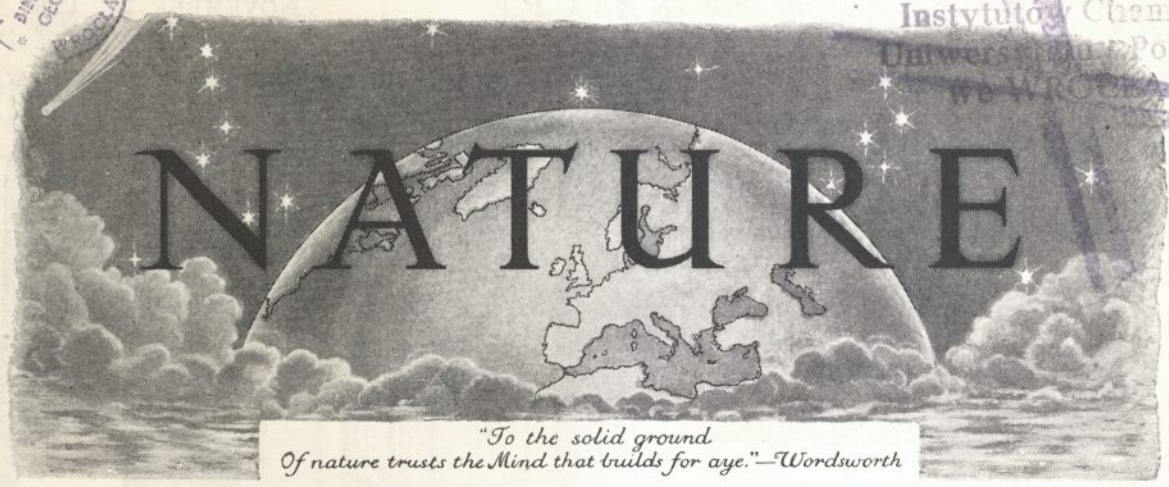

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THE MINISTRY OF WORKS AND BUILDINGS

IN his speech to the Trades Union Congress on October 9, Mr. Ernest Bevin stated that the Cabinet had decided against the establishment of a Ministry of Reconstruction to consider the problems of the peace and to prepare plans for meeting them. Instead, a Cabinet committee has been set up to consider post-War questions and to work out general principles for guidance. There will be many who think that Mr. Bevin did less than justice to the work of the Ministry of Reconstruction established under Dr. (now Lord) Addison in 1917. Whether we hold that the task of preparing for the future should be the task of a special Ministry of Reconstruction or, as suggested by Prof. J. H. Jones, of an Economic Reconstruction Commission, the task is clearly that of the Cabinet, and the gravest danger to be avoided is that of hasty improvisation by war-weary Ministers in control of departments that have been overburdened by the urgent tasks imposed by the War.

The appointment of Lord Reith to the new office of Minister of Works and Buildings and First Commissioner of Works is, however, indication that the Government recognizes more fully than Mr. Bevin's speech would imply the magnitude of the task which lies ahead. The general approval with which the creation of this new office was received may indeed be attributed to the assumption that its task was to be almost wholly that of reconstruction—immediate and local in bombed areas, theoretical and general as regards national replanning and rebuilding after the War. These expectations were somewhat disappointed by Mr. Attlee's statement on October 24 regarding the functions of the new Ministry, and by Lord Reith's own statement in similar terms on November 13 in the House of Lords. Wide as are the functions of the new Ministry, they do not inspire the vision of a new England of well-designed, clean and slumless towns, an architecture of public buildings and private homes justifying civic and personal pride, the wise and creative use of the new materials and the planning of communications and industrial and other building to safeguard æsthetic and health values as well as serve efficiency.

The two statements were largely confined to the war-time duties of the Ministry and the alterations in departmental responsibilities. The new Ministry will be responsible for the erection of all new civil works and buildings required by any other Government department. It will take over the whole organization of His Majesty's Office of Works, including its present responsibilities for the erection of buildings for other civil departments and for service departments, and some of the work of the Ministry of Supply, including the new buildings section of the Ordnance Factories and the approval of plans of new private factories or the extensions of existing private factories to the cost of which the Ministry of Supply is contributing. The Ministry will be responsible for the licensing of private building, and for determining the priority of proposals for rebuilding buildings damaged by air raids. By arrangement with the service departments or the Ministry of Aircraft Production it may erect on their behalf new works and buildings not of a highly specialized character, or supervise contracts for the erection of new private factories or the extension of existing private factories required for war production.

The general order of priority of building work will be laid down by the Production Council, of which the Minister will be a member, and he will be responsible for the Works and Buildings Priority

Committee. The Minister will be empowered to call for information from all departments retaining responsibility for the erection and maintenance of buildings and works of construction, including departments concerned with work carried out by or for local authorities and public utility undertakings. He will also be responsible for such control, or central purchase of building materials not at present controlled, as may be necessary. The Minister will also have the task of instituting research into such questions as the adoption of substitutes for building materials which are in short supply, or the modification of designs and specifications with a view to expedition and for ensuring that the results of past and future research are promptly communicated to all concerned. For this purpose he will make full use of the building research organization of the Department of Scientific and Industrial Research. He will be empowered to call on Departments retaining responsibility for building to satisfy him that they were making full use of the results of research in this connexion.

