NATURE

SATURDAY, SEPTEMBER 29, 1928.

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Editorial and Publishing Offices :

MACMILLAN & CO., LTD.,

ST. MARTIN'S STREET, LONDON, W.C.2.

Editorial communications should be addressed to the Editor.

Advertisements and business letters to the Publishers.

Telephone Number: GERRARD 8830.

Telegraphic Address: PHUSIS, WESTRAND, LONDON.

No. 3074, Vol. 122]

Our National Collections.[1]

IT is evident that the Royal Commission on National Museums and Galleries has been deeply impressed by the urgency of the needs of these institutions. It has followed the unusual course of publishing an interim report while its deliberations still have to assume their final form. The Commission was appointed by Royal Warrant on June 1, 1927. It consisted of Viscount D'Abernon (chairman), the Hon. Evan E. Charteris, Sir Thomas Heath, Sir Lionel Earle, Sir Richard Glazebrook, Sir George MacDonald, Sir Courtauld Thompson, Sir Martin Conway, Sir Henry A. Miers, and Dr. A. E. Cowley—a strong and representative body, competent to deal with the many sides of a complicated problem.

The terms of reference were indeed wide. They covered the legal position and administration, accommodation, structural condition, and cost of maintenance of nineteen institutions, of which five are Scottish and situated in Edinburgh, while the remainder are in London. The Commission was asked, further, to report on the existing conditions of the collections, their probable rate of growth and consequent increase in expenditure, the possibility of economy and the desirability of imposing admission fees : whether congestion could be relieved by methods other than of building, such as sale, gift or loan, the desirability of change in the Copyright Acts, the question of placing the collections under a central authority, the effect of benefactors' bequests as a restriction on suitable and scientific arrangement and on allocation to appropriate museums ; and, finally, to make suggestions generally which might offer themselves as pertinent in the course of the inquiry.

The Commission, up to the date of the publication of its report, had held twenty-seven meetings and had received evidence orally or by memorandum from the national institutions named in the terms of reference, from a large number of representative societies and institutions, from foreign governments, and from private individuals. A part of this evidence has been printed and is presented in a separate volume simultaneously with the report. Much of the material is of the greatest value, as will become more apparent when the final report, which must deal with a number of controversial questions, has been issued. The interim report deals only with the question of accommodation, present and future—a matter upon which there cannot be two opinions on the main

[1] Royal Commission on National Museums and Galleries. Interim Report. Pp. 64. (London: H.M. Stationery Office, 1928.) 2*s*. net.

issue, however much difference there may be as to detail.

Before dealing with its main topic the report reviews the national collections as a whole, and recapitulates the history of each. In this connexion two points in particular are stressed—their enormous value and the extent to which the nation is indebted to the private benefactor.

While recognising that financial value represents a narrow point of view, and that any trustworthy estimate of the whole of the national collections is in effect impossible, it is pointed out that one of the smaller London collections alone has been estimated to contain treasures worth £15,000,000. Yet, from the inception of each of these institutions until the present day, the total grants in aid of purchases have not exceeded £5,000,000. As compared with other social services, the growth of these institutions has been severely checked, and economy has been pushed beyond the point of prudent administration. The Commissioners think there has perhaps been a tendency to take the national collections as a matter of course without any attempt to make the public aware of their quality and character. In too many cases they are housed and exhibited unworthily of their dignity and importance.

When the Commission had under consideration the question of accommodation and its relation to the growth of the collections, it was not dealing with a question that had not previously been considered. It is of course generally known that for some time past the large national institutions in the London area have had under consideration schemes for enlargement, involving very considerable expenditure. Both the National Gallery and the National Portrait Gallery have vacant spaces upon which it is proposed ultimately to expand. Elaborate plans have been prepared for the enlargement of the British Museum, and the newspaper section of the library has been removed to Hendon. The Commission has taken these plans into account, but it offers alternative suggestions which, while making provision for expansion for the next fifty years at an estimated cost of £779,000, would effect a saving on the projected schemes of at least £800,000.

The most serious problem is of course the British Museum, and it is to a great extent for this reason that the Commission has been asked to advise on the desirability of alteration of the Copyright Acts. It is estimated that additions to the British Museum Library involve the provision of one mile of shelving per annum. The Commissioners are fully alive to the danger of one suggestion, namely, that not all accessions should be preserved: they point out that not only is it difficult to decide that any individual item is not likely to be required, but also the task of selection would require a skilled staff which would absorb the proceeds of any economies thus effected.

One problem connected with the British Museum, which from an imperial point of view is even more serious, obtains merely an incidental reference in the interim report, and is left for fuller consideration later. This is the question of the ethnographical collections. The Commission quotes with approval from the Memorandum of the Council of the Royal Anthropological Institute, in which is emphasised "the fact that the present position of ethnography in the National Museums of London is a grave reproach to our standing among other nations," and it is further remarked that "this subject is given less attention in the capital city of the British Empire than it is in countries which have far fewer responsibilities or even none at all towards uncivilised or alien peoples."

This question is one upon which much could be said, and, in view of the public interest likely to be aroused by this report, one upon which more perhaps should have been said at this stage. The provision of an adequate imperial ethnographical museum is largely a matter of arrangement and of the space which such arrangement requires. We have ample material for initiating such a museum, and although the time has passed when specimens of the material culture of primitive peoples could be bought for a song, it is still possible to add to our collections and to fill gaps at no excessive cost. Nor is it desirable that these collections should be regarded solely as an exhibition demonstrating the curious customs of primitive peoples or as material for the research student. The public should be made to realise that it is not merely an academic question that in London, at any rate, there is no adequate museum for practical demonstration in the teaching of anthropology—a subject which is essential for the training of the young administrator who will be sent out to govern the peoples in the different parts of the Empire whose culture is exemplified in the British collections. The cost of providing such a museum will be heavy; but it must be faced.

The report deals with the needs of the Natural History, Science, and Geological Museums, but its recommendations as to these institutions must be reserved for consideration in a further article.

Intelligible Philosophy.

The Analysis of Matter. By Bertrand Russell. (International Library of Psychology, Philosophy and Scientific Method.) Pp. viii + 408. (London: Kegan Paul and Co., Ltd.; New York: Harcourt, Brace and Co., Inc., 1927.) 21*s.* net.

An Outline of Philosophy. By Bertrand Russell. Pp. vi + 317. (London: George Allen and Unwin, Ltd., 1927.) 12*s.* 6*d.* net.

The Nature of Existence. By Dr. John McTaggart Ellis McTaggart. Vol. 2. Edited by Dr. C. D. Broad. Pp. xlvii + 480. (Cambridge: At the University Press, 1927.) 30*s.* net.

MR. RUSSELL'S books are always a pleasure to read, perhaps because they have been a pleasure to write. The "Outline of Philosophy" is even pleasanter than most of his philosophical works, and gives also the completest account of his views. A considerable part is essentially a summary of the "Analysis of Matter" and also of the "Analysis of Mind" published a few years ago. On the whole, the summarising process has been an improvement; though some valuable discussion of recent physical theory is to be found only in the "Analysis of Matter."

Mr. Russell follows the British tradition; his method of approach to problems is like the "plain historical method" of Locke. He starts by asking, What is man considered from the outside, as an organism capable of perceiving and acquiring knowledge about his environment? Then he considers the general character of that knowledge, that is to say, the conceptions of theoretical physics. Lastly, he returns to the study of the human mind, but considered this time from inside, asking, What is it like for me to perceive and have knowledge about my environment?

Mr. Russell seems at his best when he is most insular, and least happy when he seeks inspiration across the Atlantic. The discussion, in the first part of the book, of the working of the mind from the behaviourist point of view, might have been better had he been concerned less exclusively with Prof. J. B. Watson's views. This may be a minor point; the trouble seems more serious when he comes to his main conclusion, to which he gives the name 'neutral monism' and which he says originated with certain recent philosophers of Cambridge, Mass. The conclusion, put briefly and crudely, is this. Modern developments of physics have eliminated the mechanical universe of matter in motion assumed in scientific tradition since Descartes. In its place we have a universe of 'events,' of spatio-temporal durations, out of the abstract relations of which scientific knowledge is constructed. Physics tell us about certain logical characteristics of structure belonging to the constituents of the physical world, but nothing about their intrinsic character, which might be anything. On the other hand, in sense experience what we are aware of are just mental events. Starting from opposite ends, theoretical physics and introspective psychology reveal as primary only physical events and mental events; two sets which form a causally connected whole. There is no reason, Mr. Russell says, to suppose that the two sets are really quite distinct. What we call mental and what we call physical may be two ways of speaking about one sort of stuff which is neither one nor the other, but 'neutral.'

This 'neutrality' savours rather of the neutrality of nations whose neighbours are at war. It is likely to be weighted on the mental side, which on this theory has a certain priority, since it is all we are immediately acquainted with. The physical world, according to Mr. Russell's confession, is a precarious inference from experience. He admits that his belief in it and his repudiation of solipsism are based solely upon animal faith. The theory, though doubtless ably supported by Harvard, is astonishingly like one that appeared nearer at home, at Trinity College, Dublin, two hundred years ago. It is Berkeley's theory without God, an omission the good Bishop would have deplored. Nevertheless, if Berkeley was wrong, Mr. Russell can scarcely be right, and he need not look to his Bostonian friends for help. It is possible that they are all of them right (where they agree); and if they err, undoubtedly they err in good company.

Mr. Russell differs from Berkeley in important respects, notably those on which he bases his claim to neutrality. It is here that the gravest difficulties appear. To take one point, he says:

"When we have a percept, just what we perceive (if we avoid avoidable sources of error) is an event occupying part of the region which for physics is occupied by the brain." Seeing a green leaf "consists of the existence in the region occupied by our brain of a green patch causally connected with the leaf, or rather with a series of events emanating from the place in physical space where physics places the leaf. The percept is one of this series of events differing from the others in its effects owing to the peculiarities of the region in which it occurs—or perhaps it would be more correct to say that the different effects *are* the peculiarities of the region." ("Outline," p. 292.)

An obvious difficulty is the location of a percept in physical space. Physical space is presumably a logical construction, constructed from perceptual spaces which consist of perceptual events and their relations; therefore assertions about location in physical space are of a different logical type from assertions about the locations of percepts in perceptual space. At first sight, then, the statement that a percept is anywhere in physical space seems to be merely a metaphor; just as it is a metaphor to say I have money in the bank if I use the words in the sense in which I say literally that I have money in my pocket. The difficulty may possibly be purely verbal, but even if it is, a correct form of statement is needed.

A further difficulty suggests itself. If a perceptual event is located in physical space, why is the brain specially privileged to be its situation? The relevant physical process consists of the whole causal series of events beginning with those emanating from the place where the object is and going on to a practically endless series of events in the body of which the contemporary events in the brain are only a part and are seldom if ever the last terms, for the whole bodily reaction must be included in the series. When we see a green leaf bodily reaction is not conspicuous, and Mr. Russell's statement is plausible. If he substituted a tiger, the defects of his treatment could be seen. In ordinary speech, we say we run away because we see a tiger; it would be more correct to say we see a tiger because (among other things) we run away. If the green patch we see, or the striped patch if it is a tiger, can be said to be in the brain, may it not equally well be said to be in the whole spatio-temporal volume of causally related events both inside and outside the body? Mr. Russell makes a suggestion ("Analysis," p. 259) that might lead to a view of this sort, but does not develop it. The problems raised by Mr. Russell cannot, of course, be properly discussed here, but perhaps enough has been said to show that his treatment is, as is usual with him, both novel and interesting.

The late Dr. McTaggart's book is the second volume of his chief philosophical work, left in a state very near completion at his untimely death. His philosophy is likely to appear as 'caviare to the general,' but some will appreciate his curiously individual and compact system of thought. Many more will appreciate his vigorous but sympathetic criticism of the views of others. Dr. McTaggart's development of his theory has something of the character of Greek tragedy, fantastic as seen from outside its circle of ideas, but inevitable as seen from within. His style is admirable, dry but clear. From his editor we learn that he always made five complete drafts of his work before considering it ready for publication. *O, si sic omnes!*

A. D. R.

Strength of Materials.

(1) *Strength of Materials: a Textbook covering the Syllabuses of the B.Sc. (Eng.), A.M.I.C.E., and A.M.I.Mech.E. Examinations in this Subject.* By Dr. F. V. Warnock. (Engineering Degree Series.) Pp. ix+366. (London: Sir Isaac Pitman and Sons, Ltd., 1927.) 12*s.* 6*d.* net.

(2) *Mechanics of Materials.* By Prof. George Young, Jr., and Prof. Hubert Eugene Baxter. (Engineering Science Series.) Pp. viii+451. (New York: The Macmillan Co., 1927.) 17*s.* net.

(3) *Examples in the Strength and Elasticity of Materials.* By G. W. Bird. Pp. 196. (London: Edward Arnold and Co., 1927.) 10*s.* 6*d.* net.

THE study of the strength of materials, based on one hand upon the ideal theories of elasticity and, on the other, upon experimental data, is a growth of the last hundred and fifty years. Galileo, in the sixteenth century, made experiments upon beams and deduced a theory of the stresses due to bending, which gave a formula for a rectangular beam correct in form but incorrect so far as the constants were concerned, due to a false assumption as to the position of the neutral axis. It was not until 1825 that Navier gave the correct solution of the distribution of stress in a beam subjected to bending, his solution being based upon Hooke's Law and on the justifiable assumption that the sum of all the forces upon any section in equilibrium must be equal to zero. At the end of the eighteenth and the beginning of the nineteenth century, experimental research supplemented theory, and during the last hundred years a great body of knowledge has been accumulated upon a subject of importance to engineering in all its branches, as well as to building and architecture, and, to-day, perhaps no one subject is studied by a greater number of technical students than that of the strength of materials.

The three books which are now under consideration illustrate the wideness of the appeal. The first has been "written for Engineering Students," the author of the second has apparently had in view "those students of Engineering, Building and Architecture" who will be concerned with the design of structures, while the third, as its title

indicates, confines itself to worked examples based upon syllabuses of instruction of certain examining bodies.

(1) The first fourteen chapters of the volume by Dr. Warnock deal with the subjects that most teachers treat in an advanced evening class or in the second year, and perhaps part of the third year, of a university course. So far as we have been able to see, there is no new point of view presented, and it would be easy to mention subjects of considerable importance that are not dealt with at all. For example, the chapter on the torsion of shafts does not refer to torsional oscillation, and does not therefore deal with the time of oscillation of a spring. St. Venant's theory for rectangular and square shafts is referred to, and formulæ quoted, but no attempt has been made to give the theory; it is doubtful how far it is desirable in such a book merely to quote formulæ. The last chapter is devoted to a description of some of the more elementary apparatus found in a strength of materials laboratory. There is also given a summary of formulæ. There are well-selected examples attached to each chapter, often taken from examination papers.

(2) The volume by Messrs. Young and Baxter is even more elementary than the first volume, and commences by asking the student to work certain elementary arithmetical problems, evidently with the admirable intention of emphasising method, neatness, accuracy, and care in units. The first five chapters deal with elementary statics, a considerable number of simple types of structures being considered, and as examples for the student.

After dealing with centre of gravity, the author proceeds to consider unit stresses, and some of the characteristic properties of materials. In this connexion weathering, æsthetic qualities, cost and availability as factors in design are referred to briefly. Then follows a chapter on investigation, safe load and design, and in this chapter simple riveted joints are considered. Forces and stresses are returned to, and moments of inertia for simple areas are determined. The theory of beams and columns is then dealt with in ten chapters, one of which treats of "combined materials," including the elements of reinforced concrete theory; and another with unsymmetric bending. The last two chapters deal with miscellaneous problems and special graphic methods. The notation used is summarised at the end of the book, and there are appendices giving formulæ and a number of special bending-moment diagrams for beams.

The book is written clearly, and emphasises considerations other than those covered by mathematical theory. It should prove useful and interesting to elementary students of structural engineering and to architects. It scarcely goes far enough for advanced work in a technical school or a university course.

(3) The third volume calls for very little comment. The examples solved are representative, and no doubt will be very helpful to many students working for examinations.

British Butterflies and Moths.

A Revised Handbook of British Lepidoptera. By Edward Meyrick. Pp. vi + 914. (London: Watkins and Doncaster, 1928.) 18*s*.

MORE than a generation has elapsed since a new and comprehensive treatise on our British butterflies and moths, on highly original lines, was submitted to the entomologists of the period by a well-known worker in the field of the Micro-Lepidoptera. The sensation caused by the daring innovations in classification and nomenclature in Mr. Meyrick's first "Handbook"—now long out-of-print—and the mixed reception accorded to the book by the leading authorities of the time, are still fresh in the memory of many of our living lepidopterists. In the words of the notice which appeared in NATURE (vol. 53, p. 265) soon after its publication: "Every one who knows our British Lepidoptera will recognise the sweeping character of the changes proposed, and how far they will ultimately be accepted no one can venture to predict at present." The complete upsetting of all previous arrangements of this order of insects by a quasi-Linnean system of classification, and the revolutionary changes of the names in current use of so many of our most familiar species, were by no means generally welcomed or readily adopted; and in this connexion it is significant that, so far as the experience of the present writer is concerned, it is still very rarely that we meet with a public or private collection of Macro-Lepidoptera arranged on the system of the "Handbook."

The only practical treatise on the British Lepidoptera as a whole, in the hands of entomologists at the time of the publication of Mr. Meyrick's original "Handbook," was the well-known "Manual" of Mr. H. T. Stainton, a work then nearly fifty years old, and naturally in many respects out-of-date. Even at the present time, however,

the old "Manual" is regarded almost with veneration by the veterans of British entomology whom it served so well in the early days of their studies, and it yet retains much of its value as an introductory text-book for those young entomologists whom its esteemed author loved to call "incipients."

It was therefore with not unmixed feelings that the new work was adopted, but in spite of its many innovations and their attendant difficulties, it was not long before it was recognised by the more scientific section of our lepidopterists as embodying in very many respects a distinct advance on all preceding treatises of its kind. As it was based not merely on the consideration of a limited insular fauna, but on that of the Lepidoptera of the whole world, and throughout emphasised the paramount importance in classification of structural detail, though in the main it relied almost entirely on the single character of neuration, it was recognised by one of the foremost lepidopterists of the time as being "without exception the best class book that has yet appeared for imparting real sound knowledge of structure, evolution, and classification."[1]

In the present revised form of the "Handbook" the introduction has been largely rewritten and extended, and while the phylogenetic diagrams in the former volume have been entirely dispensed with, the very ingenious and convincing simile (p. 12) of the evolutionary scheme of classification into which the element of time is introduced as a fourth dimension, will be duly appreciated as a distinct advance on previous conceptions of this subject. The descriptions of about a hundred species which have been added to the list of our fauna in the interval between the two editions of the work are duly included in their order, and a few have been suppressed for various reasons, thus bringing the number of recognised British Lepidoptera up to a total of 2143 species, a net increase of about eighty since the 'census' of 1895.

Among the (so-called) Macro-Lepidoptera, considerable changes of detail have been effected, and two new 'phyla'—an unfortunate term in this connexion, as it has long been in use among zoologists for the major divisions of the animal kingdom—have been introduced. The separation of the Hesperiana from the Papilionina and their elevation to equal rank, as well as that of the Drepanina to a distinct 'phyletic' group, are in accordance with the most recent views on classification. In the butterflies, which are now sandwiched between the Notodontina and the Drepanina, we still find the arrangement of certain sections unconvincing to those who regard them from the points of view of life-history, habit, and structure as a whole. Thus in the Lycænidæ, the 'Little Blue' is yet found rubbing shoulders with the 'Large Copper' in the genus *Chrysophanus*; and an equally unconvincing medley of species, differing widely *inter se* in almost all respects, is presented in—as we prefer to call them—the 'Noctuid' genera *Caradrina*, *Polia*, and *Melanchra*, to say nothing of a good many others. The old 'Geometrina,' included as before in the 'phylum' Notodontina, have undergone extensive rearrangement in accordance with modern views, and the Pyralidina are now followed by the Lasiocampina, which includes the very isolated genus *Endromis*.

The work is, however, seen to greatest advantage in the Tortricina (from which *Trypanus cossus* has now been removed to the Psychina beside its evident ally *Zeuzera æsculi*) and especially in the Tineina. In these two groups, and notably in the latter, the author of the "Handbook" has for many years been recognised as *facile princeps* the highest authority, and the section dealing with the Tineina has been entirely recast in the light of his unrivalled knowledge and experience. The number of Tineid families has been increased from 6 to no fewer than 21, and an outstanding though desirable innovation is the separation of the Nepticulidæ and their elevation to 'phyletic' status.

In the preface the author gratefully acknowledges his indebtedness to the late J. Hartley Durrant, whose recent death all entomologists deplore, and to Prof. E. G. R. Waters, of Oxford, who is now well known as one of the most energetic and capable of our younger micro-lepidopterists.

The printing and general style of the work, as was the case with its predecessor, leave little or nothing to be desired, and, so far as we have seen, errata and misprints, so difficult to avoid in a book of its kind, are practically non-existent. While the views of the author on the subjects of classification and nomenclature remain matters for keen discussion, the "Revised Handbook" will for many years to come hold its place as a sound and trustworthy means of identification of our British Lepidoptera, and an invaluable aid to the scientific study of this order of insects.

J. J. W.

[1] Lord Walsingham, *Entom. Monthly Mag.*, **31**, p. 284; 1895.

Chemical Facts and Phraseology.

Chemical Encyclopædia: an Epitomised Digest of Chemistry and its Industrial Applications. By C. T. Kingzett. Fourth edition. Pp. viii + 807. (London: Baillière, Tindall and Cox, 1928.) 35*s*. net.

THE subject of chemistry increases by leaps and bounds, not only owing to the continual discovery of new inorganic and organic substances, but also because of the introduction into the science of novel conceptions and ideas involving in many cases a new and highly technical terminology. Readers of current memoirs on chemical research often feel the need for a glossary of chemical terms owing to the rapidity with which the language of chemistry is changing. To the non-technical reader much of this literature appears to be a jargon which becomes ever less intelligible, but since chemistry has an educational aspect as well as many important industrial applications, it remains desirable that non-scientific members of the community should not be entirely ignorant of chemical facts and phraseology.

The veteran author of the "Chemical Encyclopædia," who as one of the original founders of the Institute of Chemistry did much to standardise the chemical profession in the early days, has striven with conspicuous success to compile an epitomised digest of pure and applied chemistry, this epitome being now in its fourth edition. At the outset this work, which then bore the title of "The Popular Chemical Dictionary," owed its origin to the circumstance that early in his career the author realised that the future welfare of the British Empire depends in the main on increased production within its boundaries by the utilisation of its boundless natural resources. Success along this line can only be attained by increased teaching and intensive application of chemical science. In presenting this enlarged and revised edition of his encyclopædia, the author contributes anew to the enlightenment of the public as regards the more salient topics of chemistry.

The work is much more than a dictionary of chemical terms, for in many instances important headings are expanded into concise essays. The first of these essays in alphabetical order is entitled "Alcohols" and occupies four pages. It is followed shortly by a discussion of alloys which fills three pages. In both instances the data supplied are informative and up-to-date. The study of colloids has been greatly extended during recent years, and the article "Colloid Chemistry" (5 pages), which summarises progress in this direction, includes a bibliography of relevant treatises. Each chemical element receives notice, the reference being proportional in length to the industrial importance of the element and its derivatives. Many subjects of outstanding interest, such as cellulose, dyes and dyeing, isotopes, lead tetra-ethyl, motor spirit, perfumes, poisons and antidotes, sugar, tar, and vitamins, are discussed.

