **29**, 205; 1927; **30**, 747; 1927; **30**, 747; 1928.

<sup>4</sup> A. J. M. Johnson, *Phys. Rev.*, **33**, 120; 1929; **24**, 1106; 1929.

<sup>5</sup> E. Lindberg, *Z. Phys.*, **54**, 632; 1929. *Nova Acta Reg. Soc. Sci. Ups. Ser.*, **4**, Vol. 7, No. 7, 1931.

<sup>6</sup> R. V. Zumstein, *Phys. Rev.*, **25**, 747; 1925; **25**, 106; 1925.

<sup>7</sup> C. A. Whitmer, *Phys. Rev.*, **38**, 1164; 1931.

<sup>8</sup> V. Dolejšek and M. Kubiček, *C.R.*, **192**, 1369; 1931.

### Non-Ritzian Nature of the $^3S$ Terms of Mercury

AT the suggestion of Dr. A. G. Shenstone, a precise determination of the energy values of the  $^3S$  terms as well as of the  $^3D$  terms of mercury iodide ( $HgI$ ) has been made. The light from a beam of mercury vapour diffusing from a mercury arc through a slit in the iron anode was examined by means of a Hilger  $E1$  instrument. This light being rich in higher series members yielded values of the  $^3S$  terms up to  $19^3S$ . The plot of the quantum excess ( $n^*-n$ ) of the terms against the term value departed considerably from a straight line relation, indicating that the terms cannot be represented by a simple Ritz formula.

It was possible with this source also to extend other series to higher members. Thus the  $^3D_3$  terms were measured to  $23^3D_3$  and extensions have also been made on other term series. The wave numbers of these as well as the wave-length of a number of new lines in the spectrum of mercury will be published shortly.

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June 19.

## Research Items

**The Nisenan.** Although the Nisenan or Southern Maidu are one of the most numerous Indian groups of California, accurate data concerning them are difficult to obtain. The number of full-blooded individuals in a population of a thousand to twelve hundred is small. They are situated in the middle of what was the 'gold rush' country; but as no attempt was made to Christianise or Americanise them, it is still possible to obtain information relating to their primitive customs. In 1929 Mr. Ralph L. Beals spent three months in field-work among them and the material then collected has been published (*Univ. California Pub. Amer. Archæol. and Ethnol.*, vol. 31, No. 6). The information relates only to the Nisenan of hill and mountain, whose customs are differentiated sharply from those of the valley Nisenan. Their culture is typically Californian; but it has certain unique specialisations and a distinctive outlook in many features. Northward affiliations were observed in the first-salmon observance of the northern part of the area, the idea apparently being transferred to the acorn; and the games were chiefly of the northern type. Their social arrangements, however, are suggestive of southern influence. Thus cross-cousin marriage is tolerated, or even in some districts preferred. There is no trace of exogamic or totemic organisation. There is also an absence of the secret society and its restraining influence on the power of the chief, such as is to be noted among the Maidu and Patwin. At Auburn the chief was elevated into a sort of over-chief. In relation to the dead, distinctly Nisenan elements overlie the central Californian pattern. Cremation is universal, a large quantity of property is destroyed at cremation, and there is a general toning down of the mourning ceremony; while close taboos on the near relatives of the deceased are more severe than elsewhere. In their shamanistic ideas they seem unique. Enormous stress is laid on 'medicines', the initiation of shamans is highly formalised, shamanistic powers are not inherited, and contact with and possession by spiritual powers are infrequent.

**Heredity and Memory.** Comparisons between memory and heredity have frequently been made, but Dr. C. S. Myers (*Scientia*, May 1933) approaches the comparison somewhat differently. He thinks that the final solution of the problem of heredity lies in a combination of the physical and psychological points of view, the former being concerned with the mechanism of a mosaic of specialised units—the genes—while the latter expresses the more general purposive activities of the individual organism. He takes the view that, just as the theory of cerebral localisation only justifies the conclusion that a necessary condition for a special kind of consciousness to appear is that the corresponding nervous processes must pass through a special area of the cortex, so the localisation of inherited qualities in the chromosomes may have merely a similar interpretation. Since the condition for the appearance of a given phenomenon is not necessarily equivalent to its seat, the hypothetical genes may not be discrete particles of fixed position in the chromosome; but the orderliness of heredity and development may depend upon the interrelation of parts as much as upon a narrow localisation of elements. Cases of striking change in mentality during development are cited in favour of the view

that the individual inherits many alternative mental conditions, the particular ones which appear depending on the internal configuration as well as upon external influences such as education and hormonal and general environment.

**Fertile Mare Mules.** In 1926 Dr. Ernest Warren published an account of a male foal born of a cross between a stallion and a female mule, the ancestry of which was fully known. After a long interval, when the first offspring was eight years old, a second mule backcross was born in 1931, the fertile mule being then about sixteen years of age. Both offspring are strongly horse-like in appearance, neigh like horses, have horse-tails and short ears, but the first cross shows the curious characteristic of preferring the company of mules to that of horses. This may be a relic of a youthful association, attachment to mule odour associated with suckling, rather than inherited preference. The first backcross appears to be sexually potent (*Ann. Natal Mus.*, 7, 1933, p. 243). Other examples of mule fertility were referred to in *NATURE* of November 3, 1928, p. 707; and such examples banish the doubt expressed by Prof. Cossar Ewart as to the reliability of the information relating to so-called mule hybrids (*NATURE*, 85, 106, Nov. 24, 1910).

**Classification of Spiders.** Prof. A. Petrunkevitch, continuing his work on the natural relationships between the families of spiders, suggests a system based on internal structure (*Trans. Connect. Acad. Arts. Sci.*, 31, 299-389). Aided by an improved fixative, he has made sections of ninety-two species of spiders, representing all but three of the existing families. The structures thus revealed present important modifications in the number of cardiac ostia, and the form and number of the tracheal tubes, which are used to distinguish five sub-orders, as follows: (1) Liphistiomorphæ (1 family); (2) Mygalomorphæ (8 families), both as previously recognised; (3) Hypochilomorphæ for the family Hypochilidæ; (4) Dipneumonomorphæ (49 families) for spiders with one pair of lungs and one pair of tracheæ; (5) Apneumonomorphæ (3 families) for spiders with tracheæ only. Recent families are thus increased from 55 to 62 by one new discovery, the Symphytognathidæ and six promoted sub-families, while a revised definition of the Amoxenidæ is also given. The work undoubtedly represents an advance on earlier systems, founded as it is on a more thorough study of structure than has hitherto been possible. As it is the sixth scheme proposed for spiders during the past decade, it is much to be hoped that it will be generally, and finally, accepted.