This statement shows that the Ministry of Works and Buildings clearly envisages the great possibilities open to the building industry, architects and town-planners ; first, the control by a single authority of the production and allocation of all building resources for the period of the War ; secondly, the continuance of the Ministry's control after the War so that building resources may be carefully guided in supplying a huge demand ; and thirdly, the post-War amalgamation of the Ministry and the Town-Planning Section of the Ministry of Health to evolve and direct positive territorial planning policy. Even should the first of these functions absorb all the energies of the Ministry for the first year, if its powers are exercised with wisdom and foresight, many undesirable developments may be checked and much important preparatory work for reconstruction completed.

The Ministry of Works and Buildings is clearly the only right remedy for the serious difficulties which have arisen from the shortage of certain materials, plant, etc., and the even bigger difficulties in the production of building materials of the required kinds and their allocation between war expansion requirements, air raid repairs to communications, services and essential buildings, general works of maintenance, civil defence works and such other works as are made necessary by bombing. Its duties as outlined by Lord Reith falling into the three divisions, supervision, execution and research, provide the essential co-ordination of resources and should secure the full co-operation of the industries concerned.

An important memorandum recently forwarded by the Garden Cities and Town Planning Association to the Prime Minister and other ministers concerned with the use of land, outlining a practical policy with regard to bombed-out factories, rebuilding and replanning damaged areas, housing, compensation and the preservation of land for food-growing, urges that the control of war-time developments of industry or rehousing exercised by the Ministry should be through a fully qualified planning board, competent to consider and to balance all the national interests that arise in new developments. The present situation indeed stresses the importance of the principles and recommendations of the Barlow Commission, and adoption of the principle of long-range planning by the Government is a first consideration even from the point of view of the building industry alone. Indeed only by insisting on the duty of forecasting, by programmes obtained from all other departments, the total demand on the building industry at least a year ahead and preparing resources to meet those demands in the light of probable shortages of important materials, can the Ministry hope to discharge its most immediate task.

Beyond those immediate problems there must be kept in mind those broad principles which have emerged from inquiries into the distribution of the industrial population in recent years. To limit the size and density of cities, to move out congested industries to moderate-sized well-planned towns, including some new garden cities ; and to replan and rebuild the central parts of old cities, with much more open and garden space and more attention to convenience and beauty, and the elimination of wasteful daily travel so far as possible—these are now practical objectives the achievement of which is even assisted by the destruction already caused by air attack.

The new Ministry may indeed offer us the first prospect of the co-ordination leading to a comprehensive far-sighted national plan of development. Mr. Attlee's statement showed that the Government is alive to the great opportunities which are offered in the reconstruction of town and country after the War. The Minister has been charged with the responsibility of consulting the departments and organizations concerned, with the view of reporting to the Cabinet the appropriate

methods and machinery for dealing with the issues involved. The relation of the Ministry of Works and Buildings to the existing machinery for statutory planning must obviously be very close. Accordingly the memorandum from the Garden Cities and Town Planning Association suggests that the best solution of the administrative problem will ultimately be the creation of a Ministry of Planning (or of Planning and Building), to absorb the functions of controlling building and of directing the statutory planning machinery, and to formulate a broad national policy for the distribution of industry which would be operated through the regional and local committees.

The memorandum also submits that the National Advisory Planning Board should consider which of the areas now subject to heavy bombardment are in themselves reasonably satisfactory from a planning point of view and not unduly congested, and which of them are so badly planned or so congested that replanning is advisable. In the former areas there should be no ban on rebuilding or repair at the earliest safe moment, subject to local architectural and planning control and given the necessity of accommodation locally and the approval of the Ministry of Works and Buildings from the point of view of the availability of materials and labour. In the unsatisfactory areas, however, it is strongly urged that wholesale expenditure on restoration or rebuilding should be deferred and the population evacuated to other areas, including those where new factories are being erected. Sir Charles Bressey, whose report on London's transport deserves fresh attention, has independently also entered a plea that no schemes of rehabilitation in bombed areas should go forward without reference to accepted principles and standards for the improvement of London's streets and buildings.

The complexities and possibilities of the problems confronting the new Ministry are indeed immense. They involve the question of evacuation, which, in respect of mothers and young children, is largely a question of the provision of suitable accommodation in the reception areas, part at least of which will involve new construction or the structural adaptation of existing premises. There is also the question of providing alternative accommodation of industries which may need to be dispersed from London and certain other large cities if the destruction of property and dislocation of transport and other public services becomes acute. This involves not merely the provision of a reserve of new factories in suitable situations but also the provision of housing accommodation for industrial workers engaged on war production or the service of the civil population, possibly involving a priority system in the smaller towns.