Despite its wide scope, the book is remarkably free from errors and obscurities, and such as are encountered are readily recognised to be misprints. The author has exercised considerable discrimination in the selection of topics, and within a handy compass he has compressed a vast store of useful chemical information presented in a very attractive and readable form. Throughout the volume there are copious references to larger treatises and to original memoirs, so that in most cases the sources of more specialised knowledge are indicated.

The present edition is much larger and more comprehensive than the earlier ones, and should appeal not only to the professional chemist, but also to all who require a convenient desk book of information regarding chemistry and its industrial applications. G. T. M.

Biological Assay of Drugs.

Methods of Biological Assay. By Dr. J. H. Burn. (Oxford Medical Publications.) Pp. xvii + 126. (London: Oxford University Press, 1928.) 8*s*. 6*d*. net.

THE attention which has been directed during recent years to the determination of the potency of drugs for which no method of chemical analysis is at present available has necessitated both the introduction of new, or the adaptation of older, methods of biological assay as well as the preparation of stable standards of reference in terms of which the activity of the samples tested may be expressed. The importance of the accurate standardisation of a drug was shown when insulin was introduced into clinical therapeutics, and the work of the Health Section of the League of Nations and the passage of the Therapeutic Substances Act (1925) have directed further general attention to this subject.

The appearance of Dr. Burn's book at this moment is therefore most opportune, and its usefulness is enhanced by the fact that the author has strictly limited himself to the details of methods with which he is personally familiar. Thus, any worker unused to assaying a particular drug will

find at hand one or more well-tried methods by means of which he can, with any reasonable degree of skill, obtain a fairly accurate result. It is probable that in certain cases other workers will not agree with all the details of the methods as detailed by Dr. Burn; for example, the reduction in the height of the contraction of the rabbit's uterine strip to adrenalin, following a dose of ergotoxine, is taken as the endpoint, instead of the complete abolition of the adrenalin contraction, as some workers prefer; and in the assay of insulin by the method of the reduction of the blood-sugar of rabbits, the accuracy of the test is probably enhanced if more than six animals can be used.

Methods for the following drugs are given: digitalis, strophanthus and squill, pituitary (posterior lobe) extract, insulin, arsenobenzene, ergot, adrenalin, œstrin, the parathyroid hormone, histamine, atropine, and antipyretics. Wherever possible the account of the method is preceded by a note on the standard preparation for the drug in question; an omission is the definition of the unit of pituitary extract, which will doubtless be rectified in a new edition.

An introduction has been written by Dr. Dale; it should be read by all interested in the subject, since it emphasises the necessity of accurate standardisation when drugs are to be used on human beings—who show great variations in their individual reactions—and also the errors into which workers may fall. Dr. Burn concludes his book with a chapter on the accuracy to be expected from methods of biological assay and refers to the means of gauging the accuracy of any particular result. This is a most useful little book; although chiefly for the specialist, it can be read with profit by all those who take an interest in knowing how the potency of certain of the remedies they use can be kept within certain unvarying and fairly narrow limits.

Our Bookshelf.

Handbuch der Vererbungswissenschaft. Herausgegeben von E. Baur und M. Hartmann. Lieferung 4, Band 2. *Das Inzuchtproblem.* Von Harry Federley. *Selbststerilität, Heterostylie.* Von E. Lehmann. Pp. ii + 42 + ii + 43. (Berlin: Gebrüder Borntraeger, 1928.) 5·80 gold marks.

THE importance of inbreeding to practical breeders of plants and animals is well emphasised in this part of the valuable "Handbuch der Vererbungswissenschaft." The subject is considered from six aspects: as a mathematical problem, experimental research on animals, inbreeding amongst plants, heterosis and hybrid vigour, inbreeding and sterility, and the advantages and disadvantages of inbreeding. The chief advantage of inbreeding is the speedy elimination, by selection, of undesirable recessive genes from the inbred population. Correspondingly, the main disadvantage is the reduction and, except for the possibility of mutations, final prevention of 'variation' by the production of new gene combinations.

The subject of self-sterility is one of increasing interest, since we now know that it has a wide distribution amongst plants and is recorded for the animal kingdom. The present summary is a useful, but too brief, account in which the following matters are considered: the historical aspect, the taxonomic distribution, its relationships with self-fertility, and its different causes, determined or possible. It is, however, emphasised that much more research work must be done before generalisations are possible.

Dimorphic heterostylism is best known in the genus *Primula*, and genetical studies have been made in several species. It also occurs in other Primulaceæ (as in *Hottonia*), in *Forsythia*, *Pulmonaria*, *Fagopyrum*, and *Linum*. Trimorphic heterostylism has been studied in *Lythrum* and *Oxalis*. In both kinds the long-styled condition is, in known examples, recessive. In *Lythrum* the trimorphic development of the reproductive organs is genetically explicable by using the trihybrid ratio, two recessive factors giving long, one recessive mean length, the other recessive short styles. With the appearance of homostyled plants among primulas, it has been found necessary to postulate two independent factors as a genetical explanation of the positions of stigma and stamens in this genus also.

Brachiopod Morphology and Genera (Recent and Tertiary). By Dr. J. Allan Thomson. (New Zealand Board of Science and Art, Manual No. 7.) Pp. vi + 338 + 2 plates. (Wellington, N.Z.: Government Printer; London: High Commissioner for New Zealand, 1927.) 17*s*.

IT is greatly to be regretted that, owing to the death of the author, the present volume must be the last of a series of publications which were the outcome of many years' research on Tertiary and Recent Brachiopoda, more especially those of Australia and New Zealand. The volume includes a detailed description of the morphology of the Brachiopoda, as well as a complete list of all known Tertiary and Recent species, with notes on their distribution. In addition there are careful diagnoses of all the genera, illustrated by numerous diagrams showing the various stages of loop-development.

A new classification is proposed for the Brachiopoda, which the author divides into two new subclasses, Gastrocaulia and Pygocaulia, the former to include the primitive, horny forms, and the latter the more highly evolved calcareous, hinged forms. These divisions are based very largely on the embryonic development of the Brachiopoda. Beecher's classification into four orders is slightly emended; the Atremata and Neotremata are placed in the Gastrocaulia, and the Protremata

and Telotremata, together with a new order, Palæotremata, are placed in the Pygocaulia. The Telotremata are said to be derived from the Gastrocaulia through the Palæotremata and the Protremata, the former order including primitive, calcareous forms lacking articulation. Beecher, on the other hand, claimed that the Protremata were derived from the Neotremata, and that the Telotremata were derived from the Atremata. Further corroboration from the study of living Brachiopoda is required before this classification can be generally adopted.

The volume contains a list of papers dealing with the Brachiopoda of different regions, and it should prove a useful book of reference, not only to the specialist, but also to the student of zoology. Considering the somewhat high price of the book, it is regrettable that the two plates have been printed back to back, and that their reproduction is not more distinct.

The Essentials of Transformer Practice: Theory, Design, and Operation. By Emerson G. Reed. Second edition, revised and enlarged. Pp. xii+401. (London: Chapman and Hall, Ltd., 1927.) 21*s.* net.

THE maximum temperature rise of the conductors and of the insulating materials in electrical apparatus when working is usually the factor which determines their capacity. Electrical engineers, therefore, have had to study closely the theory of heat. Serious research in this direction began about twenty-five years ago, and the volume of work goes on increasing every year. There are now several well-known formulæ in connexion with the heating of buried cables which are used in practical design.

These researches have been successful in saving manufacturers many hundreds of thousands of pounds every year. Glazebrook, Russell, and others were pioneers in this direction. Most of the important problems had been already solved more than a hundred years ago in Fourier's work on the theory of the conduction of heat, one of the most brilliant books ever written. It is somewhat of a shock to find, therefore, that electrical engineers (p. 184) seem to think that the temperature rise is based on "Ohm's law for heat." This is stated to be that the resultant heat flow expressed in watts is equal to the temperature rise divided by the thermal resistivity. It is not easy to see what connexion Ohm has with this law. Numerical values of the thermal resistance are given, and also of the thermal resistivity, but it is not quite clear in what units these are measured.

The ever-growing demand for electrical energy has now made it necessary to use very high voltages. Much research, therefore, has been carried out on the brush discharges which take place from overhead cables (generally called the corona) and on the methods of grading underground cables so as to enable them to resist very high pressures. A good and interesting account of some of these researches is given in this volume. The many types of apparatus and the special devices used for obviating dangerous current and pressure rises are well described. We can recommend this book for advanced students at technical colleges and universities.

Erblichkeitsforschung an Pflanzen: ein Abriss ihrer Entwicklung in den letzten 15 Jahren. Von Prof. Dr. Friedrich Oehlkers. (Wissenschaftliche Forschungsberichte, Naturwissenschaftliche Reihe, herausgegeben von Dr. Raphael Ed. Liesegang, Band 18.) Pp. viii+203. (Dresden und Leipzig: Theodor Steinkopff, 1927.) 13 gold marks.

THE subject of inheritance is growing so rapidly that text-books dealing with it are not only in constant need of revision but also can scarcely cover the ground, in an adequate manner, in one volume. There is therefore an increasing tendency to compile more specialised text-books than formerly. Thus the present work deals with recent advances in the study of inheritance in plants. A brief summary of Mendel's work is followed by a concise account of modern research under the headings: stages of development, nucleus and inheritance, chromosomes and inheritance, Morgan's theory (of linkage and crossing over) in botany, protoplasm and inheritance, sterility and lethality, sexuality, and research on mutations. The section on sterility and lethality is especially useful, as this subject is rarely treated adequately in works on inheritance. The author keeps strictly to his subject of plant-life, but usefully directs attention to the difficulties of correlating some of the conclusions reached by geneticists working on animal life with facts emerging from plant breeding.

New Zealand Empididæ: based on Material in the British Museum (Natural History). By J. E. Collin. Pp. viii+110. (London: British Museum (Natural History), 1928.) 7*s.* 6*d.*

THIS work is a specialised monograph on species of flies of the family Empididæ and is based largely upon extensive collections made in New Zealand by Mr. T. R. Harris, who presented the specimens to the British Museum. Material from other private collectors has also been drawn upon, and the result of Mr. Collin's study of these several collections is to raise the number of known New Zealand species of the family from 23 to a total of 102. This, indeed, is a very satisfactory result, and indicates how much there still remains to be done before the Diptera of that country are adequately known.

In view of the remarkable and archaic elements found in the New Zealand fauna, it appeared likely that the smaller Diptera would yield species of considerable interest and importance. This has evidently proved to be the case, particularly with respect to the discovery of seven genera of Empididæ, previously only known from South America. Mr. Collin is to be congratulated on the evident care and thoroughness with which he has carried out his task. Like all British Museum publications, the book is well printed and clearly illustrated. A. D. I.

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.*]

Neanderthal Man and the Natives of New Caledonia.

THE following observations seem to me to be of considerable interest in connexion with the genealogy of fossil types of men. So far back as 1923 I had photographed, side by side, the mandible of an Australian aboriginal, in the Anatomy Department of the University of Sydney, and a cast of the Heidelberg mandible. My object was to show the almost exact correspondence in size and shape of the teeth; in each case the tooth arches were extraordinarily alike in very many respects, but as at that time I could find no example of an Australian or other mandible of modern man which approached the ramus of the Heidelberg jaw in size and general shape, I let the matter stand.

Recently, however, while engaged in work with some of my students upon the distribution of Australoid types in Melanesia, we had occasion to examine Sarasin's recent work (1922) upon the inhabitants of New Caledonia and Loyalty Islands, and we found that Sarasin figured at least two mandibles in which the rami were only 3 mm. smaller in breadth than was the case in the Heidelberg jaw. One of these mandibles (No. 58) also had a relatively shallow mandibular

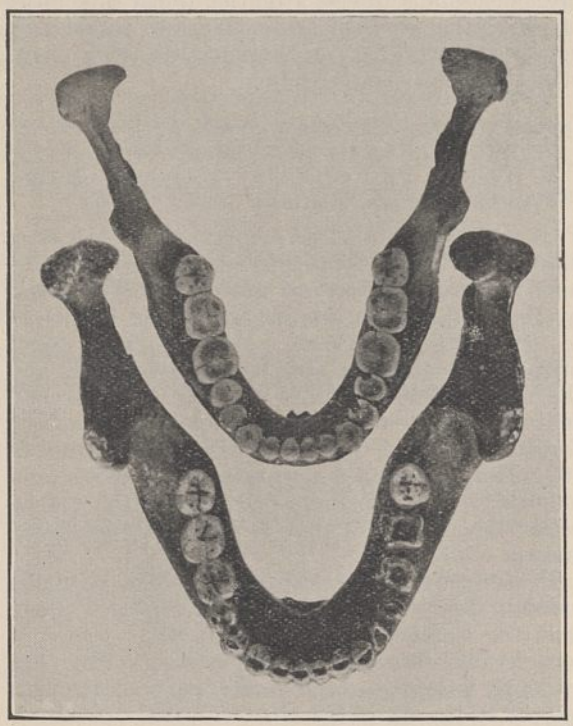

FIG. 1.—Mandible of an Australian aboriginal (No. 179, Anatomy Department, University of Sydney) (upper figure) and a cast of the Heidelberg mandible (lower figure). The dental arches, and even the proportions of individual teeth, will be seen to be almost identical in shape.

notch, though this apparently was not so shallow as that of Heidelberg man; also, in the Heidelberg jaw, more of the 3rd molar was hidden than in the lateral view of the second of these mandibles (No. 197).

In other mandibles figured by Sarasin, however, the same degree of exposure of the last molar tooth is to be seen. Further, Prof. Arthur Thomson in 1915 (*Jour. Anat.*, vol. 50), in discussing certain peculiari-

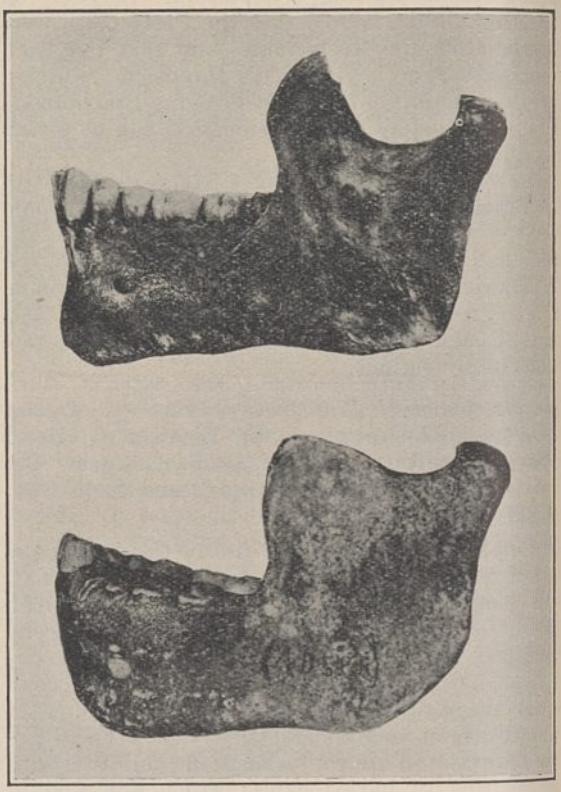

FIG. 2.—Norma lateralis of the mandible of a native of the Loyalty Islands (upper figure) (No. 197 of Sarasin's "Anthropologie der Neu-Caledonier und Loyalty-Insulaner") and of a cast of the Heidelberg mandible (lower figure). The proportions of the rami are very similar, although the recession of the chin is not very marked in Sarasin's specimen.

ties of the human and anthropoid mandible, figured in plate 1 the jaw of a New Caledonian, marked 1118 R.C.S., in which the chin is very receding although not quite to the same degree as in the Heidelberg jaw. Also, the cross-section at the symphysis region (as figured by Thomson in this New Caledonian jaw) shows a considerable similarity to that figured by Schoetensack for the Heidelberg mandible.

Again, in the chin and symphysis region, we find that Sarasin figures certain New Caledonian and Loyalty Island mandibles which approach the Heidelberg mandible very closely, both in the recession of the chin and general proportions.

A detailed comparison of other measurements taken from Sarasin ("Atlas zur Anthropologie der Neu-Caledonier und Loyalty-Insulaner," pp. 289-312) and Schoetensack ("Der Unterkiefer des *Homo Heidelbergensis*") shows that, in practically all measurements, individual mandibles of New Caledonians or Loyalty Islanders frequently approach or even exceed in size and proportions those of the Heidelberg jaw. For example, the intercondylar breadth in five male New Caledonian skulls exceeded that of the Heidelberg jaw; the same was true of the intergonial breadth.

We have already directed attention to the breadth of the ramus which is the outstanding feature of the Heidelberg jaw. In two cases, New Caledonian and Loyalty Islander, mandibles approach to within 2 or

3 mm. of the same measurement of the Heidelberg jaw, and further, the proportional height-breadth index of the ramus is frequently equalled, or the ramus may become even more squat in New Caledonians.

The condyle of the ramus presents no special feature in the Heidelberg jaw; the one feature which possibly may be primitive, namely, the great antero-posterior size of the condyle and proportional rounding especially of the left condyle, is not frequent in modern mandibles but can occasionally be found.

From a detailed consideration of the symphysis region in all its aspects, it has already been shown that occasional individuals amongst the New Caledonians may very closely approximate to the condition seen in Heidelberg man.

It will thus be seen that while the individual to whom the Heidelberg jaw belonged may possibly, and even probably, have been of a very primitive type, and his skull to have resembled those of the Neanderthal race or that of Rhodesian man, nevertheless such an assumption is by no means fully justified when we find occasionally members of a relatively large-brained modern race of mankind possessing a mandible which closely approximates to the Heidelberg mandible. These New Caledonian natives have presumably a modern type of brain and a large brain capacity (1410 c.c. in the male) and, so far as we are aware, are capable of speech and other activities, and yet their mandible can in occasional individuals closely approximate to the Heidelberg.

There are several features of interest which arise from a critical examination of Sarasin's work, which we are at present engaged in studying, particularly the pathway of migration of these New Caledonians, and of Australoid types from presumably an Asiatic centre, and also the distribution of the Australoid type. Sarasin combines the Australians and these New Caledonians and other groups in a single group—the Austro-Melanesian, which seemed to us to contain several sub-types; among these are two very distinct sub-types, the pure Australoid form with a relatively poorly developed ramus to the mandible and a smaller average brain capacity, and a New Caledonian sub-type with a more powerfully developed mandible especially as regards its ramus, and a larger brain. This latter sub-type had also, possibly, a longer face.

It will thus be seen that in three important characters, namely, the absolute size, the general type of the tooth arch, the size and shape of the ramus, and the shape of the chin, parallels can be found in living races of mankind, and the possessor of the Heidelberg jaw. This close agreement is most especially marked in the case of the New Caledonian and Loyalty Island natives. It is obvious, of course, that these close parallels are not found amongst all New Caledonians but only amongst occasional individuals who possess these characters which we may to some extent designate as 'primitive.'

In conclusion, therefore, it may be reiterated that any statement concerning the primitive characters of the possessor of the Heidelberg mandible should be very guarded, and it by no means necessarily follows that the remainder of his skull resembled that of a member of the Neanderthal race of *Homo Rhodesiensis*. On the contrary, the evidence put forward here, based chiefly upon Sarasin's observations, shows clearly that the skull of Heidelberg man might have been of a relatively modern form, and the brain of its possessor been similar to that of a New Caledonian of the present day.

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X-Ray Studies of the Structure of Quenched Carbon Steel.

CERTAIN investigators[1] have found in quenched carbon steel a body-centred tetragonal structure with the ratio of the axes c/a, 1·03-1·06, depending upon the carbon content. In the paper "Die Theorie der Stahlhartung" Honda[2] states that he and Sekito have investigated in quenched carbon steel a body-centred tetragonal structure with the constant ratio of axes c/a 1·04 independent of the carbon content. The above-mentioned structure was observed by Honda only on the surface of the specimens, whilst they had within the cubical structure, where the length of the edge was increasing with the increase of the carbon content.

We have explored by X-ray analysis a great number of specimens of carbon steel with the carbon content 0·64–1·44 per cent, the largest dimension of the specimen being $10 \times 10 \times 15$ mm. with the

TABLE I.

% C.	c/a.	% C.	c/a.
0·64	1·025	1·18	1·048
0·76	1·033	1·37	1·055
0·91	1·035	1·44	1·058
1·03	1·043		

temperature of the quenching 1000°-1100°; the steel containing 1·03 per cent of carbon had the initial temperature 900°-1300°, and the steel containing 0·91 per cent of carbon, 775°-1200°. The quenching was carried out as follows: the specimen was drawn all at once from the salt bath and was immediately dipped into the cooling agent (water, hot water, oil).

The X-ray study has shown that the tetragonal structure in all specimens exists not only on the surface but also within at a depth of 5 mm. Table I.

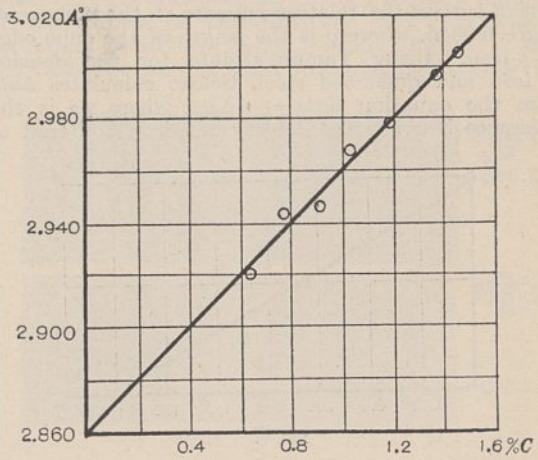

FIG. 1.

represents the middle datum or the ratio of the axes and the carbon content in the specimens of steel quenched in water at 1000°. The greatest deviation from the middle datum of the ratio of the axes was 0·003–0·004. It was found that the length of the c axis is increasing whilst the length of the second

[1] W. Fink and E. Campbell, *Trans. Amer. Soc. Steel Treating*, May 1926. N. Seljakow, G. Kurdumoff, and N. Goodzow, *Zeit. f. Phys.*, **45**, 384; 1927.
[2] K. Honda, *Archiv. d. Eisenhüttenwesen*, Heft 8, Feb. 1928.

axis a is diminishing with the increasing carbon content (see Figs. 1 and 2).

The investigation of the influence of the initial temperature has shown that the steel with 1·03 per cent of carbon has a constant ratio of c/a axes at the temperatures 900°, 1100°, and 1300° (1·041–1·045). In the specimens of steel with 0·91 per cent of carbon the diminishing of the ratio of the axes begins at 850°. The lines of the tetragonal structure are more diffuse with temperatures of quenching from 900° and below than with the higher ones.

Simultaneously, in the different layers of the specimen is to be seen the great deviation of the ratio of the axes. The inhomogeneity of the tetragonal structure causes the diffusibility of the lines of the X-ray photograms. The presence of austenite was revealed in all specimens. In the specimen with 0·64 per cent of carbon it was found only within, where in every case the quantity of the austenite prevailed. The steel with 0·91 and 1·44 per cent of carbon when quenched in oil gives more austenite than when quenched in water.

In the case of the great heterogeneity of the small ratio of the axes, each pair of lines in the tetragonal structure may give one very diffuse line. Such a photogram shows the same appearance as that representing the cubical structure. It is very probable that the Honda's β-martensite, in which Sekito [3] investigated the change of the parameter by the removal of the line (110), is a mixture of the tetragonal crystals with different small ratios of the axes. A similar case was published by N. Seljakow, G. Kurdumoff, and N. Goodzow ; these workers found in the photograms of the quenched steel a displacement of the line (110) corresponding to the line (110) of α-iron. At first they considered this as an example of cubical structure. On closer examination it was found that the lines were displaced on the photograms in different directions compared with the positions of the lines on the α-iron photograms, which was ascribed to the displacement of the more intense lines of the tetragonal lattice of the martensite.