**Food of Micro-Organisms.** Mr. Richard M. Bond has set himself the task of trying to prove or disprove the much discussed theory of Pütter with regard to the animals of the plankton nourishing themselves on dissolved organic matter taken through the integument or gills rather than through the gut ("A Contribution to the Study of the Natural Food-Cycle in Aquatic Environments with Particular Consideration of Micro-Organisms and Dissolved Organic Matter". Bull. Bingham Oceanographic Collection, Peabody Museum of Natural History, Yale University, vol. 4, Art. 4, Jan., 1933). The author has made numerous experiments regarding

the amount of dissolved organic matter in natural waters and the effect of dissolved organic substances on the nannoplankton and phytoplankton, with special experiments on *Artemia*. The results indicate that, as previous workers have shown with most marine invertebrates and some fresh-water forms, it is permeable to a certain extent, probably through the chitinous integument, therefore there is no theoretical reason against the hypothesis. Practically, however, the results showed that *Artemia* could not grow in 'nutrient' solutions but grew normally when unicellular algæ or even bacteria were given them. The author concludes that *Artemia* is dependent upon 'particulate' food, that the nature and amount of dissolved and 'particulate' foods in natural waters, and of the filtering and predatory devices of the animals, make it seem extremely unlikely that dissolved organic matter plays any important part in the nourishment of marine zooplankton, and that any seeming correlation between the quantities of dissolved organic matter and the zooplankton must, in reality, be of an indirect nature, with the phytoplankton, and especially the nannoplankton, as intermediary stages.

**Downy Mildew of Onions.** A great deal of damage to the onion crop is caused by the fungus *Peronospora destructor*, (Berk) Caspary, or *P. schleideni*, Unger, as it used to be called. Memoir 143 of Cornell University Agricultural Experiment Station ("Studies on the Downy Mildew of Onions and the Causal Organism, *Peronospora destructor* (Berk) Caspary" by H. T. Cook, pp. 40, Dec. 1932) reviews our detailed knowledge of the parasite and describes some new experiments on the spread and control of the disease. The first mildewed plants appear indiscriminately through a field and may be either systemically infected, or infected through the soil or the seed. The seed may carry the fungus externally or internally. An abundance of moisture and low temperatures spread the disease rapidly, though spores will germinate readily at any temperature between 3° and 27° C. It is interesting to note that methods of plant hygiene (exclusion of the fungus from new areas and regulation of the environmental conditions) are considered to be superior to the use of fungicides as means of control.

**Tobacco Crop and Potassic Fertilisers.** Tobacco compared with other crops is a heavy feeder on potash, and as Anderson, Swanback and Street have shown (55th Report, Connecticut Agricultural Experiment Station, Bulletin 334) the presence of an ample supply of this element in the soil is important if a good quality cigar is to be obtained. Besides inducing characteristic starvation symptoms in the plant itself, the lack of potash renders the crop less resistant to drought and to certain types of disease. From the manufacturer's point of view also, an adequate potash content of the leaves is of great importance, for leaves deficient in this element will not come into 'case' in damp weather after curing, that is, they remain brittle and difficult to handle owing to their lack of potash compounds, upon the hygroscopic properties of which the softening process depends. The fireholding capacity of cured leaves is another property dependent on the potash present, but all the potassium salts tested did not prove equally effective. In general, the organic salts were the most suitable for producing the incandescent type of combustion required for a good cigar. A reduction in the dressing of potassic

fertiliser given was found to affect the quality of the tobacco produced long before any actual decrease in yield was obtained, an annual dressing of so much as 200 lb. per acre being required to produce the best results at the Connecticut Tobacco Substation at Windsor, U.S.A.

**Geological Structure of the Southern Urals.** The geology of the Kargala Mountains in the extreme south of the Urals has been described by A. Janshin (*Bull. Soc. Nat. Moscou, sect géol.*, 10 (2), 308-345; 1932). The first folds occurred in the sediments of the Uralian geosyncline at the close of the Middle Devonian. The next and more important phase of the orogeny raised up a mountainous tract at the end of the Carboniferous. Intrusions of peridotites and granodiorites were associated with this folding. During the Permian, the ancestral Urals were subjected to erosion, and thick sediments accumulated in the downwarp that appeared to the west of the range. The last phase of the orogenesis corresponds with the *Pfalz* of Stille (between the Permian and the Triassic). The eastern flanks of the older anticlines were overthrust across the steeper western limbs and the synclines that lay beyond, while wave-like folding buckled up the Permian rocks on the west. Nappe-structures, such as occur in the Middle Urals, are not found in the Kargala Mountains. Later movements are confined to gentle folding (end of the Jurassic) and considerable faulting (doubtfully regarded as Miocene). The post-Tertiary uplift of the Northern Urals is reflected in the south by step-like uplifts of minor importance.

**Periodicity of Earthquakes.** The seismic periods of about 11 and 19 years are considered by Dr. C. Davison in two papers in the June number of the *Philosophical Magazine* (vol. 15, pp. 1085-1096). The mean duration of the former period over an interval of 580 years is 10.96 years; the maximum epoch is practically the same in both hemispheres and agrees closely with the epoch of greatest sunspot frequency. The mean duration of the latter period for 557 years is 18.6 years, the same as that of the earth's nutation period. The connexion between the two periods is shown by the epochs of the seismic period, which are reversed in the two hemispheres. In the northern hemisphere, the earthquake epoch agrees closely with that when the obliquity of the ecliptic due to nutation is least, in the southern with that when it is greatest.

**Strain on Colliery Winding Ropes.** The Safety in Mines Research Board has recently issued Paper 78, "Measurements of the Kinetic Loads on Colliery Winding Ropes", by S. M. Dixon and A. M. Hogan. Prof. Dixon and his coadjutor have made use of an ingenious electrical recording strain gauge in order to measure the strain put on the winding rope of a colliery from time to time during the wind, and have compared this with records obtained by two different forms of accelerometer as part of the work of the Wire Ropes Research Committee. It is interesting to note that their results confirm those previously obtained by accelerometer and that the tension recorded in one of the winds with slack chains was two-and-a-half times the dead load.

**Isotopes of Lead.** The isotopic constitution of lead is interesting on account of the production of several isotopic leads by radioactive disintegration. Aston (*Proc. Roy. Soc.*, June) has examined the isotopic

constitution of lead from several radioactive minerals. In each case lead tetramethyl was used in the improved mass-spectrograph, and the abundance of the isotopes was estimated by photographic photometry. An experiment with a fairly pure specimen of thorium lead revealed that a line due to hydride was present to the extent of  $2\frac{1}{2}$  per cent and the corresponding correction was applied. The isotopes found were Pb 206, Pb 207 and Pb 208, and the abundance of these was estimated in uranium lead from Katango, thorite lead from Norway and lead from pitchblende from several other sources. In a specimen of 'ordinary' lead, isotopes were detected at 203, 204, 205, 206, 207, 208, 209 and 210. Most of these are comparatively rare.