Sekito has found in the quenched steel with 1 per cent of carbon the relative increase of the parameter $\Delta a/a = 0{\cdot}0045$, where a is the length of the cube edge of α-iron. Using Tamaro's data for the density of iron and quenched steel, Sekito calculates $\Delta a/a$ from the equation $\Delta a/a = -\frac{1}{3}\Delta\rho/\rho$, where $\Delta\rho$ is the difference between the density of α-iron and that of

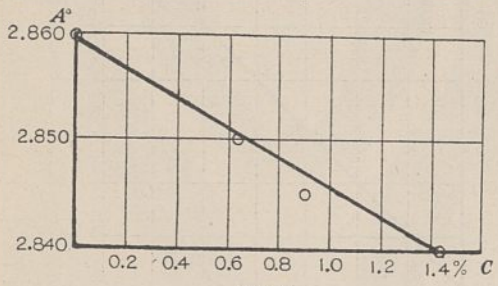

FIG. 2.

the quenched steel, obtaining for the quenched steel with 1 per cent of carbon −0·0044. Such a calculation, however, takes no account of the presence of the carbon.

The present X-ray study shows that the martensite can be considered as the solid solution of the carbon in α-iron. Hence $\rho = \mu/v$, where ρ is the density, μ the molecular weight, and v the volume of a unit cell.

$$\Delta a/a = -\tfrac{1}{3}\Delta\rho/\rho + \tfrac{1}{3}\Delta\mu/\mu.$$

[3] Sekito, *Z. f. Krystallographie*, **67**, 285 ; 1928.

For the steel with 1 per cent of carbon $\Delta\mu/\mu = 0{\cdot}01$ and $\Delta a/a = 0{\cdot}0077$. Table II. gives the density of the quenched steel using our data and assuming

TABLE II.

Per cent Carbon.	ρ.	a.	c.
0·64	7·816	2·850	2·921
0·76	7·773	2·849	2·943
0·91	7·787	2·847	2·947
1·03	7·749	2·845	2·967
1·18	7·742	2·843	2·979
1·37	7·725	2·841	2·997
1·44	7·713	2·840	3·005

that the carbon atom finds its place in the interstices between the metallic atoms (see Fig. 3).

$$\rho = \frac{111{\cdot}68(1 + p_2/p_1)}{0{\cdot}6062 \times v},$$

where ρ is the density of the martensite, p_1 and p_2 the percentage of carbon and iron, and v the volume

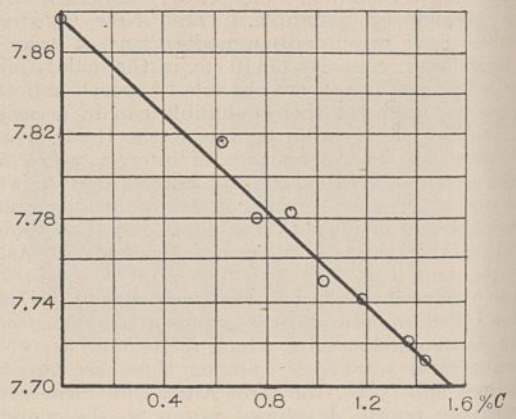

FIG. 3.

of the unit parallelopiped. For α-iron $a = 2{\cdot}860$ A. and $\rho = 7{\cdot}876$. From Sekito's data the density of the steel specimen containing 1 per cent of carbon will be $\rho = 7{\cdot}847$.

G. KURDUMOFF.
E. KAMINSKY.

Physico-technical Laboratory,
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The Dominant Species of *Ostrea*.

DR. ORTON'S letter of Mar. 3 under the above heading, in which he suggests that the genus *Ostrea* might be divided into two genera or sub-genera, *Monœciostrea* and *Diœciostrea*, is very opportune, for it must help to focus attention on one of the most difficult genera in the animal kingdom, regarded from a morphological aspect. But, as Dr. Orton states, more accurate information must be awaited before such a generic grouping can be accepted.

The specific determination of the members of the genus *Ostrea* is in a most unsatisfactory state. In the past, reliance has been placed on shell characters, but these are so extraordinarily variable that, with the exception of a few species, such as *O. nigromarginata* of the Australian Great Barrier Reef, which is cup-shaped and therefore very distinct from the dominant type, it is impossible to embrace the infinite range in a description of any one species. We must endeavour to discover, therefore, anatomical and/or physiological characteristics which will differentiate the species with complete certainty. Take, for example,

the commercial oyster of the eastern Australian coast. This has long been known as *O. cucullata*, a species which was originally described from Ascension Island in the southern Atlantic. It is possible that there are some of these Australian oysters the shells of which simulate the Ascension Island oysters, and may even fit the description of the type specimen, but this cannot be accepted as proof that they are the same species. Probably they are not. The oyster of the southern Australian and Tasmanian coasts, which has been known as *O. angasi*, is stated by Iredale (*Proc. Linn. Soc. N.S.W.*, vol. 49, p. 191; 1926) to be referable to

FIG. 1.—Ova and sperms in the gonad of *Ostrea cucullata*, Born. × about 350.

Lamarck's *sinuata*. I do not think it is an exaggeration to say that the specific names of the genus *Ostrea* are in a chaotic state.

The genus can readily be divided into two subgenera, at least in the case of the dominant species, according to whether the adult is larviparous or non-larviparous, but much further research is necessary before classification can be based on monœcious or diœcious characters. Larviparous oysters such as *O. edulis*, *O. lurida*, and *O. angasi* have long been known to be monœcious, and non-larviparous oysters such as *O. virginica* (*elongata*), *O. angulata*, and *O. cucullata* have been accepted as diœcious. But are they? Recent research which I have carried out on the life history of *O. cucullata* has shown that, although it spawns direct into the water, where fertilisation and the whole of embryonic and larval development takes place, it is nevertheless monœcious. On every occasion when I have examined microscopically the gonad of *O. cucullata*, I have found females to predominate, and early last year I had a hundred oysters sent to me from each of thirty different localities on the New South Wales coast in order that I might work out accurate percentages of females to males. In every instance I found that the females outnumbered the males, the percentage ranging from 54 per cent to 88 per cent, the average being 73 per cent. Toward the end of this investigation I opened fifteen very young oysters which were attached to some larger ones, and found that macroscopically the gonad was just showing signs of development. Every one contained actively motile sperms but no ova. Larger numbers of very young oysters were then obtained, and all, with the exception of possibly 5 per cent, contained sperms only. From this it would appear that *O. cucullata*, like *O. edulis*, spawns first as a male and undergoes a series of sex changes afterwards, the small percentage of young oysters examined which contained ova having possibly already spawned as males.

Having concluded that a sex-change occurs, an effort was made to discover specimens which were actually changing over, or, in other words, which contained both ova and sperms. When examining ova under the microscope by ordinary transmitted light, one is apt to overlook any sperms which may be in the field, and perhaps to confuse them with the Brownian movement of particles of protoplasm. In order that the search for sperms amongst ova might be as critical as possible, the sex products of every oyster were first examined by transmitted light and then by dark-ground illumination. The former clearly demonstrates the ova; the latter throws up the sperms in unmistakable relief. As a result of this combined examination, nine oysters were found the reproductive organs of which contained both ova and sperms. Sections of the whole of these were cut, and a photomicrograph of one of them accompanies this letter (Fig. 1).

An important field for research into the sex-change of our non-larviparous *O. cucullata* now presents itself, and this I intend to explore as opportunity permits.

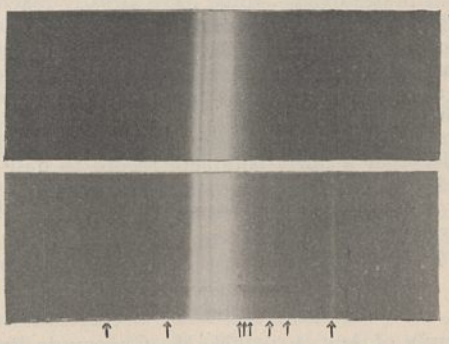
Kellogg (*Bull. U.S. Fish Comm.*, vol. 10; 1890) has described and figured the occurrence of both ova and sperms in a specimen of the American Atlantic coast oyster, *O. virginica* (*elongata*), and Amemiya (NATURE, vol. 116, p. 608; 1925) has recorded two in the Portuguese oyster, *O. angulata*. Is it possible that these oysters also undergo a regular sex-change?

T. C. ROUGHLEY
(Economic Zoologist).

Technological Museum,
Sydney, N.S.W., July 25.

The Raman Effect in Crystals.

THE thermal agitation of the atoms in solids results, as was shown by Raman (NATURE, Jan. 12, 1922, and Jan. 6, 1923), in a noticeable blue opalescence in the interior of such transparent crystals as quartz or ice when they are traversed by a strong beam of sunlight. In his address on the discovery of a new type of secondary radiation (*Indian Journal of Physics*, Mar. 31, 1928) Raman described observations showing that



monochromatic light scattered in this manner by crystals is accompanied by radiations of altered wavelength in the same way as in the case of gases and liquids. The difference between the incident and scattered frequencies corresponds, of course, to a characteristic infra-red frequency of the crystal.

Some of the frequencies revealed in this way correspond to infra-red radiations of much greater wavelength than those known previously from the work of Rubens and others on the *rest-strahlen* from crystals. Fig. 1 represents the incident radiation

(the 4358 A. group of the mercury arc), and Fig. 2 the spectrum of the light scattered in quartz, where the positions of the new lines are marked by arrow heads.

The wave-lengths of the longest radiations from quartz determined from these and other photographs are 118μ, 94μ, 78μ, 48·5μ, 37·4μ, and 21·5μ. Some of these have been overlooked by Landsberg and Mandelstam (*Comptes rendus*, July 9, 1928) and by I. R. Rao (*Ind. Jour. Phys.*, vol. 3, part I., August 1928), who have recently studied the Raman effect in quartz, apparently owing to the insufficient resolving power of their instruments.

K. S. KRISHNAN.

210 Bowbazar Street,
Calcutta, Aug. 16.

Recent Developments on Jupiter.

A GREAT revival of activity in the equatorial and south tropical regions of Jupiter has recently set in, and the developments are so rapid and the phenomena presented so interesting that it seems desirable to direct the attention of telescopic observers to what is in progress. The revival began by the appearance of a dark spot in the latitude of the south edge of the south equatorial belt and in longitude 127° (system II). It was observed in the early morning of Aug. 13 by Mr. B. M. Peek, and it quickly began to show marked activity. The extension in the *preceding* direction (which has recently become much accelerated) has reached at the time of writing as far as longitude 20°, and the disturbance in this part is composed of a series of bright spots and dark peaks and areas. They are mainly in the latitude normally occupied by the south equatorial belt. On the *following* side of the origin of disturbance a number of small dark spots, which appear to have been successively ejected, are travelling along the south component of the south equatorial belt, rather like beads on a string, in the direction of increasing longitude at the enormous rate of about 5° per day! This corresponds to a rotation period of about $9^h\ 59^m$, which would seem to be unprecedented so far as our knowledge of the planet goes.

These remarkable objects are rapidly approaching the Great Red Spot, the *preceding* end of which is now in longitude 303° ± and in nearly the same latitude. One of them—if it still exists—must have already reached the Red Spot, but unfortunately it faded just before conjunction. It is important to find out what exactly happens at such times, and it is hoped that observers will keep a careful watch on the planet at this exceptionally interesting juncture. It is fortunate that the prolonged spell of fine weather has made it possible to piece together a fairly complete record to date of the remarkable developments now in progress.

THEODORE E. R. PHILLIPS.

Headley Rectory,
Epsom, Sept. 18.

Correlation.

IN NATURE of Aug. 4, p. 171, Mr. Gheury de Bray comments upon a graphic method which I described. In his glance at my letter Mr. de Bray appears to have missed the first sentence, which states that the method is "For the determination of a linear function of X approximating to Y for a range of corresponding values (X, Y)."

In my example, 1·00 is the mean deviation of Y from the function $(40 - 3X)/5$. From the function $9{\cdot}25 - 0{\cdot}75X$, which Mr. de Bray's glance shows to be a far better solution, the mean deviation is 1·17.

A. F. DUFTON.

Greenbank, Garston, Herts, Aug. 8.

Is the mean deviation of any use at all for the present purpose? In many cases this criterion does not discriminate between an infinity of graphs, each of which will suit equally well (by this criterion, that is) the given points? Take, for example, the four points at the corners of a rectangle. The graph may coincide with the two long sides, with *any* line parallel to these and situated between them, with the two diagonals, or with *any* line passing through the centre and cutting the short sides! In each case the mean deviation from the function will be the same! Is that a criterion at all?

A practical physicist will take the graph which passes most evenly among the points. His criterion is therefore a double one: (1) the points will 'pair off,' the points of each pair being on either side of the graph at apparently the same distance from it; (2) the maximum deviation shall be as small as possible. The first criterion gives a mean deviation zero, *taking the signs into account*. This would only give for the graph a choice of positions coinciding with *any* line through the centre cutting the small sides. The lines parallel to the long sides are eliminated, except one. The second criterion eliminates all the other lines except the longitudinal axis, which is the best graph.

M. E. J. GHEURY DE BRAY.

40 Westmount Road,
Eltham, S.E.9.

Designation of the C.G.S. Unit of Acceleration.

DR. NORMAN CAMPBELL, in his recent book, "Measurement and Calculation," laments the absence of a name for the C.G.S. unit of acceleration, and the phrase "centimetres per second per second" is certainly clumsy. I am not aware if any names have hitherto been proposed, but I venture to put forward tentatively the claim of 'gal,' for Galileo. It has the merit of brevity, and also of recalling, like the names of the electrical units, the work of a great pioneer in the experimental investigation of the subject.

E. S. KEEPING.

University College of Swansea,
Singleton Park,
Swansea, Aug. 10.

Wing Dimorphism in Weevils.

IN a reference which appeared in NATURE of July 28, p. 144, to my paper on the inheritance of long and short wings in the weevil, *Sitona hispidula* (*Trans. Roy. Soc. Edin.*, vol. 55, part 3, No. 27), a statement occurs which it is desirable to correct. It is stated in the note that evidence from breeding indicates that the abnormal condition of the wing muscles in long-winged weevils is inherited, probably as a Mendelian recessive. The latter part of this sentence is inaccurate, for it was the character normally developed wing muscles which I suggested might be inherited as a Mendelian recessive.

DOROTHY J. JACKSON.

North Cliff,
St. Andrews,
Fife, Sept. 13.

Selective Association in Kittens.

MY cat has four kittens; two of them are black and white, and two are black. They are only three weeks old now, but from the beginning they have always been in two pairs according to their colour. Is there any reasonable explanation for this?

RUSSELL.

Ancient Geography in Modern Education.[1]

By Prof. JOHN L. MYRES, O.B.E.

IT is the claim for geography that it co-ordinates regionally the results and conclusions of other sciences in respect to the natural phenomena of each and every region, and that, including, as it must, man's activities among the factors with which it is concerned, it stands in a peculiarly intimate relation with history, that brings it under the special notice of the art and applied science of education, but at the same time has made it so difficult in practice to assign to geographers their proper place and function in educational schemes. It is clearly urgent that those who have views as to what geographical training the 'new stage in education' shall offer should express them without delay.

THE PLACE OF GEOGRAPHY AMONG ASPECTS OF LEARNING.

Geography, as its name indicates, is the systematic description of this earth of ours. But description is not an end in itself. The end, to which it is the means, is a science of the earth, an understanding and interpretation of its meaning. The geographer ascertains, records, compares, and interprets distributions, the arrangement of things on or in relation to the surface of the earth. Geography, that is to say, asks two questions in respect of each geographical fact: *Where* is it observed? And *why just there?*

Obviously, in this general sense, geography is the coequal sister-science of history, which studies and interprets the relations of events in time. But whereas the geographer's observations are for the most part verifiable at will—for he can go back to a place and see it again—the historian is always to this extent behind the times, that he can never catch up historical events at all, still less can he have them repeated. History is always looking for something that is no longer there; geography has the earth ever present, in all its 'young significance.'

Every relation between objects in space is, however, bound up with a relation between events in time. Consequently every geographical fact has its historical aspect, and every historical fact its geographical aspect. What we group together as the 'historical' sciences are inevitably also 'distributional' sciences, because all the facts and events which they study happen *somewhere* as well as *somewhen*.

All human history, then, is regional history, and loses value and meaning when its geographical aspect is overlooked. All geography, on the other hand, and (most obviously) all human geography, depends for its significance on the consideration that it is contemplating, not facts only, but events with causes and effects; processes, of which our map-distributions are momentary cross-sections.

Other aspects of science, the physical sciences, are concerned neither with relations in space nor with relations in time, but ultimately and sometimes quite obviously with quantities and qualities. In respect to all those expressions of *how* things happen, or *how* they are composed, the historical and distributional sciences stand in the relation of applied sciences to the 'pure sciences' of physics, chemistry, and physiology: accepting and employing their conceptions and interpretations, like their vocabulary and notation.

Similarly, those aspects of science which are concerned with the estimation and interpretation of values—with relations, that is, as irreducible to quantitative expression as they are to conjunctions of region or period—have nevertheless ultimately this point of contact with geographical and historical science, that all the values with which they are concerned are values-to-man, and consequently are, as phenomena, characteristic of—perhaps even peculiar to—terrestrial life, and to a relatively recent phase of it.

Now of these three main groups of studies, the human sciences and the natural sciences, in the stricter sense, are alike systematic and consequently collateral studies, only touching each other at their margins. The remaining group, on the other hand, both in its historical and in its distributional aspect, derives its content and its data from any or all of the systematic sciences. There is a historical aspect of botanical study, for example, the palæobotany of fossil plants, linked with the field botany and plant physiology of to-day by survivals of archaic forms of plant life; and there is a geographical aspect, the study of plant distributions, with its intimate bearing on questions of descent and affinity, and its corollary, ecology, which I take to be the special study of co-distributions. Similarly, there is a historical aspect of ethics, and æsthetics, and no less a geographical aspect, brought latterly to some notoriety by current controversies about the 'diffusion' of ideas, as well as of techniques, the latter being but the expression of ideas in the solid, in artefact instead of behaviour.

Throughout these distributional aspects and treatments of the data of systematic sciences, both historical and regional considerations are ever present, ubiquitous, inextricable from each other. At most we may recognise by an obvious paradox that the geographer is concerned with distributions which are relatively stable in point of time—land forms, vegetation types, lines of communication—and the historian with sequences which are relatively stable regionally—the doings of this or that body of people more or less permanently sedentary within a particular complex of geographical conditions. But it follows from this that in the same way as the geographer fails of his duty if he overlooks the fact that, from mountains and the tides to town-planning and aviation, he is in fact dealing with distributions which are changing, though their rates of change vary almost infinitely, so the historian fails to appreciate the significance of historical events if he ignores those historically

[1] From the presidential address to Section E (Geography) of the British Association, delivered at Glasgow on Sept. 6.

permanent limitations within which all human revolutions occur, and to which the most stable human institutions owe nearly all their stability.

HISTORICAL AND GEOGRAPHICAL INSTANCES.

We boast, and rightly, that we try to make education practical and useful; that it is a means to an end; and that its end is the establishment of successors to ourselves at least as intelligent, efficient, responsible—*free*, in the old Greek sense of freedom (*eleutheria*) as 'grown-up-ness'—as we are ourselves; and, as we severally hope, a great deal more intelligent, efficient, responsible, and free than most of our own fellow-citizens.

In the first place, then, we train the citizen-to-be in citizenship, which I take to be the modern technical term for what a Roman called *civilitas*. As, however, custom is of necessity both regional and temporal, it is to historical and geographical considerations that we recur when we are challenged to explain our own code, or to excuse those inconsistencies in it which are naturally more obvious to novices and newcomers from the 'next generation' than to old-stagers and 'men of the world' like ourselves. For these purposes we have recourse to records and traditions, reinforcing or mitigating precept by historical illustration; appealing from abstract to concrete, from morality to hero-worship.

Secondly, we have to present analytically the principal factors in the processes which make up the pageant of external Nature and the methods by which they are detected, measured, controlled, and applied to human ends. Here questions of distribution cannot arise. But from the moment when pure science passes over into any kind of practical application, considerations of place and time reappear; for in wild Nature all processes and all material resources are regional; and it is fundamental in human interference with the order of Nature that it displaces things and disarranges that order. At every stage, and more insistently and obviously in each higher stage, we are called upon to 'think geographically'; and most of all when we come to the consideration of man's dealings with his finest tool and worst obstacle, his fellow-man.

Thirdly, then, it is our business to train inborn faculties of observation and inference to make their own analysis of actual regional circumstances, of the given portion of the earth's surface to which the citizen-to-be has access now; and maybe he will never have the chance to deal with any other. Modern geography accordingly adopts increasingly, and almost inevitably, this regional method of study and exposition as being at the same time the most efficient and the most economical in point of time.

ANCIENT GEOGRAPHY OF THE HOMELAND.

Yet even at that elementary stage in which the common aim of all concurrent 'courses' of instruction is to make the child familiar with the leading features of the 'homeland,' historical retrospect comes to play a part of ever-increasing importance; if only because in our time those very features are being profoundly modified. Artificial and for the most part urban or suburban conditions are rapidly encroaching on what was recently rural. Yet what we call 'unspoiled countryside' in most parts of this island is itself in great measure artificial. Fortunately, in our timbered hedgerows, at all events, the principal elements of that ancient regime remain accessible to many of us. Characteristic data, that is, are still available for the reconstruction of that 'unspoiled countryside' for each principal period of national history, without which familiar episodes lose much of their historic value, because they are bereft of their geographical setting.

It would, however, be a very imperfect preparation for citizenship which included the history of British people only. Great as our national literature is, it owes much of its greatness and originality to the fact that it has been so apt to learn; that it has taken into its own texture so much of the best from other great literatures, from Israel, from Greece and Rome. If we would see life truly we must needs see it whole.

ANCIENT GEOGRAPHY IN CLASSICAL STUDIES.

Now it happens that these two cultures, each with its characteristic ideal of what man's life may come to be, represent supreme achievements of humanity within natural regions and regimes strongly contrasted both with each other and with those of the British homeland. Greek life and all its legacy to us are man's solution of the problem not merely of maintaining life under Mediterranean conditions, but also of realising to the full what life under those conditions might become. Conversely, as our knowledge of the later symptoms of decline and disorganisation grows, as we see it pictured in Rostovtseff's "Social and Economic History of the Roman Empire," the fact of a general hardening of the physical conditions—for which there appears to be sufficient evidence, and full corroboration from the course of events in North-Western Europe—goes far to explain the perplexing way in which well-considered remedies failed of their effect, and sometimes even aggravated that 'distress of nations with perplexity' which was imminent already in the last century of the Roman Republic.

This environment, however, happens to be one which illustrates with exceptional facility that interaction of geographical factors which makes all natural regions what they are. Partly no doubt for that reason, but mainly on account of the special interest and importance of its human geography, the Mediterranean region has been long and carefully studied; and is, I think, recognised by many teachers of geography as one of the most valuable for analytical study. There is therefore good reason to urge that at whatever stage the history of the 'classical' civilisation is included in the programme of education, the regional geography of the Mediterranean basin should be its customary counterpart, and that the two courses should be carried on with habitual cross-reference to each other. Conversely, when the proper moment comes for the study of the Mediterranean basin geographically, the history course should be planned so as to supplement it in respect of the more significant achievements of Mediterranean peoples.