**A Tentative Theory of Supra-Conductivity.** The electron theory of metals has as yet presented no picture of supra-conductivity. Frenkel (*Phys. Rev.*, June 1) has produced some suggestions in explanation of

this phenomenon. He shows that in a system of electrons moving together there will be considerable energy of mutual electromagnetic induction. The large momentum of such an organised system may allow it to resist the perturbations due to the heat motions of the crystal lattice. The author suggests that, at temperatures lower than a critical temperature, a state corresponding to such an organised motion may have lower free energy than the ordinary state of disorganised motion, and a spontaneous electric current therefore appears at these temperatures. When an external magnetic field is applied to a supra-conductor, the electrons move in large orbits and the supra-conducting body behaves as if it were strongly diamagnetic. The energy of the supra-conducting body is therefore increased by an external magnetic field and the imposition of such a field decreases the critical temperature at which the disorganised state becomes more stable than the organised. The author hopes to develop these ideas more fully.

### Astronomical Topics

**Perturbations of Minor Planets.** An extraordinary amount of computational work on the minor planets is carried out by German astronomers. Computations for 287 planets carried out by Dr. K. Boda of Frankfurt-on-Main, with some help from two other astronomers, have recently been published (*Astr. Nach.*, No. 5954-5). For most of the planets, time-intervals of one year suffice, but for nine planets that make fairly close approaches to Jupiter they are given for intervals of three months. One of the latter is 1036 Ganymede, which has an orbit of great eccentricity, so that it comes near the earth at perihelion and near Jupiter at aphelion.

These tables should be of great help in securing that the planets are kept under observation. There is now a systematic mapping out of the work of observation among different observatories, so that fewer planets get lost than was formerly the case, when things were left to chance.

**Penumbral Lunar Eclipses.** The "Nautical Almanac" has not followed a consistent line in regard to eclipses in which the moon enters the penumbra, but not the umbra, of the earth. It has occasionally given details of such eclipses, but more often it omits them. On the other hand, in the lunar eclipses that it does record, it gives the times of entering and leaving the penumbra, so it would seem that these should be given even when the umbra is not entered.

*L'Astronomie* for June contains a note by J. Ellsworth of Lyons, in which he shows that the loss of light in penumbral eclipses is capable of measurement. In the eclipse of March 12, 1933, he observed the loss of light at the moon's north pole with a Danjon photometer, obtaining the result 0.81 magnitude. The distance of the pole within the penumbra was 18.5'. He had also observed the eclipse of Sept. 14, 1932 and found that at a similar distance within the penumbra the loss of light was 0.79 magnitude.

There will be penumbral eclipses of the moon on August 5 (full moon at 7<sup>h</sup> 32<sup>m</sup> p.m.) and on September 4 (full moon at 5<sup>h</sup> 4<sup>m</sup> a.m.), but in both cases the moon will be low down in England.

When penumbral eclipses are included there must

be at least two lunar eclipses every year; in fact they become somewhat commoner than solar ones, instead of being considerably rarer.

**Secular Changes in the Brightness of the Stars.** Dr. E. Zinner of the Bamberg Observatory has recently published an article on this subject (*Astr. Nach.*, No. 5957). He takes the values of the magnitudes of the stars as given by Claudius Ptolemy about A.D. 137 and those given by Sufi about A.D. 964, and compares them with modern determinations. The stars are grouped by spectral type and also by absolute magnitude. They are divided into three magnitude groups. Supergiants with absolute magnitude brighter than 0.0; giants with magnitude between 0.0 and 3.0; dwarfs with magnitude fainter than 3.0.

The figures given below show the indicated change of magnitude in 100,000 years for the different groups; the minus sign indicates brightening; the figures in brackets after the change of magnitude give the number of stars in each group; the probable errors are given as 25 for a single star; 7 for a group of 14, 4 for a group of 39, and 2 for a group of a hundred or more; they are somewhat larger in the Sufi table, owing to the shorter interval.

Spectrum	Ptolemy			Sufi		
	Super-giants	Giants	Dwarfs	Super-giants	Giants	Dwarfs
O and B	- 4(149) +1(35)	..	-14(158)	+ 1(39)	..	..
A	+ 5(15) -1(185)	- 3(3)	0(16)	- 1(210)	+ 3(3)	..
F	-14(18) +2(59)	+ 8(39)	-21(19)	+ 2(64)	+14(42)	..
G	-11(28) -2(28)	+ 7(21)	-18(32)	- 3(30)	+ 5(22)	..
K	- 3(51) -1(161)	+11(8)	- 3(58)	+ 4(175)	+ 9(8)	..
M	- 9(23) +9(14)	-20(1)	- 3(27)	+16(14)	-10(1)	..

It will be seen that the results indicate a distinct tendency for the supergiants to become brighter and for the dwarfs to become fainter, while the intermediate group shows no marked tendency in either direction. These changes accord well with the usually accepted theories of star development, though opinions will probably differ as to whether the time intervals are long enough for much stress to be placed upon them. The author notes that some people think that Ptolemy took his magnitudes from Hipparchus, who preceded him by  $2\frac{1}{2}$  centuries. If this is so, the numbers in the Ptolemy table would need diminution by about one part in seven.

## Biology in Education

THE British Social Hygiene Council held its sixth Imperial Congress in the London School of Hygiene and Tropical Medicine on July 3-7. The Council, although not primarily concerned with methods within the schools, has recently taken an increasing interest in biological education. It has now established an Education Board corresponding to its Medical Board, both Boards being linked through administrative officers to the corresponding Government departments. The Education Board is under the chairmanship of Dr. W. W. Vaughan, and has sub-committees upon which teachers representing all types of education are serving.

The Congress gave an opportunity of calling into conference teachers representative of various parts of the Empire. Two sessions were devoted to education, biology and health (chairman: Prof. Julian Huxley), and the teaching of biology (chairman: Dr. Vaughan) respectively.

A review of the position of biology in the schools, given by Dr. W. K. Spencer, indicated the interest of the Board of Education. As regards the senior elementary school the Board's pamphlet advocates general science including biology. The pamphlet is being implemented by numerous courses taken by the Board's inspectors in various parts of the country and it is hoped that within a measurable period all children will have a serious course in science in the State schools. The interest in biological science was shown also by the speech of the Parliamentary Secretary to the Board (Mr. Ramsbotham) at the Congress dinner. In this, reference was made to the difficulties of the introduction of biology into secondary schools. A course in physics and chemistry in the school too frequently is followed by a similar course at the university. The inquiry into the First Schools Examination showed the necessity of placing some biology more securely in the secondary school curriculum. The Parliamentary Secretary also pointed out that a necessary consequence of the steps taken to secure economies in the Dependencies is the diminution of stimulus to a biological education because of a lack of careers. Further emphasis was laid upon the examination difficulty by the chairman of the Edinburgh Education Committee, who complained that the requirements for the examinations in Scotland make it exceedingly difficult to add further subjects to the curriculum. The Director of Education for Willesden pointed out that in general there is a welcome lack of rigidity in England. His experience showed that a course in chemistry and physics alone is not successful in the senior schools established by this Committee and the course is now being broadened. Representatives from South Africa pointed out that biology has for some time been a compulsory subject in the secondary schools there without detriment to the other portion of the curriculum.

The two secretaries of the Advisory Committee of the Colonial Office gave a joint paper upon the position of biology in the Dependencies. Their Committee has for some years devoted very considerable attention to the possibilities of biological teaching both as regards community health and the preservation of rural life. Following an original memorandum by Dr. W. K. Spencer and Prof. J. S. Huxley, a visit was paid to Africa by Prof. Huxley, and his conclusions and recommendations, after first

being examined by the Dependencies, are now under consideration by the Advisory Committee.

Mr. Richmond Wheeler of the Malay States gave a full and exhaustive account of the possibilities of biological education in a Dependency. This paper can usefully be read by all administrators who are concerned with this problem.

The debate which followed the papers was full of interest and it is very clear that the problem of using biological education to preserve the rural community is being worked out in several directions. Some English schools concerned in rural reconstruction have utilised their gardens to demonstrate selected pedigree strains. In the case of the Gold Coast, a similar school is showing the natives the advantages of selected English breeds both in poultry and cattle. Such is the eagerness of the natives that in spite of the fact that a common wage is about one shilling a day, they save until they can buy English cocks at the price of a guinea each. The cost is being lessened now by sending out sittings of eggs to be brooded by a native hen and allowing the owner the privilege of retaining a proportion of the chickens. The Education Officer from Fiji described boarding schools which are so far as possible self-supporting units. Generally, the account given of these native schools must have made the Colonial officers proud of the initiative shown in the Dependencies. Biology there, in places, is being brought into a very real and active association with human and social affairs.

There was a short discussion on sex education. The papers by Mrs. Neville Rolfe and Mr. Lee indicated that the Council is engaged rather in recording experiments in methods of approach than in propaganda—a very wise course.

Finally, those who listened to the papers read at this Congress must have been struck by the widespread sympathy which newer methods of education are evoking. A paper read by Dr. Drummond Shiels on "Administrative Attitude to Social Problems and Local Customs" at a general session of the Congress put forth the features which must characterise a newer philosophy of education. Dr. Shiels pointed out that the impact of Western civilisation upon native communities causes a demand for education which threatens danger to their established institutions and makes strict adherence to the ways of their fathers unlikely. No people can be shut up to contemplate merely their own past and their immediate present surroundings in a world which is changing and developing so rapidly as ours, and methods must be devised for developing talent for organisation and for impressing by practical methods the use and meaning of new ways of life.

Possibly it is the strangeness of the contact between civilisations which is making education in the Dominions overseas so alive. Ought we not in England to realise more fully that, in reality, our own civilisation possesses possibilities of change almost as marked as those of African civilisations? If so, ought not our science teachers to concentrate less on the technical advances within their own spheres of specialisation and take a greater part in educating for newer ways of living? If only the universities would stress more strongly both scientific history and philosophy in their science courses, they could not fail to produce administrators who would carry the world on a more determinate course.

### Educational Films

A SESSION of the recent Sixth Imperial Social Hygiene Congress was devoted to the discussion of modern aids to education, including the cinematograph film and wireless.

Mr. A. C. Cameron, secretary to the City of Oxford Education Committee, emphasised the great value of the film as an Imperial educational force. No single country can offer to cinematography so fruitful a field as the British Empire. Yet the field has as yet scarcely been explored. It is hoped that the formation of a British Film Institute, now regarded as assured, will help to satisfy these Imperial needs.

Mr. Cameron gave a brief summary of the steps leading to the decision to form the Institute, its constitution and its main objects. The Film Institute, co-operating with corresponding bodies in the Dominions, will arrange for the exchange of film material, which will prove of great value in conveying information on geography and agricultural processes and in presenting documentary records of life and customs in different lands. Especially important is the presentation, to the backward races in the care of the British dominions overseas, of films which worthily present our culture. The conception of white civilisation which such races, with their limited powers of discrimination, are receiving from third rate melodrama is regarded as an international menace. A stock of films not merely "Not undesirable" but "likely to be beneficial" for display in specified territories is needed. One essential step is the formation of a Colonial film library.

In this connexion an interesting experiment is proposed in Malaya. The investigator, furnished with a motor lorry equipment, would not only show films of an entertaining as well as an educational nature, but also would produce films of value to the study of anthropology. So far finance has proved a difficulty, but it is hoped that the Film Institute will enable this to be overcome.

A second paper, by Mr. F. S. Hoare, director of research in the Industrial and Educational Department of the Western Electric Co., Ltd., discussed in detail the value of films in education. The launching of the British Film Institute should serve to bring teachers and producers of films into contact. Excellent portable projectors, giving a clear picture 10 ft. wide at distances of 50-60 ft., are now available. Experiments with sound films conducted in schools in the Middlesex area have demonstrated their value, both in teaching definite lessons and as an exceptionally effective means of illustration. Of special value is the power of awakening interest characteristic of films, which seem destined to prove a great help in the education of retarded pupils.

Amongst subjects lending themselves specially well to treatment with films, history and geography, industrial processes, scientific and medical processes (revealed by slow motion photography), and social hygiene were mentioned. Relatively new fields are the use of slow-motion pictures to illustrate correct movements in games and sport and of the sound film to teach modern languages.

It is hoped that one immediate result of the work of the British Film Institute will be a large increase in the production of films specially designed for educational purposes and a speeding up of the machinery for distribution and exhibition.

### Surface Currents in the North Sea

A REPORT by Mr. John B. Tait of the Marine Laboratory at Aberdeen of the Fishery Board for Scotland (Fisheries, Scotland, Sci. Invest., No. 3; 1931) presents the results of a very detailed and painstaking cartographical analysis of the data accruing from certain large-scale experiments with surface floating drift-bottles carried out in 1911. Bottles were set afloat at positions selected to afford information concerning the surface water drift in the northern and middle areas of the North Sea and in the Faroe-Shetland Channel. Liberations were made in most months of the year.

The report in question, together with one which appeared somewhat earlier dealing with similar experiments made in 1910, and a third, wherein are to be found a statistical analysis and tabulated data relating to all such experiments carried out during five consecutive years immediately prior to the War, have added very greatly indeed to the body of knowledge on the subject.