ANCIENT GEOGRAPHY IN SIMPLE BIBLE TEACHING.

For the earlier periods of history, and for that other great factor of our own civilisation which is our inheritance from the Ancient East, the difficulties of correlation, which at first sight might appear greater, are in fact insignificant. For here we have ready to hand a great text-book already in compulsory use ; at the same time great literature and great history ; a great classic of Oriental life and its surroundings, and a masterpiece of English prose ; the historical books of the Hebrew people, in our own Authorised Version. With this example before us of what is not only practicable but also prescribed irresistibly by public opinion as a fundamental element in public education, can anyone fairly say either that ancient geography is without direct utilitarian value in modern life, or that there is no room for it in the curriculum?

We all know very well that the Old Testament is sometimes taught more as if it were a collection of parables or allegories than as geography, or history, or even literature ; but I venture to suggest that it is in proportion as we teach it as geography, as well as history and literature, that its value as parable or allegory will be most surely appreciated, and its contents will take their proper place, not as legends of an unearthly wonderland, but as contemporary record of a peculiar people, confronted, in a region no less remarkable, with the most momentous crisis that can befall any people, at a crucial period in the growth of the civilisation which is our own.

In Hebrew literature we have what is almost wholly missing in the Greek instance, an autobiography of an immigrant people during the whole momentous process of acclimatisation to regional conditions strongly contrasted with those out of which the newcomers came. Confronted with such novelties and such temptations to 'enter in and possess,' how were such people to behave?

That is one aspect of Hebrew history and geography, its domestic aspect, as an internal reconciliation of folk with place. The other aspect is external: the reaction of acclimatised Israel to the forces which were shaping the world-history of its times. From no single point of view is it more illuminating to survey and take stock of the great civilisations of the Nearer East than from the miniature States which centred in Jerusalem and Samaria ; and the fateful separation of these from each other is itself an early symptom of the distractions which those giant neighbours caused.

Here, too, as in the Mediterranean lands, there is the less need to give illustrations in detail, since the last twenty years have completely remodelled our equipment for handling these regions and periods in every degree of elementary and more advanced treatment. It is no longer honest to plead ignorance of German as an excuse for shirking a public duty. Further, since our own country has incurred the obligations of its mandates for Babylonia and Palestine, in addition to its responsibility for the security and well-being of Egypt, we cannot plead that the geography of these regions lies outside the scope of political duty, or the daily needs of every one of us. We may not want to understand those countries or their peoples ; but as things stand we neglect those studies at our peril : and, at least, let us provide for our children.

PRESENT DISCONTENTS.

I am well aware that the correlation which I have proposed will be regarded as something of a revolution in the teaching of 'classical subjects,' and also that there are historical reasons for the methods actually employed. To judge from experience both of examinations in history and in geography, and of informal conference with teachers and taught, what passes for 'historical geography' is still one of the weaker aspects of the geographical course, while what has been described as 'geographical history' is scarcely attempted at all.

In discussions of elementary training we hear a good deal of the co-ordination of brain, eye, and hand. Why is it that as we ascend our educational ladder this primary necessity seems to be progressively ignored in the study of the humanities? With every allowance for the disciplinary value of games, such lack of manual dexterity as I have described is a serious defect of scholarly equipment. It is only not realised as such, because the chief employers of the 'finished' output of the humanistic courses in our universities are still themselves so inexperienced in graphic methods that many of them would have some difficulty in understanding a fully illustrated report on any regional topic.

In every other aspect of learning and advanced study, competent use of its special symbols and notation is an elementary prerequisite. But it is amazing how ill-equipped are most students of literary or historical subjects when it is a question of describing anything otherwise than in grammatical long-hand. It is not merely that they are poor draughtsmen ; it is rather that they do not do their thinking about regional matters in such fashion that geographical symbols can express it. Yet, considered merely as a test of those qualities of co-ordinated craftsmanship, accurate observation, and clear concise statement of relevant facts, map-making ranks high. A finished map is a scientific document, but it is also a work of art ; to its scientific value, its completeness and accuracy, it adds the value which is given by style. What is true of a map, the geographical document in its simplest and most purely geographical form, is just as true of other geographical work, which is all a more or less explicit commentary on maps, in literary form, or hints for the comparison of maps with one another.

It is in those compartments of our educational system where ancient history holds the most honoured and responsible place, that indifference to geographical considerations has lasted longest and most generally. So long as a numerous and influential class of public servants and legislators is recruited from those compartments, so long will the geographical aspect of historical study continue to be overlooked, merely because the responsibl people have had little or no personal experience of it.

The Centre of the Galaxy.[1]

By Dr. HARLOW SHAPLEY, Harvard College Observatory, Cambridge, Mass., U.S.A.

INTRODUCTION.

FROM current work on the distribution of stars, clusters, and extra-galactic nebulæ, I estimate that at least 90 per cent of the sky is free of obscuring nebulous clouds. It therefore seems like an unhappy caprice in the arrangement of the material world that the centre of the Galaxy is behind impenetrable cosmic clouds, and thus hopelessly concealed from the vision of the only creatures in the whole Galaxy (so far as we know) who are curious about the centre. One investigation after another indicates an obscured region in the southern Milky Way, where the constellations Scorpio, Ophiuchus, and Sagittarius corner together, as the direction to the gravitational and rotational centre of the galactic stellar system. The hundred square degrees immediately surrounding this central point appear to be more than half covered by dark nebulosity; all along the southern Milky Way, within thirty degrees of the centre, the obscuration is heavy; but it is so irregular, fortunately, and so incomplete, that numerous exceedingly faint and distant stars are found in the clear areas. High stellar concentration, behind the obscuring veil that overlies most of the centre, is suggested by the distribution of stars in these transparent regions. Is there a massive galactic nucleus concealed by the dark nebulosity? Or is there an ordinary stellar density comparable with that of the sun's neighbourhood? Is our Galaxy an enormous spiral nebula? Or is it an assemblage of stars and star clouds?

For two or three centuries the philosophical astronomers, recognising that the sun is merely a little brother to many millions of stars, have speculated on the problem of the centre of the universe, or the centre of the Milky Way system. A natural vanity and egocentrism led most speculators to assume that the solar system is central (an assumption that is not yet extinct), but Wright, Kant, Lambert, and others suggested in turn that various conspicuous celestial objects had as good claim to the central place—objects such as Sirius and the Orion Nebula. The measuring of the motions of stars, suggesting rotation about some central mass or masses, has led within the past century to the intimation that the Pleiades or the Perseus clusters might be the controlling central bodies. The more recent extensive star counts have induced various investigators to locate the galactic centre in all quadrants of the Milky Way. Only very recently has astronomical unanimity been approached in placing the direction to the galactic centre in the southern Milky Way, though this was clearly indicated by the analysis of the distances and distribution of star clusters a dozen years ago.

Meanwhile, we have learned of a secondary centre—that of the local system—in the direction of Carina, ninety degrees from the galactic centre; and we have noted, in a preliminary fashion, various other concentrations in special regions of the Milky Way, such as the great star clouds in Cygnus. It is the existence of these localised systems that have led in the past to the variety of results based on undiscriminating counts of stars.

My present discussion of the galactic problem touches on three subjects: the new determination of the direction to the centre, with indications of its distance; the initiation of studies of the variable stars, novæ, nebulæ, clusters, and star clouds in the central region; and a consideration of the probable effect in certain problems of cosmogony of obscuring nebulous clouds.

THE DIRECTION TO THE CENTRE.

My earlier study of the distribution of globular clusters in galactic latitude and longitude was based on less than seventy objects—all the globular systems then certainly recognised. They gave as the direction to the galactic centre the right ascension $17^h{\cdot}5$, declination $-30°$; or, in galactic coordinates, longitude 325°, latitude 0°. This concentration of the globular clusters in the Sagittarius region was of high cosmic significance, however, only because the measures of the distances gave a clear indication that the clusters are certainly a part of the Galaxy and that their space distribution most probably outlines the whole system of thousands of millions of individual galactic stars. The centre of the system of globular clusters could be taken as the centre of the whole Galaxy.

The globular clusters intimated that the sun is some sixty thousand light years from the centre of the system, that it is indeed perhaps half-way out toward the periphery of the greatly flattened discoidal and irregularly assembled stellar system, that the concentration of stars near the sun is merely a local cloud—a sub-system in the Galaxy—and that the scale of measurable space and time is somewhat astonishing when compared with earlier concepts.

Although they are the best tools we have, and are positive and accurate with regard to the direction to the centre, the globular clusters leave something to be desired in the measure of the form and dimensions of the Galaxy. They show a surprising absence from mid-galactic regions—more than appears explainable by nebulous obscuration; they also have peculiarities of their own, and the more distant and difficult clusters do not yet yield precise results. We have, however, been able to increase the number to a little more than one hundred, and to revise the measures of the distances. The plot of the distribution in galactic longitude and latitude is shown in the accompanying diagram (Fig. 1); it indicates that the centre of the globular cluster system lies on the galactic equator (latitude 0°, as before), and that the longitude is $327° \pm 2°$.

The new results, therefore, fully confirm the

[1] Synopsis of the Halley Lecture delivered at Oxford on June 11.

earlier values of the position of the centre. The same value is also indicated qualitatively by the distribution of galactic novæ, planetary nebulæ, and other objects of high luminosity and great distance, and it is shown quantitatively by the distribution of faint galactic stars of all types, as studied by means of selected areas at the Mount Wilson and Groningen Observatories. The results on faint stars, recently published by F. H. Seares, give a value for the direction to the galactic centre differing but three degrees from that above.

It has been a natural inference that a flattened stellar system may be in rotation around its centre of mass, that is, in the case of the Galaxy, around a central nucleus, possibly very massive, in the direction of Sagittarius. Weight is lent to this argument by the analogy with external galactic systems, many of which, like the spiral nebulæ, are obviously of rotational form. Studies of the radial velocities and proper motions of the most remote stars of various types by Oort, Schilt, J. S. Plaskett, and others, show definite evidence of rotation around the same centre as that indicated by globular clusters.

Analysis of the Central Region.

The distances of the globular clusters are obtained in part by means of their Cepheid variable stars. Recent work on the variables of the long period class shows that they, too, are of use in the photometric methods of estimating distance. Eclipsing stars also have been used with some success in estimating absolute magnitudes and parallaxes. Since all these types of variables are widely scattered throughout the Galaxy, it is clear that a thorough study of their distribution in space can throw light on the structure of the Milky Way. A few years ago we began at Harvard a systematic study of the variable stars in about two hundred fields that thoroughly cover all of the Milky Way within a belt twenty degrees in width. We devote the time of three telescopes and of many workers to this problem. In addition to the hundred thousand plates already available at Harvard for the study of variable stars in Milky Way regions, we have accumulated several thousand especially suited to the study of the faint variables in the richest fields. Six hundred variable stars have been found within the past year, and preliminary data obtained on their types, periods, magnitudes, and distances. To complete the investigation will probably require ten or fifteen years.

For special concentration we have laid out a region around the galactic centre, extending sixty degrees along the galactic circle and forty degrees in galactic latitude. It is estimated that more than seventy-five per cent of the galactic system lies within these bounds, which enclose less than six per cent of the entire sky. The various investigations of the central regions cannot be described here, except to note that they pertain to the distribution of the extra-galactic nebulæ, the diffuse and planetary nebulæ, the galactic and globular clusters, the novæ, and several classes of variable stars.

In the richly populated star clouds that lie within twenty degrees of the central point, several hundred new variable stars have been found, many of which are so faint that they probably lie beyond the centre. Numerous extra-galactic nebulæ, probably far beyond the outermost limits of the galactic system, are seen within fifteen degrees of the nebulosity-hidden centre, thus indicating that certain regions near the centre are entirely free of obscuring cosmic clouds. In the Sagittarius region we also have some of the most beautiful bright nebulæ, and the highest density of stars for any region of the Milky Way. It is interesting to note that throughout the central region the open or galactic clusters are closely concentrated to a narrow band which is completely avoided by the globular systems. We take this arrangement to indicate that the galactic clusters are relatively near at hand, most of them, like the bright stars, lying between us and the obscuring nebulosity.

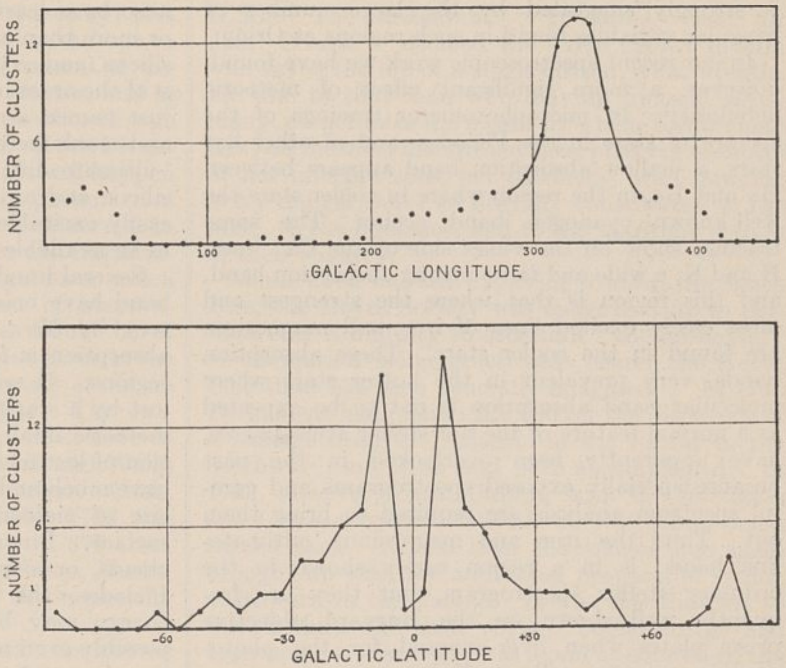


FIG. 1.—Determination of the direction of the centre of the Galaxy.

It appears probable that by continuing to feel our way around the edges of the centre-hiding nebulosities, and studying in great detail the stellar distribution in this central region, we shall in time be able to determine the distances of obscuring nebulosities and also to make a better guess at what may lie behind them—a guess as to whether or not our galactic system has a highly massive

nuclear concentration of stars, such as is observed in many of the extra-galactic nebulæ.

Dark Nebulæ, Meteors, and Stars.

In studying the distribution and distance of the dark nebulosities in the Milky Way, especially those in the direction of the galactic centre, we are led to investigate the various effects of such nebulosity on the apparent distribution, luminosity, and life of the stars. That such nebulosity is of the nature of meteoric dust is now generally accepted. It effectively blocks the light in many regions, and in some others there is a perceptible localised reddening—for example, for the nebulous stars studied by Seares and Hubble. That moving nebulosity may also incite the variability of stars is strongly suggested by the large number of irregular variables found in such regions as Orion.

In our recent spectroscopic work we have found, however, a more significant effect of meteoric nebulosity. In microphotometer tracings of the spectra of stars in the Pleiades, and of other hot stars, a shallow absorption band appears between $H\gamma$ and $H\delta$, in the region where in cooler stars the well-known cyanogen band occurs. The same tracings show on the violet side of the Ca^+ lines, H and K, a wide and fairly strong absorption band, and this region is that where the strongest and most easily excited lines of iron and magnesium are found in the cooler stars. These absorption bands, very prevalent in the hotter stars where molecular band absorption is not to be expected as a normal feature of the hot stellar atmospheres, have apparently been overlooked in the past because specially exposed spectrograms and careful spectrum analysis are required to bring them out. Thus the iron and magnesium 'ultimate-line band' is in a region rarely shown in the ordinary stellar spectrogram, but they are frequently well shown on the Harvard objective prism plates when over-exposed for the photographic regions usually studied.

Without going into further details, we briefly state that these bands in the stellar spectra probably arise from the absorption of starlight by infalling meteors or by comets and meteors moving at high velocities when the periastra of their orbits are near the surfaces of the stars. The bands are the first direct evidence we have had of the existence of enormous quantities of secondary bodies around stars. The high velocities, through the Doppler effect, smear out the structural detail in the bands, and extend their limits beyond the limits shown by laboratory spectra, or shown by ordinary atmospheric cyanogen and iron in the spectra of cooler stars.

The cyanogen, iron, and magnesium absorption might have been anticipated from a consideration of the probable meteoric infall in nebulous regions. The sun appears to be in a part of space fairly free from nebulosity, but extrapolating from the earth's daily intake of some twenty or thirty millions of naked-eye shooting stars, it is found that the sun absorbs at least a million million meteors a second, or more than a thousand tons of iron, magnesium, silicon, and oxygen, if the average mass of a meteor is of the order of only one milligram. The elements just named are the main constituents of the iron and stone meteors that meet with the earth. The 'ultimate line' absorption is not recorded for silicon and oxygen, which is natural, for the most easily excitable lines of silicon and oxygen are not in an available part of the spectrum.

Several hundred spectra showing the absorption band have been studied at the Harvard Observatory by Miss Payne and myself. The heaviest absorption is found in the most heavily nebulous regions. It seems likely that a part of the mass lost by a star through radiation is replaced by the meteoric infall. In the case of our sun the repletion of lost mass is scarcely appreciable, unless we have much underestimated (as is likely) the average size of meteors, or their frequency at the sun's surface. But in the case of stars in dark nebulous clouds, or even in lighter nebulosity such as the Pleiades, the radiative degradation of a star's energy may be much retarded, or balanced, or possibly even reversed. We appear to have found, as a by-product of the study of the region of the galactic centre, an indication that the meteoric matter of the dark nebulæ, and of space in general, can be observed spectroscopically as it feeds the stars.

The Bicentenary of Capt. Cook.

AMONG navigators of all ages, Capt. James Cook stands without a rival. Born amidst humble surroundings and apparently destined to occupy but an obscure station, by the force of natural ability and character and the cultivation of his talents, he raised himself to the highest rank among naval explorers, adding immensely to geographical knowledge and planting the British flag on two of its finest possessions. Cook was born at Marton, in the Cleveland district of Yorkshire, on Oct. 27, 1728, two hundred years ago. His father was but an agricultural labourer and farm bailiff, and Cook himself, as a boy of thirteen or fourteen years, was apprenticed to a shopkeeper near Whitby. But as on many another, the sea exercised a fascination which could not be resisted, and his youth and early manhood were spent in trading vessels of the east coast, and in the course of time he rose to be a mate. The North Sea was his high school and university; his study, the cabin of a collier.

The turning point in Cook's career came in 1755, when from a vessel lying in the Thames he volunteered for service in the Navy. War was imminent, the press-gang was abroad—the very press-gang Watt, as a youth of nineteen, alone in London, went in dread of—and Cook, volunteering for the service, exchanged his cabin in the merchantman for the forecastle of a man-of-war. He soon received promotion, however, and at that time there could have been few, if any, who by their industry,

sobriety, disposition, and experience were better fitted for service in the fleet. Four years later, in 1759, he was appointed master or navigating officer of the *Mercury*, was present at the taking of Quebec by Wolfe, and increased his reputation by surveying the St. Lawrence from Quebec to the sea. Appointed master of the *Northumberland*, he employed his leisure studying mathematics and astronomy, and in the next few succeeding years made his name as a scientific observer by his surveys of the coasts of Newfoundland and Labrador and his observations of an eclipse of the sun.

Cook's great chance in life came at the age of forty with his appointment as captain of the *Endeavour* and leader of the expedition to the Pacific to observe the transit of Venus of June 3, 1769. Circumstances had rendered the observations of the transit of 1761 unsatisfactory, and astronomers therefore looked forward with hope to that of 1769. So early as 1766 the council of the Royal Society began to discuss the matter, and in February 1768 a memorial was addressed to George III. submitting "That the passage of the Planet Venus over the disc of the Sun, which will happen on the 3rd of June in the year 1769, is a phenomenon that must, if the same be accurately observed in proper places, contribute greatly to the improvement of Astronomy, on which Navigation so much depends." . . . "That a correct set of observations, made in a Southern latitude, would be of greater importance than many of those made in the Northern," but "That the Royal Society are in no condition to defray this expense," etc. The outcome was that Lieut. Cook and Mr. Green were to be sent to the Pacific, Messrs Dymond and Wales to Hudson's Bay, and Mr. Call to Madras. Cook, granted a lieutenant's commission in May 1768, was placed in command of the *Endeavour* of 370 tons, and on Aug. 26, 1768, left England, Green, Banks, Solander, and other men of science accompanying him.

For the expedition Smeaton had constructed portable observatories, and the Royal Society provided two reflecting telescopes, one with a Dollond micrometer, an astronomical quadrant, an astronomical clock, an alarm clock, a brass Hadley's sextant, a barometer, two thermometers, and a dipping needle. Otaheite, or Tahiti, was reached on April 13, 1769, and the transit was successfully observed on June 3. Sailing westward, Cook then called at numerous islands, circumnavigated New Zealand, hoisted the British flag in New South Wales, skirted the hitherto unknown eastern coast of Australia, and after a stay at Batavia—where, unfortunately, sickness attacked the ship's company—he sailed for home around the Cape of Good Hope and anchored in the Downs on June 12, 1771, thus completing one of the most notable and fruitful voyages on record.

Cook's second voyage lasted from July 13, 1772, until July 30, 1775. Its main object was the circumnavigation of the globe in high southern latitudes, with the object of determining the existence or otherwise of a great southern continent. For this expedition the *Resolution* of 462 tons and the *Adventure* of 336 tons were purchased, and were equipped in the most liberal manner by the Admiralty. Though Cook met with no such Antarctic continent as was supposed to exist, he again circumnavigated New Zealand, exploring the eastern and southern parts; he discovered New Caledonia and Norfolk Island, and made many other additions to geographical knowledge.

This voyage, moreover, was remarkable for the methods by which Cook was able to keep his crew free from scurvy; out of more than a hundred men in the *Resolution*, he lost only one through disease, an achievement that he regarded as his greatest. On his return home he was made a post captain on Feb. 29, 1776, he was elected a fellow of the Royal Society, and later in the year received the Copley medal for his paper containing "the Method he had taken for Preserving the Health of the Crew of H.M.S. The *Resolution*." "If Rome," said Sir John Pringle, "decreed the Civic Crown to him who saved the life of a single citizen, what wreaths are due to that man who, having himself saved many, perpetuates the means by which Britain may now, on the most distant voyages, preserve numbers of her intrepid sons, her mariners; who, braving every danger, have so liberally contributed to the fame, to the opulence, and to the maritime empire of their country."

While Cook was still exploring towards the South Pole, the Royal Society was endeavouring to persuade the Admiralty to ascertain "the probability of navigation being practicable nearer the North Pole than has been generally imagined." In 1746 Parliament had offered £20,000 for the discovery of a passage from the Atlantic to the Pacific to the northward, but little had been accomplished. In 1773, however, Capt. Phipps, with the *Racehorse* and *Carcass*, reached latitude 80° 48′ before being turned back. A year later the scheme was again brought up with the additional proposal of sailing northward in the Pacific. It was this that led to Cook's third and final voyage, begun ere he had been home a year. He was again appointed to the command of the *Resolution*, while Capt. Clerke accompanied him in the *Discovery*. His instructions were to revisit some of the newly discovered islands in the Pacific and then to proceed northward along the western coast of North America. Having in the course of the voyage discovered the Hawaiian or Sandwich Islands, Cook arrived off the coast of America on Mar. 7, 1778, but in August, having reached latitude 70° 41′, the ice presented an impenetrable barrier and he returned to winter in the newly discovered Sandwich Islands. It was then he landed on Owhyhee, or Hawaii, the largest of the group, for the first time, and it was on the shore of Kealakakua Bay in Hawaii he met his death at the hands of the natives on Feb. 14, 1779, being then a little more than fifty years of age. It was the one hundred and fiftieth anniversary of Cook's discovery of the Hawaiian Islands which was celebrated at Honolulu and elsewhere last month, while it is the two hundredth anniversary of the birth which has been celebrated in Yorkshire this month.