Tait has shown conclusively that the North Sea receives a far greater access of surface water through the Shetland-Norway opening than via the Shetland-Scotland passages; that the belt of north-streaming surface waters along the Norwegian coast, representing the sole regular escape stream from the North Sea, may be of no greater width than some 50-60 miles; that there may be at times an actual exodus of water from the North Sea via the Scotland-Shetland passages; that incursion of surface waters through these latter passages is subject to occasional stoppage due to a temporary north-flowing stream up the east coast of northern Scotland which pushes on up the eastern side of the Orkneys and Shetlands. He has, as the outcome of observing periodicities in the incidence of strandings from the same liberations, on certain stretches of coast, been able to demonstrate the intervention of delaying agencies which have operated to keep bottles at sea for multiples of particular time intervals.

In this connexion, Mr. Tait has demonstrated the existence of large eddies in the surface waters of the areas concerned—some of them already known, and others now discovered for the first time. Changes in the situation, size, and shape of the largest of these, which he has named the Great Northern North Sea Eddy, are shown to be capable of bringing about a profound modification of surface water flow over a very wide area of the North Sea.

### University and Educational Intelligence

EDINBURGH.—The Senatus Academicus of the University of Edinburgh has resolved to confer the honorary degree of LL.D. on the following, at the graduation ceremonial to be held on October 28, on the occasion of the celebration of the 350th anniversary of the foundation of the University: the Right Hon. Lord Buckmaster, Mr. J. W. Dowden, president of the Royal College of Surgeons, Edinburgh, Sir James Colquhoun Irvine, principal of the University of St. Andrews, Prof. Emile Legouis, Sir Ewen John Maclean, the Right Hon. Sir James Ian Macpherson, Sir Frederick Norton Kay Menzies, Dr. A. W. Pickard-Cambridge, vice-chancellor of the University of Sheffield, Sir Robert S. Rait, principal of the University of Glasgow, the Right Hon. Lord



Rayleigh, Prof. William Rennie, Sir Edward Sharpey-Schafer, Miss Frances H. Simson, Sir George Adam Smith, principal of the University of Aberdeen, Dr. Robert Thin, president of the Royal College of Physicians, Edinburgh, and the Right Hon. William Johnston Thomson, Lord Provost of Edinburgh.

LONDON.—The Court has accepted with cordial thanks an offer made by the Royal Geographical Society of a set of reproductions of old maps.

The Rockefeller Foundation has made a grant of £4,000 for the reconstruction and equipment of additional laboratories of the Department of Physiology at University College, to accommodate expansion of Prof. A. V. Hill's work in biophysics.

ST. ANDREWS.—The University Court has appointed Dr. B. M. Wilson to be professor of mathematics in University College, Dundee, in succession to Prof. J. E. A. Steggall, retired. An exhibitor of Trinity College, Cambridge, Dr. Wilson was a Wrangler, and afterwards became a lecturer in mathematics at the University of Liverpool in 1920. He was advanced to the post of senior lecturer in 1926, and since 1931 has been in charge of the Department. His published work deals with the analytic theory of numbers, the theory of functions and of series, and the theory of integral equations. He holds the degree of D.Sc. of the University of Liverpool.

SHEFFIELD.—The following appointments, among others, have recently been made: Dr. L. B. Winter, demonstrator in physiology in the University of Manchester, to be lecturer in physiology; Mr. R. G. Bellams, to be assistant lecturer in mechanical engineering.

THE second award of the Brotherton research scholarship has been made to Mr. H. C. Millett, a student of the University of Leeds, who has just completed his B.Sc. degree course. The award will enable him to continue research work on the influence of sulphur compounds in furnace gases on the scaling of metals.

THE Science Scholarships Committee of the Royal Commission for the Exhibition of 1851 has made the following appointments to overseas scholarships for 1933, the subject and place of research being indicated in brackets: *Canada*:—on the recommendation of McGill University, Montreal: Dr. R. N. H. Haslam (physics, at the University of Leipzig); Dr. J. S. Tapp (physical chemistry, at the Imperial College of Science and Technology, London); on the recommendation of the University of Toronto: Mr. J. J. Rae (biochemistry, at the Lister Institute, London). *Australia*:—on the recommendation of the University of Adelaide: Mr. R. C. L. Bosworth (physics, at the University of Cambridge); on the recommendation of the University of Melbourne: Mr. E. H. S. Burhop (physics, at the University of Cambridge); on the recommendation of the University of Sydney: Mr. S. E. Williams (physics, at the University of Bristol or Durham). *New Zealand*:—on the recommendation of the University of New Zealand: Mr. E. R. Cooper (physics, at the University of Cambridge). *South Africa*:—on the recommendation of the University of South Africa: Mr. J. E. Vanderplank (mycology, plant physiology and plant chemistry, at an institution in Europe).

## Calendar of Nature Topics

### Curious Feeding Habit of Grebes

In July most of the grebes' eggs in Great Britain will have hatched and adults and young will offer opportunity for fuller observation of a grebe habit about which much doubt exists. The stomachs of grebes almost always contain masses of feathers, and these feathers are often swallowed during the process of preening. But the swallowing is deliberate, and its possible purpose has given rise to many suggestions: that the feathers protect the walls of the stomach from sharp fish bones; that they prevent the passage of large undigested fragments into the intestine; that they retain small organisms in the stomach until they are digested; that they supply some chemical useful in digestion, and so on.

There is something to be said for the idea that the feathers may be used in making up pellets, along with indigestible fragments of food, which the bird will reject as casts, like those of birds of prey. On this point Dr. Josef Jirsik has collected evidence (*Bull. école sup. agron., Brno, p. 1, 1929*). Where only small insects occurred in the stomachs examined, very few feathers were found; where remains of fishes or of large insects, such as *Dytiscus*, were present, recently swallowed feathers were many, and in the stomach hard indigestible remains were felt together with feathers, although no trace of such appeared in the intestine. Finally, with the aid of a binocular telescope, Jirsik observed adult grebes making vomiting motions like those made by herons, as if they were actually rejecting 'casts' of food debris. On the other hand, the authors of the "Great Crested Grebe Enquiry of 1931" state that "there is no evidence at all of pellet formation". July is a good month to settle this problem of pellet formation by direct observation.

### Another Grebe Problem for July

Even very young grebes are found to contain feathers in their stomachs; the feathers, however, are not their own, but those of the parent birds. How are the feathers obtained? Messrs. Harrison and Hollom 'have seen a four-day chick given fourteen feathers in one day' (*British Birds, 26, p. 149, 1932*). Jirsik examined a chick still covered solely with down, and still containing yolk from the egg in its intestine; it was only a few hours old, yet it contained 13 adult feathers. Another chick from the same family, several hours older, contained 93 feathers; and three others, successively older, had each proportionally more feathers, all from the plumage of the mother. But whenever feathers begin to appear amongst the down of the chicks, as Jirsik found by examining three July coveys, these feathers are to be found in the stomachs of the chicks, plucked and swallowed by the chicks themselves. He insists that the parental feathers also have been plucked from the parent even by the very young chicks, although he offers no direct evidence, other than the statement that sometimes the feathers are from parts of the body which the parent cannot reach with its beak. The young, at any rate, have many opportunities of obtaining adult feathers, for a considerable proportion of their youth is spent huddled upon the back of the swimming parent. Although feather-swallowing in the adults is often associated with

preening, it is a process not confined to the casual swallowing of loose feathers, for fragments of skin are sometimes attached to the shaft, suggesting that the feather has been deliberately plucked out.