Many competent judges have spoken of Cook's

work as an explorer and discoverer. As a circumnavigator, one writer has said that Cook stands unequalled "first for the magnitude of the work done in the time, second for its accuracy, third for the preservation of the health of his people." His efficiency as a commander and his scientific and seamanlike qualities were not alone responsible for his success. "His personality had more to do with it than his efficiency. What manner of man he was is shown by the fact that during the many weary months when the ship's companies were confined together in a small vessel the entries of punishment in the log-books were fewer than could be found in any other ships in the service at that time." It was, however, the French Admiral Dumont d'Urville, himself a distinguished explorer, who said that Cook was the "most illustrious navigator of both the past and present ages, whose name will for ever remain at the head of the list of sailors of all nations."

Obituary.

Prof. E. C. Grey.

EGERTON CHARLES GREY, who died on Aug. 10 at the early age of forty-one years, had long been engaged in researches on the biochemistry of fermentation by bacteria. Working with large inoculations of the organism and synthetic media, he made a careful study of the time relations of the chemical changes and found that well-defined phases of fermentation existed, characterised by different products. Thus, *B. coli*, under these conditions, produces from glucose, in the period immediately following inoculation, alcohol, formic acid, and succinic acid, whereas in the next subsequent period these products are partially decomposed, some of the sugar is synthesised to a non-reducing saccharide and lactic acid is formed; finally, a prolonged period of mixed fermentation occurs.

These experiments, coupled with the observation that the action of the bacteria on sugar varied according as the organisms had been grown aerobically or anaerobically, led Grey to the view (expressed in a paper which has appeared since his death in the *Proceedings of the Royal Society*) that the modified alcoholic fermentation produced by *B. coli* (which he regarded as strictly analogous to the alcoholic fermentation produced by yeast) was only possible when the organism had been recently grown in the presence of free oxygen, zymase (the alcohol-producing enzyme system) being the surviving portion of the respiratory mechanism, and alcoholic fermentation the result of its continued action, under anaerobic conditions.

Grey was the second son of the late Col. Arthur Grey, and, after his schooldays in Paris, graduated in the University of Sydney. After his return to Europe in 1912 with an 1851 Exhibition Scholarship, he became successively Beit Fellow and John Foulerton Student of the Royal Society, working at various times at the Lister Institute, l'Institut Pasteur, and the Biochemical Laboratory, Cambridge, and was awarded the degrees of M.A. (Cantab.) and D.Sc. (London), besides obtaining a medical qualification. During the war he served as a second lieutenant in the Royal Fusiliers, was wounded at Gallipoli and invalided from the service; afterwards he was engaged for a while as surgeon-sub-lieutenant to H.M.S. *Nereide*, and as interpreter in French and German, and took part in the operations in the Black Sea.

After the War, Grey was appointed to the chair of chemistry in the University of Cairo, and was decorated with the Order of the Nile. He relinquished this appointment to undertake research for the League of Nations on the food problems of Japan, in which connexion he made, in six months, analyses of all the typical foodstuffs of the country. He was the author of a book in which he described a new method of teaching analytical chemistry which he had found useful in his Cairo classes.

Grey was a man of attractive but unconventional character, full of enthusiasm for his subject. His early death is a great loss both to his friends and to biochemical science. A. Harden.

There are many who will regret to learn of the death of Mr. George Newlands, the Advisory Officer in Soils in the North of Scotland College of Agriculture. Mr. Newlands was a graduate of the University of Aberdeen and specialised in geology and in chemistry. After serving for a time as assistant to Dr. Gibb, the professor of geology, he worked as a chemist in munition works during the War. After his war service he joined the staff of the North of Scotland College of Agriculture as a research worker in soils under Prof. Hendrick, with whom he published a number of papers on the mineralogical constitution of the soil. He recently went to visit laboratories on the continent engaged on research work on soils; when there he was taken ill and died rather suddenly in Berlin. Never of very robust health, he had overstrained himself in an attempt to see as much as possible in a limited time. Soil science has lost in Mr. Newlands a worker of great promise who had reached the stage at which his work was becoming fruitful.

We regret to announce the following deaths:

Mr. George M. Beringer, a past president of the American Pharmaceutical Association, and formerly editor of the *American Journal of Pharmacy*, on June 23, aged sixty-eight years.

Mr. William Brown, lecturer in veterinary hygiene and agricultural bacteriology in the University of Aberdeen since 1913, and joint author of "The Modern Veterinary Adviser," on Sept. 3.

Sir Horace Darwin, K.B.E., F.R.S., founder and chairman of the Cambridge Instrument Co., Ltd., on Sept. 22, aged seventy-seven years.

Mr. W. S. Gray, Director of Chemical Section, Ministry of Agriculture, Cairo, on Aug. 31, aged fifty-four years.

Dr. Robert Knox, president of the Röntgen Society, a distinguished pioneer in medical radiology, on Sept. 21, aged sixty years.

News and Views.

THE scientific testing of materials, which may be said to have grown up from the work of Fairbairn, Hodgkinson, Wöhler, and other pioneers, has during the course of time led to the formation in most countries of societies, the main object of which has been the extension and co-ordination of this important side of scientific and technical work. Up to 1914 there was also an International Association for Testing Materials of Construction, the activities of which, however, ceased with the War and were not resumed. At a congress in Amsterdam in 1927 another society, the New International Association for Testing Materials (N.I.A.T.M.), was inaugurated with a simpler and more satisfactory organisation, and, to ensure adequate British representation on this, a British committee was formed consisting of delegates from the principal engineering, metallurgical, and chemical societies of the country, including the Department of Scientific and Industrial Research. Of this British committee, Sir Henry Fowler is the chairman, Mr. G. C. Lloyd is the honorary secretary and treasurer, while Dr. W. Rosenhain is the delegate to the permanent committee of the N.I.A.T.M. The British committee, 28 Victoria Street, S.W.1, in the interest of the science and art of testing in Great Britain, and in view of the importance of the maintenance of British status, has now issued an appeal to the members of the constituent societies and institutions to become members of the N.I.A.T.M., the subscription being the nominal sum of 10*s*. A Congress is to be held at Zurich in 1931, and others are to be held every three or four years, and members of several years' standing will be entitled to certain privileges. It may also be remarked that the work of the new Association is being divided between four international committees dealing respectively with metals, inorganic non-metallic materials (cement, concrete, etc.), organic materials (oil, indiarubber, etc.), and methods of testing, and of the first of these committees Dr. Rosenhain is the chairman.

THE starting of a company to provide an instrument which will receive pictures from the British Broadcasting Company next month is of interest to all who possess loud speakers. The instrument is called a 'fultograph,' and is interchangeable with an ordinary loud speaker. Simultaneously with the sending from the broadcasting station the picture is reproduced on a sheet of prepared paper which is attached to a revolving cylinder forming part of the apparatus. It is set in action by the release of a lever and begins to work automatically as soon as the transmission commences from the broadcasting station. The reproduction takes place in full view of the observer, who is able to see the building up of the picture, and no development of any kind is required. Upon the completion of the transmission a facsimile of the picture appears on the paper, which is then detached from the apparatus. The B.B.C. has made satisfactory experiments with these 'still' picture transmissions. It has decided to make arrangements for a short transmission daily from Daventry 5XX over a period beginning in October next. The Fultograph system will be used for the October transmission. Any future changes in the system of transmission with the view of the adoption of a standard must naturally be governed by technical developments. The Fultograph Company intends to grant licences to newspaper proprietors and news agencies to transmit photographs and other material over private telephone lines to be installed for such purposes. The apparatus transmits and receives minute details. It can give, for example, exact reproductions of finger prints. Although not so interesting as seeing moving pictures, the apparatus should prove useful for some purposes.

SOME of the chief problems of Antarctic exploration were noted in an article in the *Times* by Sir Edgeworth David in relation to Com. R. E. Byrd's forthcoming aeroplane expedition. Sir Edgeworth points out that the Bay of Whales on the Ross Barrier, where Com. Byrd proposes to make his base, is an excellent site for an attack on the chief problem of the Antarctic, that is, the relations of the Antarctic horst of the Ross Sea with the Antarctic Andes of Graham Land. The exploration of the gap between Carmen Land, on the east of the Barrier, and the Queen Maud Ranges is important. Sir Edgeworth suggests that a second base might be placed in Graham Land. He does not give the locality, and the difficulty would be, as the *Scotia*, *Endurance*, and *Deutschland* have shown, to reach a satisfactory base by sea. Foreseeing the danger of wintering a ship either at the Bay of Whales or in the Weddell Sea, Sir Edgeworth suggests that during the winter the ship might profitably be employed in sounding and dredging in Antarctic seas. No doubt a certain amount of such work might be done in winter, but the darkness and very stormy weather would not allow any extensive programme of work south of lat. 50° S. The suggestion is made that aeroplanes might be most usefully employed in laying down outlying stations in suitable places for intensive geological work and also as a rapid means of securing meteorological data from the higher layers of the atmosphere. It is in the study of Antarctic meteorology that we may look for the most definite practical results. The *Daily Chronicle* of Sept. 24 has an article on the programme of the expedition by Com. Byrd, and will publish dispatches from the expedition from time to time.

THE departure on Sept. 22 of another Antarctic expedition has been announced by the New York correspondent of the *Times*. Sir Hubert Wilkins, accompanied by Lieut. C. B. Eielson and Mr. J. Crossan, pilots, Mr. W. Gaston and Mr. O. Porter, mechanics, has sailed from Montevideo on the first stage of his journey to Deception Island, from which he hopes to make an aerial survey of the Antarctic continent. The expedition is taking two Lockheed-Vega aeroplanes, and proposes to fly from Deception Island to a point on the Antarctic continent, which will be used as a field base for survey work with the view of establishing meteorological stations. Later,

Sir Hubert hopes to fly to the Ross Sea, where Com. Byrd will be at work, and make a base there for further observations.

DR. EDWARD R. WEIDLEIN, the Director of the Mellon Institute of Industrial Research, wrote for the *Pittsburgh Record*, the quarterly magazine of the University of Pittsburgh, an article, which has been reprinted as a pamphlet, entitled "Achievements in Industrial Research." He begins by stating that with regard to a carefully prepared list of fifty-five noted inventions, selected because of their economic value, inquiry revealed that all of these great inventions had been made by applying scientific knowledge through experiment. After emphasing the interdependence of 'pure science' or 'fundamental' research on one hand, and 'applied science' or 'industrial' research on the other, and also their intellectual equality, in order of importance and in dignity, he points out that the co-operation in research typified by the combination of forces between the University of Pittsburgh and the Mellon Institute, "reduces to a minimum the time elapsed from the discovery of a principle in science to mass production."

THIS lag between the completion of the laboratory experiments and the full scale application of their results to industry is of great importance to industry in general. Sir Josiah Stamp, who calls it the 'period of gestation,' in a Watt Memorial Lecture delivered at Greenock, has recently directed attention to its economic significance. The various research associations established in Great Britain are well familiar with it as an industrial phenomenon. Increased co-operation between the pure science research workers, the industrial scientific workers, and the industrialists is undoubtedly one way to reduce this lag. Dr. Weidlein makes a fair point when he says: "The electrical industry, which is based upon the pure science research of Michael Faraday, required nearly a hundred years for its development. Compare with that the development of the radio industry or any of our other modern branches of manufacture during this period of better understanding of co-operation among the pure science research worker, the industrial scientist, and the industrialist." The pamphlet contains some apt and striking illustrations of the revolutions effected in many industries as the direct results of the application of the results of scientific research.

IN October 1927 a meeting was held at Washington of the International Union of Scientific Radio Telegraphy—the U.R.S.T. The first instalment of the papers presented at this meeting has now been published by the general secretariat, the offices of which are at 54, avenue des Arts, Brussels. The U.R.S.T. is divided into four sections; the first three cover measurements and standardisation, wave propagation, and atmospherics. The fourth section includes the work of amateurs. The price of the complete volume is 100 French francs. The papers have been written by well-known specialists from many countries. They are commendably short, but describe important results on wave propagation obtained by observation, experiment, and theory. Amongst the papers in this part are two by Prof. E. V. Appleton. He discusses first the question of whether there is one or more ionised layer in the upper atmosphere, and then the influence of terrestrial magnetism on radio transmission. In an interesting paper by H. B. Maris, a theory of the upper atmosphere is advanced which accounts for the phenomena observed in connexion with meteors. There is an instructive paper by Van der Pol on the effect of retroaction on the received signal strength. Other papers discuss frequency standards, short wave transmission, directional observations on atmospherics, the influence of solar activity, radio transmission, automatic recorders, and radio compass calibration.

THE place-names of mineral localities in central Europe have presented many difficulties in connexion with museum classification of specimens and with topographical indexes. The recently published paper on the subject in the *Mineralogical Magazine* (June, 1928, pp. 441-479) by Prof. F. Slavík (Prague) and Dr. L. J. Spencer is therefore of special importance to geologists, mineralogists, and the curators of museums. Prior to 1918 it was customary to use German names for the mineral localities in central Europe. Now that new States have been created, and others enlarged, the official names of many towns have reverted to the vernacular, and the old German and Hungarian names are being discarded in scientific and general literature. Sometimes these have been direct translations of the local names or have been approximate phonetic reproductions of the same names in German and Magyar. An example of the former is Nová Ves, in Czechoslovakia, which was rendered Neudorf in German. On the other hand, Zirovnica in Jugo-Slavia was termed Scheraunitz on pre-War Austrian maps. It must not be supposed that the Czech, Rumanian, and other place-names are new merely because they are in languages not generally familiar. Many of them were in general use in the Middle Ages, and whilst the use of German place-names dates from the time of Agricola, the Hungarian ones are of much more recent origin. In mixed ethnological districts it still happens that certain places have two officially recognised names. Such alternatives are officially recognised in Czechoslovakia when they represent the mother tongue of at least 20 per cent of the inhabitants. The authors of the paper give lists of the State place-names, together with their German and Hungarian equivalents and the minerals found there. The territory covered by these lists corresponds with the former Austro-Hungarian monarchy and those parts of the republic of Poland which previously belonged to Germany and Russia.

IN order that the public may become better acquainted with outstanding features of the Museum collections, a series of special exhibits is being arranged at frequent intervals in the Natural History Department of the Birmingham Museum. The present exhibit is of 'Flightless Birds.' It includes a fine specimen of the South American rhea, sometimes

called the South American ostrich, with its immensely powerful legs, and the wings now relegated to the purpose of balancers when the bird runs. Near by are specimens of the closely related New Zealand kiwi, in which the wings are invisible and the feathers resemble tufted hairs. In the penguins the wings have been adapted for service as paddles. The grass-green owl-parrot of New Zealand illustrates how a bird that had little occasion to use its wings in a land once almost free from aggressive animals, has lost the power of flight and is threatened with extinction now that man has introduced natural enemies. A life-sized drawing shows the great auk, which became extinct less than a century ago, and there is a coloured cast of the handsome egg. Another model of an egg, having a capacity of no less than two gallons, enables one to visualise *Æpyornis*, a gigantic bird from Madagascar which became extinct only within recent times.

THE Prime Minister, Mr. Stanley Baldwin, will open the new Safety in Mines Research Laboratories, Sheffield, on Thursday, Oct. 11.

THE Norman Lockyer Lecture of the British Science Guild will be given this year by Prof. J. Arthur Thomson, Regius professor of natural history, University of Aberdeen, on "The Culture Value of Natural History." The lecture will be delivered on the afternoon of Wednesday, Nov. 28, in the Goldsmiths' Hall, London, by kind permission of the Goldsmiths' Company.

THE Council of the Royal Sanitary Institute has accepted the invitation of the Sheffield City Council to hold its fortieth Congress and Health Exhibition at Sheffield on July 13–20, 1929. A public meeting to inaugurate the arrangements will be held in the Town Hall, Sheffield, on Friday, Oct. 19, at 3 P.M., under the chairmanship of the Lord Mayor of Sheffield.

THE Council of the Institute of Chemistry has decided to utilise the income from the legacy bequeathed to the Institute by the late Sir Alexander Pedler to provide a scholarship to be known as the Pedler Scholarship. The award will be of the annual value of £300, and will be open to fellows and associates of the Institute. The scholar will work on an investigation selected by the Council as being in the public interest, and this year candidates have had a choice of three problems: the sterols of natural fats, determination of sugars in mixtures with special reference to foods, and determination of casein, albumin, and globulin in milk. The expenses of the research will be met by the Pedler Fund.

THE following distinguished foreign men of science will be guests of the Faraday Society at the discussion being held at Cambridge on Sept. 28 and 29 on "Homogeneous Catalysis": Prof. H. Bäckström, Princeton, U.S.A.; Prof. J. Böeseker, Delft; Dr. E. J. Bigwood, Brussels; Prof. J. N. Brönsted, Copenhagen; Prof. H. Copaux, Paris (president of the Société de Chimie et Physique); Prof. H. Dufraisse, Paris; Prof. H. von Euler, Stockholm; Prof. F. Giordani, Naples; Prof. C. Moureu, Paris; Dr. Henri Moureu, Paris; Prof. M. Polanyi, Berlin; Prof. F. O. Rice, Johns Hopkins University, U.S.A. Prof. J. W. McBain, a vice-president of the Faraday Society, now at Stanford University, California, is also attending the meeting.

TWELVE major topics for discussion at the second International Conference on Bituminous Coal, to be held under the auspices of the Carnegie Institute of Technology, Pittsburgh, Pa., U.S.A., on Nov. 19–24, are tentatively announced by Dr. Thomas S. Baker, president of the Institute, and chairman of the Congress. Although the Conference will be similar in purpose to the first congress held in 1926, its scope has been considerably enlarged and the programme is more international in character. The discussion on fixed nitrogen will no doubt arouse considerable interest. The liquefaction of coal, which was one of the principal subjects of discussion at the first meeting, will again occupy a prominent place in the deliberations. Low temperature distillation will be treated by representatives of at least a half-dozen countries. High temperature distillation, power from coal, coal tars, and oils, complete gasification of coal, origin of coal, coal washing, pulverised coal, catalysts, and the general aspects of the bituminous coal industry are other topics that will be considered. Representatives from England include Lord Melchett, Dr. C. H. Lander, Mr. Harald Nielsen, Col. Lindemann, Dr. R. Lessing, and Mr. Edgar C. Evans; France, Germany, Italy, Austria, Belgium, Denmark, Poland, Russia, Japan, Czecho-Slovakia, Canada, Norway, Spain, Chile, Rumania, Jugo-Slavia, and Bulgaria will also send delegates.

MR. C. A. SILBERRAD, Forest Side, Epping, writes to point out that the statement that the month of Muharram of the Moslem year "corresponds with the month of August" in our Calendar of Customs and Festivals published Sept. 1, is not, strictly speaking, accurate. It should no doubt have been mentioned that the correspondence was approximate only and variable. In all equations of the Christian and Moslem Calendar it must, of course, be remembered that Moslem feasts are variable in our dating, owing to the fact that the Moslem calendar is lunar. All dates therefore work back each year approximately eleven days, with a maximum variation of about 22 days.

AN interesting catalogue (No. 508) of books, engravings, original drawings, maps, etc., relating to South and Central America, with short lists on Cuba, Hayti, Porto Rico, and Falkland Islands, has just been circulated by Messrs. Francis Edwards, Ltd., 83 High Street, Marylebone, W.1. Upwards of 900 works are listed. The catalogue should be seen by readers interested in South America. Messrs. Edwards also offer for sale, in catalogue No. 509, a number of books on gardening, horticulture, and botany.

APPLICATIONS are invited for the following appointments, on or before the dates mentioned:—An assistant to the Island Professor of Chemistry, Barbados—C. A. (T.), The Secretary, Board of Educa-

tion, Whitehall, S.W.1. For Scottish candidates, C. A. (T.), The Secretary, Scottish Education Department, Whitehall, S.W.1 (Oct. 1). A Bernhard Baron Research Scholar at the Ferens Institute of Oto-Laryngology of the Middlesex Hospital—The Secretary, Middlesex Hospital, W.1 (Oct. 5). A woman lecturer in education at University College, Southampton—The Registrar, University College, Southampton (Oct. 6). An assistant lecturer in the department of Civil Engineering, Architecture, and Building of the Bradford Technical College — The Principal, Technical College, Bradford (Oct. 6). A head of the department of engineering of the Constantine Technical College — The Director of Education, Education Offices, Middlesbrough (Oct. 8). A secretary of the Institution of Gas Engineers — The President, Institution of Gas Engineers, 28 Grosvenor Gardens, London, S.W. (Oct. 9). A full-time assistant lecturer in engineering at the Cardiff Technical College—The Principal, The Technical College, Cardiff (Oct. 13). A senior assistant lecturer in agricultural chemistry at the Edinburgh and East of Scotland College of Agriculture—The Secretary, Edinburgh and East of Scotland College of Agriculture, 13 George Square, Edinburgh (Oct. 15). A laboratory assistant in the food-canning section of the Low Temperature Research Station, Cambridge—The Secretary, Department of Scientific and Industrial Research, 16 Old Queen Street, S.W.1 (Oct. 15). A bacteriologist in the Department of Agriculture, Irish Free State, in connexion with the Dairy Produce Act, 1924—The Secretary, Civil Service Commission, 33 St. Stephen's Green, Dublin (Oct. 20). A librarian of the British Medical Association—The Medical Secretary, British Medical Association, Tavistock Square, W.C.1 (Oct. 20). A research chemist in the department of Coal Gas and Fuel Industries of the University of Leeds, primarily for research on carbonisation — The Registrar, The University, Leeds (Oct. 31). A principal of the Municipal College, Portsmouth — The Secretary, Offices for Higher Education, The Municipal College, Portsmouth. A temporary lecturer in elementary science and hygiene at the Warrington Training College, Battersea—The Principal, Warrington Training College, Vicarage Road, Battersea, S.W.11. An instructor in metalwork at the Darlington Technical College—The Chief Education Officer, Education Office, Darlington. A research assistant at the Research Association of British Motor and Allied Manufacturers—The Research Association of British Motor and Allied Manufacturers, 15 Bolton Road, W.4.

Our Astronomical Column.

THE APPROACH OF COMET PONS-WINNECKE TO THE EARTH IN JUNE 1927.—This approach was the closest cometary approach to the earth since that of Lexell's Comet in 1770. That comet had been discovered only a short time when it made its near approach, and observers did not know until later how small its distance had been (1½ million miles at minimum). Moreover, it does not appear to have presented a sharp stellar nucleus, as Pons-Winnecke did; the latter feature makes it possible to utilise the observations for a deduction of the solar parallax. A necessary preliminary work is the calculation of an accurate ephemeris at the time of near approach. Dr. R. T. A. Innes deals with this problem in *Astr. Nach.*, No. 5570. He notes that when the comet is near the earth, the perturbations of the two bodies by other planets are practically identical, and do not affect the comet's geocentric position. It suffices, therefore, in a solution by mechanical quadratures, to consider only the attractions of the sun and of the earth-moon system. Dr. Innes made successive approximations until the best accordance with observation was obtained. He gives an ephemeris at intervals of a fifth of a day from June 25·0 until July 2·0. The nearest approach to the earth was at June 26·8 when log Δ was 8·5952, giving a distance of 3·66 million miles.

Mr. Bengt Strömgren gives in the same number of *Astr. Nach.* an ephemeris of the comet at intervals of 1 day from April 28 to June 20, with corrections deduced from observation.

THE TRANSIT OF MERCURY IN NOVEMBER 1927.—M. J. P. Lagrula, in *Jour. des Observateurs* for June, discusses the photographs obtained of the transit at Algiers. He claims that photographs obtained when the planet was on the disc give much more reliable results than the visual observations of the times of contacts. The reverse was found in the transit of Venus in 1882, but the technique of solar photographs has improved since then.

The final result of a long discussion of the measures gives positions of the planet indicating that egress occurred 24ˢ·7 earlier than the time calculated from the *Nautical Almanac* data. This is in very good agreement with the results from visual measures.

M. Gonnessiat found from visual observations at Algiers 20ˢ from 3rd contact, 26ˢ from 4th. M. Deslandres found 25ˢ from a combination of the Meudon observations; Dr. Innes found 23ˢ from a combination of observations at a number of observatories. The determination is of value for checking both the motion of the planet's perihelion and the supposed variation in the earth's rate of rotation.

JAHRESBERICHT DER HAMBURGER STERNWARTE IN BERGEDORF, 1928.—This publication contains four plates reproducing photographs taken during the total solar eclipse of June 29, 1927, by the expedition sent from the observatory to Jokkmokk (Lapland). The first was taken with 1 sec. exposure, and a focal length of 20 metres. It shows much beautiful detail in the prominences and inner corona. An interesting set of coronal arches over a prominence can be seen in the south-east quadrant. An exposure of 18 sec. with the same instrument shows much greater extension of the corona but less fine detail. There is also a reproduction of a plate with 1 sec. exposure taken with the reflecting telescope. The last two photographs agree closely with each other and show a curious large hollow in the north-west quadrant extending through 50° of position angle: they also show a prominent pair of nearly parallel coronal rays a little south of the east point. The other plate contains seven spectra of the flash and the inner corona, taken with a prismatic camera, the exposures ranging from 1 sec. to 18 sec. The overlap of the moon beyond the sun was so small that many of the images appear as almost complete rings.

Research Items.

EMBALMING IN TAHITI.—A remarkable document relating to Tahiti forms No. 48 of the *Bulletin of the Bernice P. Bishop Museum* of Honolulu. Owing to the fact that development in Tahiti was rapid as compared with other parts of the Pacific, after its discovery accurate information as to its early native institutions is scanty. The best record of its customs about a hundred years ago is contained in Ellis's "Polynesian Researches," published in 1831. In 1848 the Rev. John Muggridge Orsmund presented to the French Government a manuscript embodying the result of his researches on Tahitian customs, institutions and history, drawn from native sources during a residence of thirty years. The manuscript disappeared, but his granddaughter, Miss Teuira Henry, a distinguished linguist and Tahitian scholar, who died in 1915, was able to reconstruct it from the manuscripts and notes left by her grandfather, as well as supplement and check it from her own knowledge. The result is a most valuable and comprehensive work, too wide indeed in scope for summary. The following information in relation to embalming is of interest. The operation was performed by an adept, who required a high remuneration. The body was placed on a portable altar, about three feet high, over a pit. The expert drew out the viscera through the anus, sucked the brains through the nostrils, and then buried them in a secret spot of the marae. The body was then allowed to drain into the pit through an opening in the altar. It was saturated with oil—sandalwood preferred—and the cavity filled to its natural size with tapa soaked in oil. The limbs were rendered pliant by frequent moving and the skin toughened and detached by massage, the flesh being squeezed out through perforations under the joints and dropped into the pit. A small pillar was placed in the pit to represent the body, and it was filled up. The body was then dried in the sun, after which it was placed in a sitting posture and dressed in a tapa cape with a turban. The hair was, if necessary, fastened on with gum.

QUARTZITE IMPLEMENT FROM DURHAM.—Dr. C. T. Tretman has published in Vol. 65 of the *Geological Magazine* a description, with illustration, of a supposed implement of quartzite from beneath the boulder clay of the Durham coast. It was found in a bed of water-deposited gravel at Limekiln Gill, about four miles north of Hartlepool. It has been seen by Mr. R. A. Smith and Mr. Reid Moir, who concur in thinking it definitely human and say that they would expect to find it in some margin between two principal boulder clays (inter-glacial of East Anglia). The specimen is therefore of some considerable significance as it comes from a bed underlying the Cheviot and Northern drift or Purple Clay, which at this spot is at least 70 ft. thick and consists very largely of typical boulder clay. The specimen looks like a rough attempt at a hand axe of Chellean or St. Acheul type. It is 3½ inches in length, 3 inches wide, and 1½ inches in thickness, and of yellow translucent, faintly banded quartzite. It is roughly chipped, with part of the smooth crust of a water-worn pebble remaining on one side. All the chips are of one period. The Limekiln Gill gravel, where the supposed implement occurred, is later than the Scandinavian glaciation of the Durham coast and later than the Westerly or Stainmoor boulder clay of Hartlepool, but earlier than the Cheviot and Scottish drift, which forms the main mass of the boulder drift that caps the coastal cliffs.

SWANS IN ANCIENT ENGLAND.—The importance attached to the domestic swan in former days is indicated not only by the elaborate system of swan-marking in vogue, but also by the appointment of accredited Masters of the Swans, a subject discussed by Dr. N. F. Ticehurst in *British Birds* (Sept. 1928). Although there are earlier records of the performance of the swan-master's duties, the first definite appointment recorded appears to be that of Thomas de Russham in 1361. The primary duty lay in caring for the royal birds and in maintaining the crown rights, which incidentally involved the supervision of swan-keeping by all private owners. Dr. Ticehurst discusses these various duties in detail under the headings of the maintenance of the royal prerogative, the preservation of the birds themselves, and the safeguarding of the rights of private owners and the prevention of fraud. A list, compiled from many sources, is appended, giving the names of swan-masters and deputies from Thomas Gervys in 1355, to 1799, when Richard Roberts was keeper of the King's swans on the Thames.

LARVÆ OF BRITISH CRABS.—Miss Lebour has continued her studies on the larvæ of the Plymouth Brachyura, and her latest work (*Proc. Zool. Soc.*, part 2, 1928, pp. 473-560) is a very notable contribution to our knowledge of decapod larvæ, since she is able to show that both zoea and megalopa of the Brachyura have definite systematic characters by which the families, genera, and usually even the species can be recognised. Out of 37 species of Brachyura known from Plymouth, she describes the larvæ of 33, and, as among these are represented most of the families of crabs, her survey of the group is of the utmost importance. Those who are concerned with marine plankton will owe much to her for the means now placed at their disposal by keys and coloured figures for the identification of their material; but perhaps the most valuable result is the proof given that these larvæ can be used to check the systematic arrangement of the adults. It is not possible at present to come to definite conclusions on some of the points of difficulty, since so much depends upon the correctness of the identification of some larvæ described by others. Cano's work, for example, has frequently to be brought into the discussion, but unfortunately it is often impossible to discover what ground he had for his identifications, and in some cases they can be shown to have been wrong. Miss Lebour has introduced some changes in the classification, but the most important point seems to be the evidence of relationship between the Leucosiids and the Pinnotherids. Bourne's work on the Raninidæ shows that the Oxystomata are not a natural group, and it is to be hoped that Miss Lebour's paper will lead to a revision of the Brachyura based to a large extent on larval characters. What is needed now is the identification of the larvæ of more of the exotic crabs.

INDIAN INSECTS.—A recent instalment of the useful "Catalogue of Indian Insects," in course of publication, is Part 15 (1928), by Mr. R. Senior-White (Calcutta: Government of India Central Publication Branch. London: High Commissioner for India) who lists the Cecidomyidæ or Gall Midges of that country. Altogether, 44 genera and 87 species are listed, and the publication of such a catalogue should prove a valuable aid to the study of the Indian forms of this important but neglected family of Diptera. The Catalogue, it may be added, is edited by a standing committee of entomologists appointed in India. Each part can be purchased separately, and is published under the authority of the Government of India.

PURKINJE AND THE DISCOVERY OF CELLS.—In a short article (*Anat. Anz.*, Bd. 64, 1927) and in a detailed memoir with full bibliographical references (*Acta. Soc. Sci. Nat. Moravicæ*, **4**, Fasc. 4, 1927) Prof. F. K. Studnička of Brünn deals with the part played by J. E. Purkinje and his school in the discovery of animal cells, and concludes that, without undervaluing the contributions of Schwann, more credit should be given to Purkinje and to his pupil and co-worker Valentin. He points out that the principal investigations leading to the discovery of cells in animal tissues were carried out in two schools in Germany—in that of Purkinje in Breslau, and in that of Johannes Müller in Berlin. To the latter school belonged Schwann, whose first papers appeared in 1838. Purkinje and his pupils, who worked in his house, and in particular Valentin, discovered cells—then termed in Breslau *Körperchen*, *Körnchen*, *Kugeln*—in various epithelia (1835–37), in the notochord and in cartilage (1835), in bone (1834), in nervous tissue (1836; they had been already observed by Ehrenberg in 1833), in the pigment layer of the retina (1837, by Valentin, who saw the nuclei), and in various glands, for example, liver, pancreas, mucous glands (1837). Nuclei were observed by Raschkow of the Breslau School in epithelial cells in 1835 and the nucleolus by Valentin (1837, but Rudolf Wagner had seen the nucleolus in 1835), and the names *Cellula* and *Zelle* were used by these authors. Under the direction of Purkinje, systematic researches on the whole range of animal tissues were carried out. In September 1837, Purkinje delivered a lecture in Prague on the gastric glands and their cells which he had recently discovered, and in the plate (reproduced in Prof. Studnička's memoir) he showed also multipolar ganglion cells with their nuclei. Prof. Studnička's documented contribution is of great interest and importance to all concerned in the history of our knowledge of the cell.

POWER ALCOHOL FROM VEGETABLE PRODUCTS.—Some months ago the Department of Scientific and Industrial Research published a memorandum on the production of power alcohol from grasses, straws, and waste vegetable material (Fuel for Motor Transport, Fourth Memorandum, 1927, 9*d.*). In the August issue of the *Annals of Applied Biology* (Vol. 15, No. 3), A. C. Thaysen and L. D. Galloway give further details of their work on this subject. A method has been worked out by which such materials as maize cobs, etc., are hydrolysed by dilute acids and the resulting liquor fermented to give a mixture of ethyl alcohol and acetone, eminently suitable as a motor fuel. No pressure vessels are required, and yields averaging 20 gallons per ton of dried material are reported. The organism employed is the pentose-fermenting *Bacillus acetoethylicus* (Northrop), and the conditions required for a successful large scale fermentation by this organism are fully described.

ENZYMES OF *ASPERGILLUS ORYZÆ*.—There are at least four large industries in Japan in which this fungus is of first importance—in the manufactures of rice wine, soy sauce, soy cheese, and *shochu*, a distilled alcoholic liquor. In this connexion a recent study of Kokichi Oshima on the protease and amylase of *Aspergillus oryzæ* is of some economic value (*Jour. of Coll. of Agri.*, Hokkaido Imperial University, Sapporo, Japan, vol. 19, part 3). A new method is detailed for quantitative estimation of these two enzymes by which determinations can be made easily, rapidly, and accurately. Amylase or diastase is not considered as one simple enzyme. Amylases of different origins often show different velocities of action, when their starch-liquefying, dextrinising, and saccharifying activities are compared. In the present paper the starch-liquefying reaction is determined by measuring the viscosity change of starch paste with Ostwald's viscosimeter, and the enzymatic activity in these determined from a prepared scale. Starch-saccharifying reaction is tested by reduction of Fehling's solution and by finding enzymatic activity from a scale prepared by using a generalisation of Lintner's unit. A protease which acts near to neutral reaction is estimated by casein liquefaction, the undigested casein being found as a precipitate by using a mixture of nitric acid and magnesium sulphate. Some precautions for elimination of errors in the use of Van Slyke's apparatus for the determination of α-amino nitrogen are also suggested.

CYTOLOGY OF SUGAR-CANE HYBRIDS.—It is well known that the sugar-cane in Java has suffered very badly from 'sereh' and mosaic diseases. G. Bremer (in *Archief voor de Suckerindustrie in Nederlandsch Indie*, part iii. 565; 1928) has published an account of crossing and back-crossing varieties of *Saccharum officinarum* and *S. spontaneum* which resulted in the production of hybrids with high sugar content and immune or very resistant to these diseases. The following cytological details are abstracted from an English summary received from the author. *S. officinarum* has 40 chromosomes (haploid) and *S. spontaneum* 56, while the F_1 of the cross between them had 136. The author concludes that the additional 40 chromosomes originated by the longitudinal splitting of the maternal (*S. officinarum*) chromosomes during fertilisation. The F_2 plants in general resembled those of the F_1 generation. Back-crosses of *S. officinarum* and F_1 plants had 148 chromosomes, indicating that the haploid number of the former had doubled again during fertilisation. It was by crossing these back-crosses again with *S. officinarum* that plants were obtained of high value for cultivation and resistant to both 'sereh' and mosaic. The somatic chromosomes of plants from this crossing varied in number from 106 to 120. A hybrid of *S. officinarum* and a variety of *S. spontaneum* from North Celebes again showed an increase of 40 chromosomes, presumably through the splitting of the *S. officinarum* chromosomes. There is some evidence that the size of the plants in *Saccharum* is dependent on the chromosome number. Some of the new sugar-canes, with about 57 as the haploid chromosome number, obtained in the above experiments were crossed again with *S. spontaneum*. From these crosses robust plants were obtained with about 170 chromosomes in the somatic cells. Though these hybrids are useless for cultivation, it is suggested that recrossing them with the best varieties of *S. officinarum* might result in some hybrids of high value with very high chromosome numbers.

UPPER PALÆOZOIC OF KASHMIR.—"The Fauna of the Agglomeratic Slate Series of Kashmir" by the late H. S. Bion, with an introductory chapter by C. S. Middlemiss, is the subject of a memoir recently issued by the Geological Survey of India (*Pal. Ind.*, New Series, vol. 12). The discovery of this fauna fills in a gap in Himalayan geology between the Middle Carboniferous (Fenestella Shales) and the Panjal Trap which underlies the Permian. The geological structure of the district is described in the first sixteen pages and illustrated by a map and sections, the remaining portion (of the 42 pages) being devoted to the fauna. This consists almost entirely of Brachiopoda, *Spirifer* and *Productus* predominating. Exact specific determination has not been possible in some cases, while a few are defined as new species. The six photo-type plates

of the fossils have been executed in its usual admirable style by the Survey.

EXPERIMENTS IN UNDERTHRUSTING.—Mr. G. R. MacCarthy has carried out an important series of box-experiments to determine so far as possible the conditions under which underthrust faults and underturned folds might be formed, and to study the effects produced by a plastic supporting layer on the form of the structures developed by compression on the materials above it. His record of the results and conclusions reached appears in the *Am. Jour. Sci.* for July 1928. Underthrusts appear to be favoured by great plasticity of the substratum, upward-moving resistances, and unequal distribution of the overburden, the latter condition being particularly effective when the greater weight lies farthest from the point at which the active pressure is applied. Comparison of the results with the structures of actual mountain systems shows that a good case for underthrusting can be made out for the Rockies, but the problem of the direction of movement in the case of the Appalachian structures still remains indeterminate. Mr. MacCarthy points out that he has discovered no criteria by means of which underthrusts might be distinguished from overthrusts from an examination of the structures themselves. This is an important consequence of Newton's law of action and reaction which is frequently overlooked in geological descriptions.

RADIOACTIVITY AND ASTROPHYSICS.—The August issue of the *Journal of the Franklin Institute* contains an account of the presentation of the Franklin Medal to Prof. Walther Nernst, of Berlin, on May 16, and a communication from Prof. Nernst on the above subject, which, in the absence of the author, was read by Dr. I. Langmuir. Prof. Nernst considers that the source of the large amount of energy expended as radiation in the universe during the two thousand million years that the sun has existed must be sought for in radioactive processes. There must be elements which decompose more rapidly than uranium, and in so doing give off much more heat. They must have higher atomic weights and their radiations be of shorter wave-lengths than those of the known radioactive elements. The newly discovered cosmic radiation appears to be of this type, and probably five to twenty million volts would be necessary to generate it artificially. Astrophysics is, he considers, dependent more than any other science on daring hypotheses.

THE PATH OF SHORT RADIO WAVES.—In the *Bell Laboratories Record* for July interesting experiments by H. T. Friis, of the Bell Laboratories' research department, to determine the path of short radio waves are described. Two receiving antennæ placed a short distance apart receive an incoming wave at slightly different times which depend on the direction of reception. If the output of these receivers is separately connected to a pair of deflection electrodes of a cathode ray oscillograph, the pattern traced on the face of the tube by the stream of electrons will be different for each direction of the incoming wave. The experiments show that, when daylight extends over the entire transmission path, the horizontal angle of reception is small; the figure on the oscillograph being merely a straight line or a very thin ellipse. When the sunrise or sunset shadow wall lies across the path of transmission, the ellipses become quite pronounced. This seems to indicate a refraction of the short waves along the shadow wall. A very long series of observations would be required, however, before the exact law can be found. The patterns traced by the oscillograph change not only in shape, but also in size. The signal figures are sometimes complicated, but this is probably due to interference between two waves of different amplitude. Although the fading of short waves can be caused by rapid changes in absorption, it is probable that change in wave interference is by far the commonest cause of this phenomenon.

PHOTOCHEMICAL DECOMPOSITION OF HYDROGEN AZIDE.—The *Journal of the American Chemical Society* for July contains an interesting paper by A. O. Beckman and R. G. Dickinson describing experiments carried out on the photochemical decomposition of hydrogen azide, HN_3. In spite of its violently explosive properties in the liquid state, hydrogen azide vapour can be manipulated fairly safely at low pressures (*ca.* 13 cm.), and the gas was found to be decomposed by ultra-violet radiation from an aluminium spark, only wave-lengths shorter than 2400 A. being effective. The products of the decomposition were hydrogen, nitrogen, and ammonia in the form of ammonium azide, which appeared as a white solid. The relative proportions depended on the initial pressure and the time of illumination, and probably all the decomposition products were set free simultaneously. The analyses for hydrogen and nitrogen were carried out by means of a quartz fibre gauge, and a determination of the molecular weight was made, using the fibre and M'Leod gauges. This showed that hydrogen azide vapour consists of unassociated HN_3 molecules as was deduced by Dennis and Isham (1907) from a vapour density measurement.

ATOMIC WEIGHT OF CESIUM.—The accepted value for the atomic weight of cesium is 132·81, and is based upon the work of Richards and Archibald (1903), but Aston (1921), using the mass spectograph, found that cesium is a simple element with a mass of $133 \pm 0{\cdot}2$. A redetermination of the atomic weight was therefore undertaken by the late Prof. Richards and M. Francon, and their results are given in the *Journal of the American Chemical Society* for August. The cesium chloride used was prepared from recrystallised cesium alums which were converted into the chloride and then into the perchlorate, when further recrystallisations were carried out. The chloride was re-formed by thermal decomposition of the perchlorate in a platinum boat, and the purity of the final product checked by spectroscopic examination. The results confirmed the value 132·81, the probable error being 0·012, and so the discrepancy between the chemical and physical determinations still remains.

HIGH FREQUENCY ALTERNATORS.—In the *English Electrical Journal* for July, a description is given of large power high frequency alternators which are used for induction furnaces. It seems that the difficulties formerly experienced in making high frequency alternators suitable for commercial purposes have now been overcome. The principle of using eddy currents for operating metal furnaces has been known for many years and offers many advantages. Unlike the use of furnace crucibles or electric arcs for melting, the eddy current system has the great advantage that no impurities can pass into the metal. The high frequency currents also set up a powerful circulation which causes intimate mixing of the ingredients, and consequently a highly uniform product. The magnetising coil is protected from the hot crucible by asbestos sheeting and sand packing. The 150 kilowatt furnace melts 450 lb. of steel in about 50 minutes, and the consumption of energy is at the rate of 750 kilowatts per ton. A photograph is shown of a 650 kilowatt machine which has a frequency of 1000. The over-all efficiency is more than 80 per cent, a result which a few years ago would have been considered quite impossible.

Radiovision in the United States.

THE use of the words 'radiogram' and 'radiophone' now seem firmly established to denote a message that has come through the ether, and the instrument by means of which we hear speech and music that has travelled through it, respectively. It seems natural, therefore, to call the seeing of pictures that have travelled through the ether 'radiovision.' According to this analogy, 'television' would be restricted to pictures that have travelled through wires. In this sense we use the words telegraph and telephone.

We learn from Science Service, of Washington, D.C., that there are now 'movies' as well as speech and music in the ether. At certain times of the day, silhouettes are being sent out from the Jenkins Laboratory Station, 3XK at Washington, and later on half-tone pictures will be broadcast. Picture subjects and picture stories, in silhouette, are much easier for the beginner to pick up than real scenes. That they are of interest has been proved by the success of moving picture cartoons at the picture theatres.

In the early days of broadcasting, many amateurs and enthusiasts got much pleasure from building their own sets and searching the ether to try to locate some particular broadcasting station, their pleasure being comparable with that of a fisherman when he first gets into touch with a fish. There is no doubt that the search for visual radio will appeal to many. Receiving radiovision is more difficult than receiving ordinary broadcast, but it is well within the power of an amateur familiar with the ordinary valve sets. Receiving sets are not yet on the market, but C. F. Jenkins, the well-known pioneer in this art, through Science Service, is providing the readers of newspapers with full instructions as to the best way of making one with the help of paper matrices. The apparatus is called a radiovisor. In addition, a small alternating or direct current motor of about $\frac{1}{10}$ horse-power, a special neon tube, and an ordinary radio receiving set are required.

Radiovision is generally restricted to mean the transmission and reception of images of scenes and living persons by means of radio waves. It is probable, however, that considerable use will be made of moving picture films in this connexion. In radiovision, light and shadow are translated into variations of electric intensity, and by means of an aerial produce waves which can be broadcast and received in any home.

The microphone of the ordinary radio transmission picks up sound vibrations and translates them into electrical waves. In a similar way, the eye, which is a photoelectric cell, of the radio transmission station analyses the scene or motion picture into strips of fluctuating light. These strips of fluctuating light, generally 48 in number, are converted into waves and then reconverted into light, which illuminates for a small fraction of a second a screen. Fifteen complete still pictures are flashed on the screen per second. The same principle is adopted as that used in phototelegraphy. A scanning device is used to focus the photoelectric cell on each point of the scene in succession. In radiovision it is necessary to scan the whole scene in the fifteenth of a second.

In order to receive the pictures, four essential parts are necessary, a radio receiving set of good quality, capable of receiving the short wave-lengths used in radiovision, a neon lamp, a scanning disc, and a motor to rotate it. The neon lamp used in America is marked G—10 A.C. 110 volt. The scanning disc is 12 in. in diameter, and 48 holes forming a spiral are punched on it. It can be made of paper, held between two small gramophone records to stiffen it. A rubber friction disc driven by a motor bears on the back of the scanning disc.

Synchronism is obtained by moving the motor board nearer to or farther from the centre of the scanning disc. At first there are only black and white dots and dashes in the picture area, but when synchronism with the broadcasting station is obtained, the picture suddenly appears when the lamp is looked at through the flying holes of the scanning disc. At this speed the motor is running at 900 revolutions per minute. When the picture ends, the picture frame becomes pink; the radiovisor is then switched off and the loudspeaker switched on to listen to the announcer. From 3XK the pictures appear in black silhouette on a pink ground.