#### An Early Harvest

Looking through the field notes relating to ninety years of wheat growing on the Broadbalk field at Rothamsted, we find that in 1868 the wheat on certain of the more forward plots was cut on July 22 and was safely in the stack by July 25. These are the earliest dates on record in the long series. The yields in that year were better than usual; the plots receiving a complete and generous application of artificials gave  $46\frac{1}{2}$  bushels of dressed grain per acre, or about thirty per cent more than the average.

The characteristics of the season were unusual heat and drought in the summer months; May, June and July together had only 1.47 in. of rain. On the heavier types of soil in England, such seasons provide good standing crops of winter corn early to harvest and ready if necessary to thresh from the field. Examination of the Broadbalk yields in relation to rainfall has shown that the normal rainfall of about 27 in. is in excess of the requirements of the crop. The dry years are the good years for winter corn on typical wheat land and the resulting early harvest gives an opportunity for autumn cleaning the stubbles, and puts the winter ploughing well forward. These secondary advantages of an early harvest are not easy to evaluate, but their effects often make themselves felt throughout the following year.

#### Silage

Numerous tower silos in the eastern counties of England will now be receiving their yearly charge of green fodder to be preserved for winter feeding. The idea of the conservation of green stuff in a fresh and succulent condition is by no means new; for so early as 1843 there is in the *Transactions of the Highland and Agricultural Society of Scotland*, a full description of the German practice of ensiling grass and fodder crops in air-tight excavations.

In 1876 the idea of making silage in towers instead of in pits spread to the United States, where maize silage rapidly became an essential part of livestock husbandry. A succession of wet summers in the early 'eighties then brought the subject into prominence in England as an alternative to hay-making, and a careful study of the process was made at Rothamsted in 1884. Farmers were slow to adopt the new procedure at this time and when a sequence of better summers set in in 1887, interest in silage was lost. In recent years silage has again come into prominence in an attempt to reduce the area under the expensive root crop and to provide a substitute for hay-making in wet districts. With the better understanding of the chemical and biological changes at work in the silo, and the nature and extent of the inevitable losses during manufacture, farmers now have a close control of the product.

The question of fodder preservation has not yet reached its final solution, and many modifications of the ordinary procedure are being tested, particularly in relation to the conservation of the herbage of grassland; for in grass we have a fodder of the highest feeding value and one that can be produced at minimum cost.

## Societies and Academies

### LONDON

Geological Society, June 14. S. I. TOMKEIEFF and C. E. MARSHALL: The Mourne Dyke swarm. This swarm, represented by approximately 130 dykes exposed along the shore between Newcastle and Kilkeel, Co. Down, stands in striking contrast with other dyke swarms of Tertiary age in north-east Ireland. While the dykes of the latter swarms are mainly represented by the crinaitic olivine-basalt types, in the Mourne swarm the olivine-bearing basalts are definitely in the minority, and even so contain only relicts of serpentinised olivine. The Mourne dykes can be classified broadly into four principal groups arranged as follows according to their order of intrusion, namely, olivine-bearing basalts, olivine-free basalts, intermediate types, and acid types. LESLEY S. ROBERTSON: A report on some fossil plants collected in Tanganyika Territory. Certain fossil plants collected by Mr. G. M. Stockley in the Karroo formation of Tanganyika comprise *Glossopteris* fronds and equisetaceous stems. Among the former are several fragments from the Kidodi area; those with a wide-meshed venation and a clear midrib are identified as *Glossopteris conspicua* Feistmantel, and those with narrow, elongated meshes are identified as *Glossopteris indica* Schimper. One fragment with no definite midrib is possibly an intermediate type between *Glossopteris* and *Gangamopteris*. The equisetaceous stems are pith-casts in a carbonaceous mica-shale from the Rufiji-Ruaha area. The nodes and ribbing are distinct; as no leaf sheaths are present, the genus cannot be identified.

### DUBLIN

Royal Dublin Society, April 25. PHYLLIS CLINCH and J. B. LOUGHNANE: A study of the crinkle disease of potatoes and of its constituent or associated viruses. The mosaic disease obtained by needle inoculation from crinkle-infected President to healthy President potato resembles the naturally-occurring Arran Victory mosaic (or simple mosaic) in its reactions on various solanaceous hosts, but the symptoms which it produces are more intense. In tobacco it causes vein-clearing and ringspot and in *Datura* a mosaic frequently accompanied by necrotic lesions. On needle inoculation to potato (var. Arran Crest) it causes a lethal acronecrotic streak. When combined by grafting with virus A from Irish Chieftain, typical crinkle is reproduced. The aphid, *Myzus persicae*, selectively transmits a virus from crinkle which causes a diffuse veinal mottle in healthy President, a lethal necrosis in British Queen and Up-to-Date and green veinbanding in tobacco. In combination with the mosaic disease derived from crinkle by needle inoculation to healthy President, this aphid-borne virus produces crinkle. It has been identified with virus A which occurs naturally in Irish Chieftain. Interveinal mosaic is inoculated by needle to tobacco, *Datura* and *Nicandra physaloides*, in all of which it causes symptoms of the mottle and ringspot type. REPORT OF THE IRISH RADIUM COMMITTEE FOR THE YEAR 1932. 14,820 millicuries of radon were issued during the year for therapeutic purposes. Reports from some of the largest users give particulars of the results of treatment of 499 cases of malignant, and 169 cases of non-malignant disease. Many satisfactory results are recorded in both sections.

## EDINBURGH

Royal Society of Edinburgh, June 5. H. GRAHAM CANNON: On the feeding mechanism of certain marine ostracods. *Asterope* is a perfect filter feeding ostracod. The maxillule forms a close-meshed filter; a current is sucked through this by the oscillation of the vibratory plate of the maxilla working against the stationary first trunk limb; the hinder part of the latter acts as a valve allowing only a passage of water posteriorly. The residue obtained is scraped off the filter by comb setae on the main axis of the maxilla and passed on to the endites of the maxillules which then push the food upwards into the mouth. *Cytherella* filters in a similar manner but uses different limbs for the same processes; the filter is mandibular, the scraper and current producer are maxillary. A. C. STEPHEN: Studies on the Scottish marine fauna: quantitative distribution of the echinoderms and the natural faunistic divisions of the North Sea. The bulk of the echinoderm population was made up of species belonging to the genera *Ophiura*, *Amphiura* and *Echinocardium*. The density of the echinoderm population was usually less than that of the lamelli-branch population and the distribution of the dominant species of echinoderms did not coincide with the obvious moluscan zones. The community notation is therefore considered not very useful and that of zones is suggested instead. It is suggested that the molluscs, especially the lamelli-branches, be used for dividing up the North Sea into its major zones. EMILY DIX: The sequence of floras in the Upper Carboniferous with special reference to South Wales. Through the researches of Kidston, Davies and other workers, the flora of the Upper Carboniferous of South Wales is now well known. The succession of strata too is more complete than that of any other coalfield in Britain; the author has established the occurrence of rocks of lower Stephanian age. Nine floral zones have been recognised in the Swansea district, and their presence has been noted in other parts of the coalfield, while most of them are represented in other coalfields in Great Britain. These floral divisions compare closely with those established on the Continent. THOMAS NICOL: Studies on the reproductive system in the guinea-pig. Variations in the oestrous cycle in the virgin animal, after parturition, and during pregnancy. The author gives an analysis of 368 oestrous cycles from forty-four animals. The chief results are (1) confirmation of a 16-18 day cycle; (2) the normal variation is one or two days; (3) a long or short cycle may be inter-polated; occasionally a cycle is missed; (4) sometimes the rhythm is irregular; (5) the first cycles at puberty may be of normal length or prolonged, then the regular rhythm establishes itself abruptly; (6) in suckling animals the first post partum cycles may be irregular; (7) no seasonal variation was found at a fairly uniform temperature; (8) oestrous signs may be observed during pregnancy. IAN SANDEMAN: The mathematical representation of the energy levels of the secondary spectrum of hydrogen. The representation of the energy terms fixing the band spectrum of a diatomic molecule has attracted much attention, but special difficulty arises in the application of theory to the spectrum of the hydrogen molecule. A semi-empirical formula of a fairly simple type is suggested and this is found to represent the terms of all the simpler states of the visible spectrum of hydrogen with considerable accuracy. An extension

of the formula is suggested for other states and this is found to give satisfactory agreement with the results of observation. M. S. BARTLETT: On the theory of statistical regression. An analysis is carried through of the joint distribution of second order moment statistics in a normal system, and a summary is made of the chance distributions required in the theory of regression in connexion with the sampling errors and tests of significance of regression coefficients. A generalised partial distribution, to indicate the minimum assumptions necessary for these various distributions and tests to hold, is derived. Remarks are made on the test of goodness of fit, and on the accuracy of estimated regression coefficients.

## PARIS

Academy of Sciences, June 6 (*C.R.*, 196, 1705-1752). ARMAND DE GRAMONT: The movements of a quartz crystal in an electrostatic field. A description of two methods by means of which a quartz crystal can be set in rapid rotation in an electrostatic field. LUCIEN DANIEL: The graft of *Allaria* on the cabbage and its descendants. E. J. GUMBEL: The mean error and the arithmetical mean. The mean age of the living and the mean age at the moment of death. ARNAUD DENJOY: The multipliable balanced variables of Cantelli. J. LE ROUX: The incompatibility of the Riemann conception of space with the principle of relativity. L. SACKMANN: The variation of the angle of separation as a function of the regime of flow. EMILE MERLIN: The problem of two bodies with decreasing mass. A. DANJON: A new interference micrometric method applicable to the satellites of Jupiter and to double stars. L. GOLDSTEIN and Y. ROCARD: The paramagnetism and the magnetic double refraction of gaseous and liquid oxygen. M. SCHÉREER and R. CORDONNIER: The magnetic circular dichroism of aqueous solutions of cobalt sulphate and nitrate. A. HAUTOT: The structure of the  $K$ -spectrum of the very light atoms. A. LÉAUTÉ: The evaporation and oxidation of [road] coverings made from coal tar. The losses by evaporation of coal tar were found to be much greater than would have been expected from the fractional distillation results. The addition of carbon or mineral filler reduced this loss and rendered the resulting coating less brittle. F. FRANÇOIS and MLE. L. DELWAULLE: The direct formation of bismuthyl iodide by the combination of bismuth oxide and iodide. Its dissociation by heating. The formation of BiOI by the interaction of bismuth iodide and oxide is reversible: at 620° C. the bismuthyl iodide is completely decomposed into its constituents. G. ARRAGON: Two acetyl derivatives of sorbose. A description of the preparation and of the physical and chemical properties of pentaacetyl-sorbose and tetracetylsorbose. G. DEDEBANT: Barometric evolution. An analytical study of the daily isobar charts shows that the total field of barometric pressure represents the superposition of a stable field and a field of disturbances. A mathematical study of the latter is given. ANDRÉ DAUPHINÉ: The presence of protein materials in the pecto-cellulosic membrane. The Derrien and Turchini method (absorption of tannin) gives positive and constant results for proteins: objections to this method are stated and discussed, but the author regards the presence of proteins as proved. MLE. MARGUERITE COZIC: Oxidations and reductions determined by *Acetobacter xylinum*. Evidence is given that the two phenomena, oxidation in the

presence of oxygen and oxido-reduction under anaerobic conditions, are independent. A. STOLL and W. KREIS: The initial digitalic glycosides. From the experiments described it is concluded that crystallised digitaline, gitoxin and digoxin result from the action of an enzyme. P. MATHIAS and M. L. BOULLE: A larva of *Chironomide*, parasitic on a mollusc. LISBONNE and SEIGNEURIN: The electrophoresis of *Brucella*. *Brucella* of different origins (man, cattle, sheep) can be differentiated by their electrophoretic mobility: the experimental results in proof of this are summarised in graphical form. The question as to the possibility of a relation between the electrophoretic mobility and their pathogenic virulence is being proceeded with. PH. LASSEUR, M. LLES, A. DUPAIX and L. GEORGES: Observations on the fixation of colouring matters by microbial bodies as a function of the pH.

## VIENNA

Academy of Sciences, Feb. 16. PAUL LUDWIK and JOSEF KRYSSTOF: Influence of 'pre-stretching' [of steel] on the permanent strength.