International Congress of Mathematics at Bologna.

THE International Congress of Mathematics was held this year at Bologna, on Sept. 3–Sept. 10, under the presidency of Prof. S. Pincherle. In view of the chequered history of these congresses, it is interesting to note the names and countries of the vice-presidents. They include Profs. De La Vallée Poussin (Belgium), Hadamard (France), Hilbert (Germany), W. H. Young and J. C. Fields (Britain and Dominions), Veblen (U.S.A.), Terradas (Spain), Sierpinski (Poland), H. Bohr (Holland, Denmark, Scandinavia), N. Lusin (Russia), and S. Kakeya (Japan).

In a sense this was the first congress of a really international character since the War, and for this reason, if for no other, it was a great pity that England, from the point of view of numbers, was so poorly represented that the matter was freely commented upon.

The first International Congress was held at Zurich in 1896, followed at regular intervals of four years by conferences until they were interrupted by the War. After the War, an attempt was made to renew the periodic sittings, but mathematicians, despite the universality of appeal of their subject, were unable to free themselves from the bondage of war psychology, and representatives from the countries of the Central Powers were at first deliberately excluded. Two conferences have been held with this restriction, one at Strasbourg in 1920 and the other at Toronto in 1924. At the conclusion of the latter, a resolution was carried expressing the view that the period of exclusion should be terminated. Such a resolution was not likely in itself to be successful in drawing once more within the ambit of an international body the powerful group of German mathematicians without whose co-operation such a conference was certain to be ineffective. The transition on this occasion was made the more easy and certain by the fact that the invitations to Bologna were sent out by the *University* of that town without regard to nationality.

The result was that although certain German university representatives were conspicuous by their absence, other schools, Göttingen for example, appeared in such force, both of talent and of numbers, as to exert an almost dominating influence on the gathering. To judge from numbers, appearances suggested that Britain and not Germany had been the excluded country. Out of nearly eight hundred mathematicians,

British members totalled scarcely more than a score, and among nearly four hundred contributions, papers by English mathematicians were few and far between. The public addresses, however, were fully international in character: they were delivered, among others, by D. Hilbert on "Problems of Mathematical Logic"; by J. Hadamard on "The Development and the Scientific Rôle of Functional Calculus"; by E. Borel on "The Calculus of Probability and the Exact Sciences"; by O. Veblen on "Differential Invariants"; by W. H. Young on "Mathematical Methods and Limitations"; by V. Volterra on "The Theory of Functions applied to Problems of Heredity"; by H. Weyl on "Continuous Groups"; and by T. von Kàrmàn on "Mathematical Problems in Modern Aerodynamics."

In the main, the interest of members appeared to be centred on the pure rather than on the applied side of mathematics, and this was reflected in the nature of the communications made. From among British mathematicians present, papers were read by L. J. Mordell, D. Wrinch, H. Levy, E. T. Whittaker, H. W. Turnbull, L. M. Milne-Thomson, and J. C. Fields.

Nothing was spared by the Italian Government, the Municipal authorities, and the University to make the stay of the members as pleasant and attractive as possible, and numerous valuable facilities were freely granted to delegates. The history and architecture of Bologna were explained in book and brochure, the museums and art galleries thrown open, and excursions conducted to points of interest.

The final sitting was held at Florence, when it was arranged that the next conference, in 1932, should be held in Switzerland. If the International Congress at Bologna does not record any epoch-making discovery in mathematics, it is at any rate likely to mark, rather late, it is true, the definite termination of a state of misunderstanding among mathematicians.

"Nous osons affirmer," said Prof. Pincherle in his presidential address, "que le souvenir de cette réunion sera une pierre miliaire dans l'histoire du développement des rapports scientifiques: nous osons croire qu'elle ouvre une série nouvelle de Congrès, où les anciennes mésintelligences seront oubliées, et où les savants de tous les pays marqueront périodiquement les progrès obtenus dans ce domaine idéal qui embrasse les plus hautes et les plus délicates associations de la pensée, et qui trace à la technique les directions à suivre pour contribuer, par les voies les plus rationnelles, au bien-être de l'humanité."

Oxford Meeting of the Association of Special Libraries and Information Bureaux.

THE Association of Special Libraries and Information Bureaux (Aslib) held its fifth successive annual conference on Sept. 14–17 in New College, Oxford. During the past year it has been registered as an incorporated body, and the membership has grown from 311 to nearly 400; but a higher rate of increase will be necessary in future if the Association is to become self-supporting. In addition to other tasks before it, the Association must at once proceed to collect material for keeping up-to-date and enlarging the very useful Aslib Directory (of Sources of Specialised Information) which it published early this year, thanks to the generosity of the Carnegie United Kingdom Trustees.

Scientific and Technical Abstracts.

One of the chief functions of the Association is to bring together workers in different branches of learning for the discussion of common problems. Abstracts are of common concern, and the paper which was read by Dr. W. Rosenhain will serve to focus attention upon the defects of present systems, which are too indiscriminate and uncritical, and result in much waste of time.

In Dr. Rosenhain's view, a good system should provide a 'reasoned index' of all published literature; it should serve as a guide to the more important publications; and it should act as a 'filter' to obviate the reader clogging his mind and wasting his time on a mass of profitless material. This index should be divided into three groups: (*a*) abstracts of really important papers, which should be critical and not too brief; (*b*) abstracts of less-important papers; and (*c*) abstracts of papers of comparatively little value. Abstracts in groups (*b*) and (*c*) should not as a rule exceed a three- or four-lined précis of the contents of a paper, but the critical review-abstracts in group (*a*) should direct attention to doubtful statements, to work done by inexperienced authors or by methods too crude to be exact, and to work which is purely repetitive.

Such a system could only be implemented by wide co-operation among all bodies concerned with abstracting in a given country, but preferably on an international basis. A central abstracting bureau would have to be set up that would command the services of a body of able editors, referees, review-abstracters, and competent indexers. The financing of such a scheme should not be insuperable, as much money would be saved by abolishing present wasteful methods. Certain bodies could not afford to abandon their abstracts because of the revenue which they bring in, but they could draw their supply from the central bureau and acquire from it the sole right of publication. The discussion upon this paper disclosed much opposition to the idea of critical abstracts, and it was suggested that criticisms should be supplied in the form of review articles or reports published at a later date.

Preservation and Reproduction of Printed Matter.

In view of the probability that much of the paper used to-day is unlikely to last more than forty or fifty years, the durability of printed matter is a subject that concerns all societies which issue publications, as well as publishers of 'books that are books.' Thirty years ago the Royal Society of Arts issued a report on the deterioration of paper, embodying the findings of a special committee appointed by it; these findings are still applicable to-day. Durability of paper is determined by the kind of cellulose employed, by the treatment meted out to it in the mill, and by the quality and quantity of rosin, alum, etc., used in the manufacture. The best paper is made of cotton or linen rag that has not been over-boiled or over-bleached; it should be free from 'loading,' from colouring matter other than mineral colour, and from rosin. Such a paper is highly resistant to light and heat, and will keep, if properly stored, for hundreds, if not thousands, of years. Following 'rag' papers in order of durability are papers made of wood-cellulose or chemical pulp, esparto and straw celluloses, and mechanical wood pulp.

A good paper made of chemical pulp is, however, better than a rag paper that has been badly made, and according to Mr. N. Parley, who introduced this subject, a paper composed of equal parts of rag and chemical pulp should, if properly manufactured, last at least 400 or 500 years; and it should not cost

more than twice as much as the average book-papers of to-day. On the proposal of Mr. Parley, the Association passed a resolution (*a*) endorsing the recommendations of the committee of experts appointed by the International Committee on Intellectual Co-operation that the attention of governments be directed to the necessity for using documents and printed matter of permanent value, and only such papers as are manufactured according to given specifications; (*b*) asking H.M. Government to consider the establishment of a testing station to fix standards of durability for papers and other writing materials, and (*c*) to consider the advisability of enforcing by statute the printing of books, etc., for the copyright libraries on papers of approved durability.

In a second paper, on the reproduction of books and manuscripts, Mr. Parley urged the virtues of the recently introduced Replika process, which he claimed is superior to most other processes now in use. Collotype remains supreme where tone has to be reproduced, but it is relatively very expensive, and 'photostat' is economical only when a few copies are required. Replika is a combined printing and photographic process, which involves the use of light zinc or aluminium plates and accurate machinery employing the rubber blanket for printing. It is said to be particularly serviceable for reproducing extracts from transactions of learned societies, with or without size reduction.

Agricultural Intelligence Services.

With the object of evoking a discussion among agricultural research workers, Dr. E. H. Tripp read a paper dealing with the informational aspects of agricultural research. The complexity and extremely wide geographical distribution of agricultural research, with its ever-increasing volume, demand not only organised attack of problems on a wide front, but also organised preparatory or intelligence work. Intelligence departments, staffed with trained scientific workers, are becoming increasingly necessary as research work increases in volume and importance, and the functions of 'searcher' and 'researcher' tend to become more distinct.

Intelligence facilities for agricultural research are not good: not only are adequate subject-indexes lacking, but also libraries containing agricultural collections are for the most part small and widely dispersed throughout the country. It was suggested that each small library should attempt to accumulate a complete collection of the literature of a special branch, leaving Rothamsted to aim at a complete general collection. Every special library should command the services of at least one assistant conversant with the special subject with which the library deals. Librarianship is not enough; one must have special knowledge. The intelligence worker, whether he be in an information bureau or special library, must also have a good command of the English language, and of at least two foreign languages, of which German must be one. Intelligence work offers a good opening for some of our scientific unemployed.

Indexes to Periodicals.

An informal discussion on the indexes of technical journals was opened by Mr. H. H. Johnson, editor of *Engineering*, whose contention that existing types of indexes are not only too diverse but also for the most part inadequate, was heartily supported. A resolution was passed asking the Council of the Association to appoint a special committee to consider practicable and economical methods of improving the indexes and lists of contents of scientific and technical periodicals.

University and Educational Intelligence.

Dr. W. T. H. Williamson, senior assistant lecturer in agricultural chemistry at the Edinburgh and East of Scotland College of Agriculture, has resigned, on appointment as Director of the Chemical Section of the Egyptian Ministry of Agriculture at Cairo, in succession to Mr. W. S. Gray, who died on Aug. 31.

An interesting programme of University Extension Lectures for the coming session has just been issued by the University of London, South Kensington. In addition to the courses which will be delivered in the City, lectures will be given at about fifty local centres in different parts of London and the suburbs, covering various periods and aspects of literature, geography, painting, music, history, science, architecture, and economics.

In the Aeronautics Department of the Imperial College of Science and Technology are conducted regular courses of advanced study in aeronautical science lasting one or two years. A syllabus is given in the Department's pamphlet for the session 1928–29 of a one-year course in design and engineering and in meteorology, which qualifies for entering upon a further course in aeronautical research. The Department was established in pursuance of the recommendation of the Committee on Education and Research in Aeronautics, which reported to Parliament in 1919 that the Imperial College should become the central school for advanced study in this subject. It is under the direction of Prof. Leonard Bairstow, and is, in the main, a school for graduates. Among institutions in which provision for undergraduate work in aeronautical engineering is made are the East London College and the Northampton Polytechnic Institute. The former offers a three years' course in aerodynamics and aeroplane design for students proposing to take the London B.Sc. (Eng.) degree examination. At the Polytechnic, aeronautical engineering is one of five branches (the others being civil, mechanical, electrical, and electrical communication) in which candidates for the College Diploma, with or without the London B.Sc. (Eng.) degree, specialise in the third and fourth years of their course.

We have received from the London County Council's Education Offices a handbook for the session 1928–29, giving particulars of the Council's admirably abundant provision of evening lectures and classes for teachers. The scheme, which is intended to be self-supporting by means of small fees, is designed to bring London teachers into touch with the latest developments in educational methods, and to give them opportunities of hearing leading authorities in various branches of learning and on current questions of importance. That teachers appreciate the provision thus made for their intellectual recreation and improvement is shown by the fact that last year the entries exceeded 14,000. The fees average less than a shilling a lecture for teachers in London and certain other privileged areas. Under the heading of science appear notices of courses of lectures by Prof. Winifred Cullis on food and health; by Dr. Ralph Williams on hygiene for boys' schools; by Prof. C. A. Edwards, Principal of University College, Swansea, on metals and their alloys; by Prof. C. R. Darling, on science in the home; and several others. The Director of the Science Museum will arrange a series of three weekly lectures and demonstrations on the Electrical Engineering Collection at the Museum at South Kensington. Several scientific societies are co-operating by placing at the Council's disposal for distribution to teachers a certain number of tickets of admission to their ordinary meetings.

Calendar of Customs and Festivals.

September 30.

THE COURT OF FOOLS.—In the year 1381, at Cleves, "on the Day of St. Cumbert" was instituted an "Order of Fools" of which it was ordained that a court lasting seven days should be held at Cleves in each year on the first Sunday after Michaelmas, the time to be passed in conviviality and good fellowship. The members were to wear a fool in silver or embroidery on their coats under penalty of a fine, such fines to go to the poor, and amity was to prevail among them under pain of expulsion from the Court.

Another Society of Fools was instituted in Poland, also in the fourteenth century, but here the qualification was some act or habit of outstanding folly, according to the character of which office in the society was bestowed; for example, a man inordinately fond of dogs was made master of the hunt. The society rapidly assumed large proportions.

October 1.

At Kidderminster the inauguration of the annually elected magistrates used to take place on the first Monday after Michaelmas. The town hall bell gave the signal for the 'lawless hour,' when the people assembled in the streets and cabbage stalks and other missiles were flung about. At the end of the hour the bailiffs elect and Corporation in their robes with a band visited the retiring magistrates, and then quantities of apples were thrown from the windows of their houses.

October 2.

GOOSE FAIR.—Once an annual fair at Nottingham for the sale of geese from the fens of Lincolnshire. The Mayor of Nottingham customarily gave a feast of roast goose on the last day of his office. The fair will be held this year for the last time. A local festival known as 'Goose Fair' was held at Great Crosby, near Liverpool, each year, and coming at the end of the harvest served as the harvest home.

October 6.

ST. FAITH'S DAY.—A curious custom forecasting marriage is recorded from the north of England. Three maidens or widows share equally in the making and baking of a cake, each turning it three times in the cooking. When done, it is cut into three portions, and each divided into nine slices. Each slice must be passed through the wedding ring of a woman married at least seven years. Each then eats her nine slices of cake as she goes to bed, repeating a verse. She sleeps with the ring suspended above her bed and dreams of her future husband.

THE MAYOR OF MYLOR.—At Penrhyn in Cornwall, when the nuts were ripe, a nutting day was held in late September or early October. The rabble of the town went out to the woods early in the morning and gathered nuts, returning with green boughs. In the meantime the journeyman tailors repaired to the adjacent village of Mylor, where they elected one of their number, usually the wittiest, as 'Mayor of Mylor.' He was then carried back to Penrhyn in a chair shaded with green boughs in a procession headed by stout fellows with cudgels, torch bearers, two 'town sergeants' in cocked hats and official gowns, but bearing cabbages instead of maces, and the nutters in the rear. The procession marched to the town hall, where the 'mayor' made a burlesque speech outlining his 'policy.' The day ended with fireworks and bonfires on 'The Green' and 'Old Wall.' There was a popular tradition that a clause in the town charter required the mayor of the town to yield up his authority to the 'Mayor of Mylor' on this night, and to allow the use of the official insignia of the town sergeants.

Similar mock mayors were elected in other parts of Cornwall. At St. Germans on May 28 a mayor was elected who was drawn round the boundaries in a cart. At Bodmin at the end of July a 'Mayor of Halgaver' was elected who dealt with minor and imaginary offences.

HARVEST.—Although the 'corn baby' represents the corn spirit, that spirit is not necessarily withdrawn from the remainder of the crop by its reservation. The sacrosanct character of the crop is unimpaired, and it is still dangerous to the devotees of the corn god: hence the Harvest Home and the first-fruit ceremonial. In the former the agriculturist does not merely rejoice at the gathering of the crop; he enters into a solemn communion with the deity by a sacrificial meal of which the substance of the deity is the material. The first-fruit ceremonies, in which an offering of the crop is made to the deity, remove the taboo arising from the sanctity which renders it dangerous until that quality has been neutralised. The special sanctity of the first fruits is shown by the fact that when eaten they must be taken fasting, just as the Christian fasts before Communion.

In Sweden the grain of the last sheaf was baked in the form of a little girl, and was then distributed to be eaten by every member of the household, while at La Palisse in France, a man made of dough was carried on the last load and then preserved until the close of the vintage, when it was broken up and eaten at a feast. In Lithuania, two hundred years ago, the new corn was eaten at the beginning of December at an elaborate ceremonial meal to which every kind of crop contributed and of which every member of the household partook, while a cock and hen of the year were sacrificed as an offering to 'god' and 'earth.' The first-fruit festival of the Creek Indians—the principal festival of their year—involved complete provision of new clothes, new utensils and furniture, new fire, fasting, purging, purification, and an offering of the first fruits to the fire spirit before the new crops could be touched. It will be noted in the "yam custom" of Ashanti, described in NATURE, Sept. 1, p. 334, not only were portions of the new yams given to the spirits, but the whole country had to be purified before the new yams could be eaten (for further examples see Frazer, "Golden Bough," abridged edition, pp. 479 *sqq.*).

As a parallel among primitive peoples to the rejoicing and horse-play of the peasant's harvest home may be quoted practices among the pagan tribes of Borneo. The women take cakes of the sticky boiled new rice and cover them with soot. These they endeavour to imprint on the faces and bodies of the men, who endeavour to retaliate. Drinking of the liquor made from the new rice and feasting are followed by dancing, in which some of the women dress as men carrying *padi* pestles. In one dance a woman leads holding a dried head, her followers being women dressed in war-coats. Another dance represents the departure of the spirit, and is a dramatic representation by three performers of the death of one of them who is restored to life by the Water of Life, which is supposed to be brought from the country traversed in the journey to the land of shades.

Part of the harvest ceremonial is a form of divination or good luck ceremony with four water beetles which are placed in a large gong filled with water. From their movements the good or ill success of the next year's crops is foretold. The aid of Laki Ivong to bring the soul of the *padi* to their homes is invoked.

Societies and Academies.

PARIS.

Academy of Sciences, Aug. 13.—**A. Lacroix**: New observations on the lavas of the Marquesas and the island of Tubuai (Southern Polynesia). Complete analyses of 21 specimens are given.—**Eugène Slutsky**: A criterion of the stochastic convergence of ensembles of contingent values.—**Silvio Minetti**: An equality in the theory of integral functions.—**Henri Muraour**: The laws of combustion of colloidal powders.—**G. Valensi**: The action of nitrogen on manganese. Pyrophoric manganese, obtained by the distillation of its amalgam, heated in nitrogen under atmospheric pressure, absorbs quantities of the gas which are a function of the temperature. The experimental results are given as curves. The true composition of the manganese nitride is still unknown, but is certainly richer in nitrogen than the generally accepted Mn_3N_2.—**Eugène**: Annealing anomalies after cold hardening of copper and brasses.—**A. Travers** and **Sehnoutka**: The hydrated tricalcium aluminate. The existence of this compound has been doubted: by using very dilute solutions of potassium aluminate and calcium nitrate, fine needles are obtained which have the composition $Al_2O_3 \cdot 3CaO \cdot 21H_2O$. The *p*H of the solution must be maintained within close limits, 11·55 and 11·62.—**Bourguel** and **Rambaud**: The determination of the spatial configuration of two *cis-trans*-ethylenic isomers. A study of the isomeric tetra-methylbutenediols,

$$(CH_3)_2C(OH) \cdot CH = CH \cdot C(OH)(CH_3)_2.$$

The author's conclusions are opposed to those of Salkind.—**Antoine Willemart**: Contribution to the study of the coloured hydrocarbons of the rubrene family.—**P. Russo** and **Mme. L. Russo**: First geological observations on the northern Rif.—**A. Magnan** and **A. Sainte-Laguë**: The static equilibrium of fishes. A fish can remain a long time in the same place, apparently immobile. As a result of a kinematograph study of a black bass, it is shown that the fins are in continual motion, and the nature of the motion can be determined from the photographs.—**K. Toumanoff**: Concerning aspergillomycosis of bees. The experimental infection of bees by *Aspergillus flavus* is easily realised. Multiplication of the fungus inside the body of the insect is rare, at least with the strains employed in this research. It was proved that the sterilised filtrates from cultures of the fungus are toxic to bees.

Aug. 20.—**A. Lacroix**: New observations on the lavas of the Leeward Islands and the Society Islands. Complete analyses of fourteen rocks are given.—**G. Bigourdan**: The observatory, instruments, and observations of Delambre at the rue Sainte-Avoye.—**A. Cotton**: The automatic mounting of a concave grating by the method of H. C. Richards. The author's communication of Jan. 16 last was anticipated by H. C. Richards in 1912 (*Proc. Amer. Phil. Soc.*).—**Charles Moureu, Charles Dufraisse**, and **Léon Enderlin**: Researches on rubrene. The constitution of rubrene. A constitutional formula is proposed for rubrene, mainly based on the fact that on oxidation with chromic acid, *o*-dibenzoylbenzene is formed in considerable amounts. Willemart has arrived at the same formula by another method.—**H. Vincent**: Anticolibacillus serotherapy. The results of its use in acute or chronic infections with *Bacillus coli*. In cases of gangrenous appendicitis, complicated with perforation, or with local peritonitis, the anticolibacillus serum has proved a valuable aid to surgical treatment, and has effected rapid and unexpected cures in very grave cases. In suppurating pyelonephritis of coli bacillus nature (verified in the laboratory), the serum has proved very active in cases in which the usual treatment has proved ineffectual. Some examples are given in detail.—**Krawtchouk**: The convergence of some methods of the approximate integration of differential equations.—**N. Stoyko**: A case of equation of lighting in meridian passage observations. The corrections of the clock determined with the aid of the Bouty meridian telescope at the Paris Observatory, have shown a systematic deviation which depends on the lighting of the field of the telescope. An equation for correction is worked out.—**N. Kryloff**: A method for the approximate solution of the problems of mathematical physics.—**Vasilesco Karpen**: New researches on batteries contradicting the second law of thermodynamics. A description of experiments with a cell composed of graphite, caustic soda solution, platinised platinum. From the rate of change of the E.M.F. of this cell with temperature, the second law of thermodynamics implies a reaction between water freed from air and graphite or platinum. Such a reaction appears improbable.—**G. Vavon** and **Crajcinovic**: The hydrogenation of nitrobenzene by platinum black. The reduction of nitrobenzene by hydrogen in the presence of platinum black and benzaldehyde gives *N*-phenylphenylnitrone in quantities which prove that the greater part of the nitrobenzene on reduction passes through the stage of phenylhydroxylamine.—**Edouard Rock**: The facies of the Jurassic in western Morocco.—**E. Rothé, J. Lacoste**, and **Mlle. Y. Dammann**: Earthquakes in France in 1927. Seventeen well-characterised earthquakes were felt in France during 1927. The Central Plateau, Alsace, and the Vosges were more stable than during 1926. In the south-east there was one violent shock, causing damage in the Mont Ventoux region, but the seismic activity was mainly manifested in Brittany and Normandy.—**E. A. Martel**: The four deepest abysses (natural pits) in the world (Italy, 420 to 637 metres). A description of pits at Monte-Lessini, Montenero, and Fiume. The Bertarelli or della Harna abyss has been described in an earlier communication.—**V. Agafonoff**: Some red soils of Cochin-China.—**Mme. Hufnagel** and **de Nabias**: Does radium act upon insects in the course of their metamorphosis? Experiments with *Calliphora* and *Hyponomeuta* showed that exposure to the gamma rays of radium was without effect on development.—**Edm. Sergent, A. Donatien, L. Parrot, F. Lestoquard**: The biological conflict against bovine piroplasmosis due to *Theileria dispar*. Bovine theileriosis is a house disease: the tick which transmits it bites the horse; but this animal is refractory to the disease.—**C. Levaditi, P. Lépiene**, and **Mlle. R. Schœn**: The spirochæticidal properties of the element vanadium. Asterogenesis round particles of vanadium. Elementary vanadium, finely divided, and in suspension in olive oil, exercises a marked curative action in spontaneous spirochætosis and in experimental syphilis.