Feb. 23. BERTA KARLIK: Luminescence method for investigating the range of  $\alpha$ -rays. By measuring the luminescence excited in a zinc sulphide screen by a pencil of  $\alpha$ -rays, it is possible to determine whether the radiation is non-homogeneous as regards range and especially whether it contains discrete range-groups. BERTA KARLIK and ELISABETH RONA: Investigations on the range of the  $\alpha$ -rays of actinium X and its products by the luminescence method. In general, the results obtained agree satisfactorily with those of other observers. MARIA RENATA DEINLEIN: Persistence of the radium emanation (radon) of water in the human body. When radon-containing water is drunk, the emanation leaves the body almost quantitatively in a few hours by the breath, but when powdered charcoal is taken with the water, about one-half of the radon remains in the body until it is discharged with the charcoal. ALEXANDER TORNQUIST: Mineralisation and migration of gold in the ores of the Upper Tauern lodes. EBERHARD CLAR: Age and position of the Eggenberg breccia at Graz. HANS HAHN: Separable magnitudes. ARTUR WINKLER-HERMADEN: Newer tertiary deposits at the north-east spur of the Central Alps and its southern border. HERBERT HOLLER, FRANZ KAHLER and EMIL TSCHERNIG: The system of the lead-zinc ores in the Bleiberg district and in the Karawankens. ERICH HABERFELNER: (1) The age of the ores of the Hüttenberger ore-mountain, Carinthia. (2) Geological maps in the vicinity of the Eisenerz ore-mountain. FRANZ PALM: Application of Maclaurin's transformation in graphic calculation. PETRU M. SUSTER: (1) Fore-leg regeneration after extirpation of the ganglia in *Divippus* (= *Carausius*) *morosus* Br. et Redt. (2) Fore-leg regeneration after extirpation of the ganglia in *Sphodromantis bioculata* Burm. VIKTOR OBERGUGENBERGER: The possibility of the photometric evaluation of extra-focal photographs with the reflecting telescope.

## Forthcoming Events

PHARMACEUTICAL SOCIETY OF GREAT BRITAIN, July 24-27. British Pharmaceutical Conference to be held in London. J. Keall: President.

## Official Publications Received

## GREAT BRITAIN AND IRELAND

Air Ministry: Aeronautical Research Committee: Reports and Memoranda. No. 1510 (T.3274a): Turbulence in the Wake of a Body. By A. Fage. Pp. 7+6 plates. 6d. net. No. 1511 (T. 3296): Effect of Turbulence on Drag of Airship Models. By Hilda M. Lyon. Pp. 28+27 plates. 1s. 9d. net. No. 1516 (T. 3315): Some Possible Advantages of a Variable Pitch Airscrew. By W. G. Jennings. Pp. 25+8 plates. 1s. 3d. net. No. 1523 (A. 83. 93): Abstract, Inter-crystalline Corrosion of Duralumin. By A. J. Sidery, K. G. Lewis and H. Sutton. Pp. 3. 3d. net. (London: H.M. Stationery Office.)

Research Defence Society. Annual Report of Committee and Hon. Treasurer's Report, 1932-33. Pp. 8. (London: Research Defence Society.)

Quarterly Journal of the Royal Meteorological Society. Vol. 59, No. 250, July. Pp. ii+201-286+plates 3-5. 7s. 6d. Vol. 59, No. 251: The Phenological Report 1932. (Forty-second Report.) Pp. 287-340. 3s. (London: Edward Stanford, Ltd.)

The Proceedings of the Physical Society. Vol. 45, Part 4, July 1, No. 249. Pp. iv+493-623. (London: Physical Society.) 7s. net.

Journal of the Chemical Society. June. Pp. iv+557-740+viii. (London: Chemical Society.)

Air Ministry: Aeronautical Research Committee: Reports and Memoranda. No. 1506 (Strut 110): Theory of Loss of Lateral Control due to Wing Twisting. By Dr. H. Roxbee Cox and A. G. Pugsley. Pp. 11+3 plates. 9d. net. No. 1515 (T. 3287): Spinning of a Bristol Fighter. By A. V. Stephens. Pp. 22+18 plates. 1s. 3d. net. No. 1518 (T. 3341): Present Position of Investigation of Airscrew Flutter. By Dr. W. J. Duncan and A. R. Collar. Pp. 44+8 plates. 2s. net. No. 1525 (I.C.E. 822): Abstract, Detonation, Spark-Plug Position and Engine Speed. By R. O. King and H. Moss. Pp. 2. 2d. net. (London: H.M. Stationery Office.)

Northern Naturalists' Union. Transactions, Vol. 1, Part 2, 1932. Pp. 79-138. (Alnmouth.) 4s.

Department of Scientific and Industrial Research. Building Science Abstracts. Vol. 6 (New Series), No. 5, May. Abstracts Nos. 770-962. Pp. 145-184. (London: H.M. Stationery Office.) 1s. 6d. net.

## OTHER COUNTRIES

Field Museum of Natural History: Department of Anthropology. Guide, Part 2: Archaeology of North America, Hall B (Ground Floor). By Paul S. Martin. Pp. 122+8 plates. (Chicago.) 50 cents.

Ministry of the Interior, Egypt: Department of Public Health. Research Institute and Endemic Diseases Hospital: First Annual Report 1931. Pp. ii+15. (Cairo: Government Press.) 10 P.T.

Mémoires du Musée Royal d'Histoire Naturelle de Belgique, Hors Série. Résultats scientifiques du Voyage aux Indes orientales Néerlandaises de LL. AA. RR. le Prince et la Princesse Léopold de Belgique. Publiés par V. Van Straelen. Vol. 4, Fascicule 4: Coleoptera I. Pp. 194. Vol. 4, Fascicule 5: Hymenoptera I. Pp. 59. Vol. 4, Fascicule 6: Lepidoptera I. Pp. 99. Vol. 4, Fascicule 7: Diptera I. Pp. 38. (Bruxelles.)

Annuaire de l'Académie Royale de Belgique. 1933-1C. Pp. 198. (Bruxelles: Maurice Lamertin.)

University Observatory, Oslo. Publication No. 6: Height and Velocity of Luminous Night-Clouds observed in Norway 1932. By Carl Stormer. Pp. 45+10 plates. (Oslo: A. W. Broggers Boktrykkeri A.-S.)

U.S. Department of Commerce: Bureau of Standards. Research Paper No. 544: The Preparation and Crystallization of Pure Ether-Soluble Rubber Hydrocarbon; Composition, Melting Point and Optical Properties. By W. H. Smith, Charles Proffer Saylor and Henty J. Wing. Pp. 479-492. (Washington, D.C.: Government Printing Office.) 5 cents.

Tables of Rainfalls in Queensland: being a Monthly and Yearly Summary of Rainfalls registered by 159 Recording Stations throughout Queensland over the whole period during which Records have been kept. Prepared by Inigo Jones. Pp. 168. (Brisbane: Government Printer.)

Seasonal Forecasting: Meteorology as a Branch of Astronomy. By Inigo Jones. Pp. 16. (Brisbane: Queensland Producer Pty., Ltd.)

Canada: Department of Mines: Geological Survey. Summary Report 1932. Part A1. (No. 2331.) Pp. 151. Summary Report, 1932. Part A2. (No. 2333.) Pp. 197. Summary Report 1932. Part B. (No. 2329.) Pp. 107. Summary Report 1932. Part C. (No. 2332.) Pp. 127. Summary Report 1932. Part D. (No. 2330.) Pp. 81. Memoir 170: Studies of Geophysical Methods 1930. (No. 2313.) Pp. v+118. 20 cents. (Ottawa: Acting King's Printer.)

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