BRUSSELS.

Royal Academy of Belgium, July 7.—**P. Fourmarier**: The relations of the 'massif de la Vesdre' and the synclinorium of Dinant.—**E. de Wildeman**: Branching of the oil palm (*Elæis guineensis*). Branching in the oil palm is due either to the death of the terminal bud or to some disease which prevents its growth.—**Jean Pelseneer**: Radiation in generalised relativity.—**F. Dacos**: Note on the velocity of the α-particles.—**Alliaume**: The investigation of star streams.

SYDNEY.

Linnean Society of New South Wales, July 25.—J. R. Malloch: Notes on Australian Diptera (No. 15).—Genera and species in the families Sapromyzidæ, Sciomyzidæ, Borboridæ, Muscidæ, Calliphoridæ, and Tachinidæ are dealt with. Two genera, one subgenus, and ten species are described as new. (No. 16.) Deals with genera and species in the families Ortalidæ, Ephydridæ, Drosophilidæ, Sapromyzidæ, Calliphoridæ, and Stratiomyiidæ. One genus and nine species are described as new.—A. M. Lea: New species of Australian Erirhinides (Curculionidæ). The paper deals with some small weevils of the subfamily Erirhinides, of which 42 species are described as new, the most interesting of these being the species of *Glaucopela* which was taken in large numbers from the nest of a bird at Ooldea in South Australia.—A. S. Le Souef: Notes on four little-known species of kangaroos. In the genus *Macropus*, which embraces the kangaroos, there are eight species and eleven more or less well-marked subspecies. Owing to lack of material, several of these are little known. The present paper gives more definite information about the Black-faced, Hagenbeck's, Bernard's, and the Tasmanian kangaroos.

Royal Society of New South Wales, Aug. 1.—T. H. Harrison: Brown rot of fruits and associated diseases in Australia (1). History of the disease and determination of the causal organism. Brown rot of deciduous fruits was introduced into Australia in the nineties of last century, and is now present in most temperate fruit-growing regions of the south-eastern fringe of Australia, but absent from South Australia and Western Australia. Comparative cultural and inoculation experiments, conidial germination, and taxonomic features of both conidial and apothecial stages, are recorded in detail. It is concluded that *Sclerotinia fructicola* (Wint.) Rehm. is the organism responsible for brown rot in Australia and New Zealand.—R. H. Cambage: Acacia seedlings (Part 13). The seedlings are described of the following ten species of *Acacia*: *argentea*, *cæsiella*, *confusa*, *ericifolia*, *harpophylla*, *homalophylla*, *horrida*, *linophylla*, *merinthophora*, and *mollissima*. In connexion with the vitality of seeds in sea-water, it was mentioned that a seed of *A. Farnesiana* and one of *A. melanoxylon* had germinated after having been immersed continuously in sea-water for seven and a half and ten years respectively.

Official Publications Received.

BRITISH.

International Geographical Congresses: a Brief Account of their Origin, History and Proceedings. By Colonel Sir Charles Close. (Reprinted for the Members of the International Geographical Congress, London and Cambridge, 1928.) Pp. 17. (London: Royal Geographical Society.)

University of Liverpool: Tidal Institute. Ninth Annual Report, 1928. Pp. 7. (Liverpool.)

Philosophical Transactions of the Royal Society of London. Vol. 227, Series A. 652: The Analysis of Tidal Observations. By Dr. A. T. Doodson. Pp. 223-279. (London: Harrison and Sons, Ltd.)

International Radiotelegraph Convention of Washington, 1927. International Radiotelegraph Convention and General and Supplementary Regulations, Signed at Washington, 25th November 1927. Pp. 172. (London: H.M. Stationery Office.) 2*s.* 6*d.* net.

The Scientific Proceedings of the Royal Dublin Society. Vol. 19 (N.S.), No. 6: Report of the Irish Radium Committee for the Year 1927. By Maurice R. J. Hayes and Dr. Walter C. Stevenson. Pp. 43-53. 6*d.* Vol. 19 (N.S.), No. 7: Spectrographic Analyses of Irish Ring-Money and of a Metallic Alloy found in Commercial Calcium Carbide. By Dr. A. G. G. Leonard and P. F. Whelan. Pp. 55-62. 6*d.* (Dublin: Hodges, Figgis and Co.; London: Williams and Norgate, Ltd.)

Royal Commission on Agriculture in India, Vol. 14. Appendix to the Report. Pp. vi+432+11 maps. (London: H.M. Stationery Office.)

The Journal of the Institute of Metals. Vol. 39. Edited by G. Shaw Scott. Pp. xii+814+43 plates. (London.) 31*s.* 6*d.* net.

Journal of the Royal Statistical Society. Vol. 91, Part 3. Pp. xii+462. (London.) 7*s.* 6*d.*

Air Ministry. Aeronautical Research Committee: Reports and Memoranda. No. 1141 (Ae. 310): The Determination of the Horsepower Height Factor of Engines from the Results of Type Trials of Aircraft. By J. D. Coales and A. L. Lingard. (T. 2720-I.C.E. 617.) Pp. 8+7 plates. 6*d.* net. No. 1143 (Ae. 311): The Structure of Vortex Sheets. By A. Fage and F. C. Johansen. (T. 2501.) Pp. 19+8 plates. 1*s.* net. (London: H.M. Stationery Office.)

The Hundred and Sixth Report of the Commissioners of Crown Lands. Pp. 35. (London: H.M. Stationery Office.) 4*s.* net.

Proceedings of the Malacological Society of London. Edited by R. Winckworth. Vol. 18, Part 2, August. Pp. 45-92+7 plates. (London: Dulau and Co., Ltd.) 10*s.* net.

Colony of Mauritius. Annual Report on Royal Alfred Observatory for the Year 1927. Pp. 3. (Mauritius.)

The Edinburgh and East of Scotland College of Agriculture. Calendar for 1928-1929. Pp. 96. (Edinburgh.)

The Botanical Society and Exchange Club of the British Isles. Vol. 8, Part 3: Report for 1927. By G. Claridge Druce. Pp. 289-558+2 plates. (Arbroath: T. Buncle and Co.) 10*s.*

Air Ministry. Aeronautical Research Committee: Reports and Memoranda. No. 1156 (Ae. 321): On the Flow of a Compressible Fluid Past an Obstacle. By Dr. H. Lamb. (T. 2596). Pp. 5. 4*d.* net. No. 1158 (Ae. 323): The Effect of the Static Pressure Gradient on the Drag of a Body Tested in a Wind Tunnel. By H. Glauert. (T. 2601.) Pp. 12+1 plate. 9*d.* net. (London: H.M. Stationery Office.)

The Royal Technical College, Glasgow. Calendar for the One Hundred and Thirty-Third Session, 1928-1929. Pp. 426+xxviii. (Glasgow.)

Battersea Polytechnic. Technical College for Day Students, and Day School of Arts and Crafts: Calendar, Session 1928-1929. Pp. 47+12 plates. 3*d.* Domestic Science Department and Training College: Full Time Day Instruction, Afternoon and Evening Classes, Session 1928-1929. Pp. 34+8 plates. 3*d.* Department of Hygiene and Public Health, Session 1928-1929. Pp. 29+3 plates. 3*d.* Calendar of Evening and Afternoon Courses and Classes for Session 1928-1929. Pp. 30+11 plates. Free. (London.)

The Scientific Proceedings of the Royal Dublin Society. Vol. 19 (N.S.), No. 8: "Blossom-Wilt" of Apple Trees, and "Wither-Tip" of Plum Trees, with special reference to Two Biologic Forms of *Monilia cinerea* Bon. By Dr. C. Boyle, M. Murphy and Dr. H. A. Cummins. Pp. 63-76+plates 3-5. (Dublin: Hodges, Figgis and Co.; London: Williams and Norgate, Ltd.) 2*s.*

Ninth Annual Report of the Ministry of Health, 1927-1928. (Cmd. 3185.) Pp. xviii+292. (London: H.M. Stationery Office.) 5*s.* net.

Indian Journal of Physics, Vol. 2, Part 4, and Proceedings of the Indian Association for the Cultivation of Science, Vol. 11, Part 4. Conducted by Prof. C. V. Raman. Pp. ii+399-507+ii+ii+plates 13-20. (Calcutta.) 3 rupees; 4*s.*

Indian Lac Association for Research. Reports of the Committee and of the Director, Indian Lac Research Institute, Nankum, Ranchi, for the Year 1st April 1927 to 31st March 1928. Pp. ii+44. (Nankum, Ranchi.)

Journal of the Chemical Society: containing Papers communicated to the Society. August. Pp. iv+1989-2307+xii. (London: Gurney and Jackson.)

The Livingstone Lectures, 1927: The Evolution of the Physical Features of Sydney and the Blue Mountains. By Dr. W. G. Woolnough. Pp. 28. (Sydney, N.S.W.: Camden College.)

The Cawthron Institute, Nelson, New Zealand. Cawthron Lectures, Vol. 3. No. 1: A Popular Account of Evolution, by Dr. J. P. Lotsy; No. 2: Electricity and Matter, by Sir Ernest Rutherford; No. 3: Recent Advances in Astronomy, by J. T. Ward; No. 4: Athens, Florence and the Modern State, by Prof. A. J. Grant. Pp. 22+18+28+22. (Nelson, N.Z.)

London County Council. Lectures and Classes for Teachers: Handbook for the Session 1928-29. Pp. 84. (London.)

FOREIGN.

Union Géographique Internationale. Publication No. 3: L'Extension des régions privées d'écoulement vers l'océan. Par Emm. de Martonne et L. Aufrère. Pp. iv+197. Rapport de la Commission de l'Habitat rural. (Report of the Commission on Types of Rural Settlement.) (U.G.I., No. 1.) Pp. vii+130. Rapport de la Commission des Terrasses Pliocènes et Pléistocènes. (First Report of the Commission on Pliocene and Pleistocene Terraces.) (U.G.I., No. 2.) Pp. 123+2 planches. (Paris.)

University of California Publications in American Archæology and Ethnology. Vol. 23, No. 9: Native Culture of the Southwest. By A. L. Kroeber. Pp. 375-398. (Berkeley, Calif.: University of California Press.)

Cornell University Agricultural Experiment Station. Memoir 115: Some Relations of Green Manures to the Nitrogen of a Soil. By T. L. Lyon and B. D. Wilson. Pp. 29. Bulletin 461: Farmers' Co-operative Business Organizations in New York. By J. F. Booth. Pp. 123. Bulletin 466: Interrelationships of Supply and Price. By G. F. Warren and F. A. Pearson. Pp. 144. Bulletin 468: Whey Butter. By E. S. Guthrie. Pp. 12. (Ithaca, N.Y.)

Agricultural Experiment Station: Michigan State College of Agriculture and Applied Science. Technical Bulletin No. 90: The Breeding of Strains of A-Tester Yellow Dent Corn. By K. M. Liu. Pp. 40. Special Bulletin No. 176: Use of Cut Flowers. By Alex Laurie. Pp. 22. (East Lansing, Mich.)

IV Congresso Internazionale di Navigazione Aerea organizzato dal Ministero dell' Aeronautica, Ufficio Aviazione Civile e Traffico Aereo, Roma 24-30 Ottobre 1927. Vol. 1: Resoconto Generale. Pp. 468. Vol. 2: Memorie; Sezione Navigazione Aerea; Sezione Turismo e Propaganda; Sezione Giuridica. Pp. 545+40 tavole. Vol. 3; Memorie; Sezione Tecnicale. Pp. 550+34 tavole. Vol. 4: Memorie; Sezione Scientifica ed Aerologica; Sezione Medica. Pp. 687+22 tavole. (Roma: G. Bardi.)

Department of the Interior: Bureau of Education. Bulletin, 1928, No. 4: Commercial Education in 1924-1926. By J. O. Malott. Pp. 33. (Washington, D.C.: Government Printing Office.)

Trinity College. A List of Books for a College Student's Reading: Being the Trinity Booklist. Edited by Prof. Harry Todd Costello. Second edition, revised. Pp. 116. (Hartford, Conn.: Trinity College.)

Ministero dei Lavori Pubblici, Consiglio Superiore. Servizio Idrografico. Carte Quinquennali della Precipitazioni atmosferiche in Italia. Fasc. 1: Quinquennio 1921-1925. A cura del Prof. Filippo Eredia. Pp. xii+94. (Roma.)

Department of Commerce: Bureau of Standards. Technologic Papers of the Bureau of Standards, No. 369: Transmissive Properties of Eye-Protective Glasses and other Substances. By W. W. Coblentz and R. Stair. Pp. 555-578. (Washington, D.C.: Government Printing Office.) 10 cents.

Scientific Papers of the Institute of Physical and Chemical Research. No. 153: A View on the So-called Hygroscopic Water of Clays. By T. Okazawa. Pp. 15-49. 45 sen. No. 154: A Fine Quantum Analysis of Certain Terms of Thallium, 1. By M. Kimura. Pp. 51-56. 20 sen. No. 155: Limits of Ultra-Violet Transmission of Certain Inorganic Compounds. By M. Kimura and M. Takewaki. Pp. 57-64. 20 sen. Supplement, Vol. 9, No. 6: On the Series Relations of the Neon Spectrum. By Y. Ishida. Pp. 3+1 plate. 10 sen. (Komagome: Iwanami Shoten.)

Proceedings of the Academy of Natural Sciences of Philadelphia, Vol. 80. The Orthoptera of Montana. By Morgan Hebard. Pp. 211-306+2 plates. (Philadelphia, Pa.)

Comptes rendus de la Troisième séance de la Commission Géodésique Baltique réunie à Riga du 20 au 23 Mai 1927. Rédigés par Ilmari Bonsdorff. Pp. iii+159. (Helsinki: Kirjapaino-Oy, Sana.)

Koninklijk Magnetisch en Meteorologisch Observatorium te Batavia. Jaarverslag 1927. Pp. 28. (Weltevreden.)

Occasional Papers of the California Academy of Sciences. No. 15: Studies on Marine Ostracods. Part 2: External Morphology of the Genus Cythereis with Descriptions of Twenty-one New Species. By Tage Skogsberg. Pp. 155. (San Francisco, Calif.) 2 dollars.

Smithsonian Institution: United States National Museum. Bulletin 76: Asteroidea of the North Pacific and Adjacent Waters. Part 2: Forcipulata (part). By Prof. Walter Kenrick Fisher. Pp. iii+245+81 plates. (Washington, D.C.: Government Printing Office.)

Maryland Geological Survey. Kent County. Pp. 184+12 plates+3 maps. Queen Anne's County. Pp. 175+8 plates+2 maps. Talbot County. Pp. 177+8 plates+2 maps. (Baltimore, Md.: Johns Hopkins Press.)

Department of the Interior: U.S. Geological Survey. Bulletin 793: Economic Geology of the Castlegate, Wellington and Sunnyside Quadrangles, Carbon County, Utah. By Frank R. Clark. Pp. vi+165+22 plates. 75 cents. Water-Supply Paper 573: Surface Water Supply of the United States, 1923. Part 12: North Pacific Slope Drainage Basins. B: Snake River Basin. Pp. vi+259+li. 40 cents. Water-Supply Paper 585: Surface Water Supply of the United States, 1924. Part 5: Hudson Bay and Upper Mississippi River Basins. Pp. v+185. 25 cents. Water-Supply Paper 587: Surface Water Supply of the United States, 1924. Part 7: Lower Mississippi River Basin. Pp. iv+123. 20 cents. Professional Paper 142-E: The Molluscan Fauna of the Alum Bluff Group of Florida. By Julia Gardner. Part 5: Tellinacea, Solenacea, Mactracea, Myacea, Molluscoidea. Pp. iv+185-249+iv+plates 29-36. (Washington, D.C.: Government Printing Office.)

Proceedings of the American Philosophical Society held at Philadelphia for Promoting Useful Knowledge. Vol. 67, No. 1. Pp. 103. (Philadelphia, Pa.)

Diary of Societies.

SATURDAY, SEPTEMBER 29.

HULL ASSOCIATION OF ENGINEERS (at Technical College, Hull), at 7.15.—J. R. Hutchings: The Brush Ljungström Turbine.

MONDAY, OCTOBER 1.

SOCIETY OF ENGINEERS (at Geological Society), at 6.—Dr. G. E. K. Blythe: Pulverised Fuel in Theory and Practice.

BRITISH MYCOLOGICAL SOCIETY (Annual Meeting) (at Littlehampton).—*Oct.* 1 *to* 6.

Monday, Oct. 1, at 8.45 P.M.—Annual General Meeting, at the Beach Hotel.

Tuesday, Oct. 2, at 8.45 P.M.—Dame Helen Gwynne-Vaughan: Problems of Development in the Fungi (Presidential Address).

Wednesday, Oct. 3, at 8.45 P.M.—A. Smith and W. C. Moore: New and Interesting Plant Diseases.

Thursday, Oct. 4, at 8.45 P.M.—Col. C. T. Green: Fungi and their Haunts.

Friday, Oct. 5, at 5.30.—J. Ramsbottom: Lecture to Littlehampton Nature and Archæology Circle on Fairy Rings. (Open to members of the British Mycological Society.)—At 8.45 P.M.—Carleton Rea: Comments on the Finds of the Week.

SOCIETY OF CHEMICAL INDUSTRY (London Section) (jointly with Chemical Engineering Group) (at Royal Society of Arts).—W. J. A. Butterfield: Road Surfacing Materials.

TUESDAY, OCTOBER 2.

INSTITUTION OF AUTOMOBILE ENGINEERS (at Royal Automobile Club), at 8.—L. H. Hounsfield: The Integrity of the Technical Man (Presidential Address).

WEDNESDAY, OCTOBER 3.

PHARMACEUTICAL SOCIETY, at 3.—R. R. Bennett: Inaugural Sessional Address and Presentation of the Pereira Medal.

SOCIETY OF PUBLIC ANALYSTS AND OTHER ANALYTICAL CHEMISTS (at Chemical Society), at 8.—Dr. G. W. Monier-Williams: Polarimetric Determination of Sucrose in Milk and Sucrose Mixtures.—T. McLachlan: The Analysis of Sugar Degradation Products by Selective Fermentation.—Dr. W. R. Schoeller and E. F. Waterhouse: Investigations into the Analytical Chemistry of Tantalum, Niobium, and their Mineral Associates. XIII. A New Method for the Separation of Zirconium and Hafnium from Tantalum and Niobium.

FRIDAY, OCTOBER 5.

JUNIOR INSTITUTION OF ENGINEERS, at 7.30.—A. J. Simpson: Interesting Details of Swiss Alpine Railways.

SOCIETY OF CHEMICAL INDUSTRY (Chemical Engineering Group) (jointly with Society of Chemical Industry—London Section) (at Royal Society of Arts).—F. H. Rogers: Factory Floors.

SATURDAY, OCTOBER 6.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS (North-Western District Meeting) (at Town Hall, Stockport), at 11 A.M.

PUBLIC LECTURES.

MONDAY, OCTOBER 1.

GRESHAM COLLEGE (Basinghall Street), at 6.—G. C. Robson: The Nature and Origin of Life.

SATURDAY, OCTOBER 6.

HORNIMAN MUSEUM (Forest Hill), at 3.30.—J. R. Ogden: The Recent Discoveries at Ur of the Chaldees.

SATURDAY, OCTOBER 13.

HORNIMAN MUSEUM (Forest Hill), at 3.30.—Prof. J. R. Ainsworth Davis: The Animal Conquest of the Sea.

CONGRESSES.

SEPTEMBER 24–OCTOBER 6.

WORLD POWER CONFERENCE—FUEL CONFERENCE (at Imperial Institute). (For Programme see NATURE, Sept. 22.)

SEPTEMBER 28 AND 29.

FARADAY SOCIETY (in Physical Chemistry Laboratory, University of Cambridge).—General Discussion on Homogeneous Catalysis.

Friday, Sept. 28, *from* 2.30-4.30 *and* 5-7.15.—

Prof. T. M. Lowry: Introductory Paper. Some Problems in Homogeneous Catalysis.

Part I. General Relations.

C. N. Hinshelwood: Homogeneous Catalysis.

C. H. Gibson and C. N. Hinshelwood: The Influence of Nitrogen Peroxide on the Union of Hydrogen and Oxygen. A Problem of 'Trace Catalysis.'

H. Moureu: Catalytic Phenomena in the Tautomerism of certain α-Diketones.

Dr. E. K. Rideal: Negative Catalysis.

N. R. Dhar: (*a*) Ionisation in Chemical Change; (*b*) Negative Catalysis in Slow and Induced Oxidations.

F. Gill, E. W. J. Mardles, and H. C. Tett: Phosphorescence and Autocatalysis during Slow Combustion.

H. Baeckstroem: Negative Catalysis.

Part II. Intermediate Addition-Compounds and Chain Reactions.

J. Kendall and Lilian E. Harrison: Compound Formation in Ester-Water Systems.

J. A. Christiansen: Report on the Theory of Chain Reactions.

M. Polanyi: Bromine Inhibition of Chain Reactions.

J. Böeseken: The Theory of Molecular Dislocation Applied to Homogeneous Catalysis.

Saturday, Sept. 29, 10 A.M.-1 P.M. *and* 2.30-4 P.M.

Part III. Neutral Salt and Activity Effects.

J. N. Brönsted: The Theory of Acid and Basic Catalysis.

Dr. H. M. Dawson: Catalytic Effects of Acids and Bases and the Influence of Inert Salts.

H. von Euler: Compounds between Catalysts and Substrates and their Reactivity.

H. Goldschmidt: On the Catalytic Activity of Hydrogen Ions in Ethyl Alcohol.

H. S. Harned and G. Åkerlöf: Investigations of Salt Action in Homogeneous Catalysis.

F. O. Rice and J. J. Sullivan: Keto-Enol Isomerism and the Mechanism of Homogeneous Reactions.

F. G. Soper: The Activity Theory of Reaction Velocity. The Rate of Interaction of a Chloroamine and Hydrobromic Acid.

OCTOBER 1–3.

INTERNATIONAL FEDERATION OF INTELLECTUAL UNIONS (at Prague).

Oct. 1.

C. P. Blacker: The Modern Conception of the World.—F. Dessauer: Der Geist der Erfindung.

Oct. 2.

H. de Man: Le rôle de la technique dans le domaine social.—A. Fontaine: La transformation d'État sous l'influence de la technique.

Oct. 3.

Jeanneret-Le Corbusier: Les formes nouvelles de l'art protique.—C. G. Jung: Das Seelenproblem des modernen Menschen.

OCTOBER 9–11.

FRENCH CONGRESS OF LEGAL MEDICINE (at Paris).—Prof. Balthazar: Expert Evidence in Social Questions.—MM. Charbonnel and Massé: Industrial Accidents, Comparative Results of External Methods and Osteosynthesis in the Treatment of Fractures of the Leg.—M. Duvoir: Professional Intoxication by Hydrocarbides.—M. Fribourg-Blanc: Anti-social Reactions in Epidemic Encephalitis.