Moreover, not even in war-time can we neglect the control of building in agricultural areas. Sporadic or ill-considered building has already robbed the country of valuable agricultural land when alternative siting on land less valuable for food production could readily have been found. The criticism of the Select Committee on the neglect of camouflage possibilities in choosing sites could equally apply to neglect of agricultural or food production values. Moreover, some of the worst offenders have been the service departments over whose activities in respect of aerodromes, fortifications and other highly specialized work the Ministry of Works and Buildings will have no control.

Nor is it only on these grounds that there are well-founded fears as to whether the functions and powers of the new Ministry are sufficiently extensive. The work of rebuilding is indeed only a small part of the task of reconstruction awaiting us. That reconstruction will reshape many ways of life and will attack poverty and slumdom, ignorance and ill-health, the insecurities of employment, the closed doors of opportunity. It involves nothing less than the replanning of the national life, and if the Ministry of Works and Buildings is to have any real powers in planning and reconstruction, it must take over much of the present work of the Ministry of Health—especially its housing and planning departments. Besides close relations with the local authorities and with all the technical and professional bodies connected with building, the new Ministry must undertake a large task of education.

We can only hope to build a better order in any sense of the word in so far as both the population and their leaders are prepared for it. Educational work of this type is essential if our younger architects with vision and understanding are to be given the opportunity to express the possibilities of the new materials and to seize the new opportunities of serving social needs. It is equally a preliminary to securing the firm direction from the top to override anarchic interests. If the execution of such a programme of education lies outside the scope of the new Ministry, something at least of the inspiration is to be looked for from it.

RECENT BRITISH EXCAVATIONS IN EGYPT

Temples of Armant

A Preliminary Survey. By Sir Robert Mond and Oliver H. Myers; with Chapters by M. S. Drower, D. B. Harden, S. A. Huzayyin, R. E. McEuen and Mary I. C. Myers. The Text. Pp. xii+223. The Plates. Pp. vi+107 plates. (London: Egypt Exploration Society, 1940.)

EGYPTOLOGY is deeply indebted to Lady Mond for making financially possible the publication in these two fine volumes of the material obtained during the excavation of the temple sites at Armant. Much of this material is of considerable archæological and historical importance, and at the same time it comprises inscriptions, reliefs and statues, which, though for the most part fragmentary, will interest both philologists and students of Egyptian art and religion.

In the opening chapter, Mr. Myers deals with the long history of Armant, which as late as the thirteenth century A.D. was still a town of considerable size and importance. It is disappointing to have to record that with the destruction of the late Roman wall in the middle of the last century "have probably gone the last hopes of tracing the life history (as opposed to the funerary record) of Buchis" (p. 10).

A number of fragments of reliefs, once adorning the Eleventh Dynasty temple of Mentu, have been recovered (Pls. XCIV ff.). As examples of Eleventh Dynasty sculpture, several of these fragments are of great value and interest, showing as they do that some at least of the craftsmen of this period were as accomplished masters of technique and design as their predecessors in the Old Kingdom.

It might here be noted that an inscription accompanying one of the Twelfth Dynasty reliefs which Mr. Myers has unearthed suggests that the cult of the Bull of Mentu originated in the town of et-Ṭūd (Pl. XCIX, 2; p. 157).

I am inclined to agree with the suggestion that the Osirid statues bearing the name of Merenptaḥ, who seems to have had some special connexion with Armant, are of Eleventh Dynasty workmanship usurped by the above-mentioned Pharaoh (Pls. XV ff.; p. 50). I find it difficult to believe, however, that the pylon relief of the procession of tribute-bearing negroes headed by a captive rhinoceros dates from the reign of Tuthmosis III (pp. 25 f.). Not only its style but also the phraseology of the accompanying inscription, and above all the occurrence of the word *Pr-ʿ* with the meaning 'Pharaoh'—a usage not so far known before the reign of Akhenaten (p. 160)—suggest the reign of Rameses II. Mr. J. Fisher, by the way, contributes an interesting note (p. 204) on the dimensions of the captive rhinoceros which are inscribed beside the representation of it.

An exceptionally fine example of Egyptian sculpture is the fragment of a relief displaying the heads of captive Nubians and negroes (Pl. LXXXVII, 3). The account of the measures taken to preserve the colouring of this relief is most instructive (p. 23).

Archæologists will welcome Mr. S. A. Huzayyin's chapter on the flint implements (pp. 66 ff.) and will no doubt note with approval his remarks on the possibility of the survival of certain elements and aspects of Predynastic technique into historic times. A similar view was expressed by Dr. G. A. Reisner to me so long ago as 1908.

Mr. Myers deals admirably and at length with the Roman and Coptic pottery, material at one time shamefully neglected by Egyptologists (pp. 78 ff.). Pls. LIV ff. supply a valuable addition to the Corpus of Graeco–Roman–Coptic pottery in "Bucheum III", as do the two coloured plates LXXII and LXXIII, reproduced from paintings by Mrs. Myers, which exemplify the decorations on late Roman and Coptic ceramics.

Miss Drower's chapter on the inscriptions (pp. 157 ff.) deserves a special word of praise. Her translations and notes are admirable, and what she has to say on Mentu and the Hermonthite triad will be read with interest by students of Egyptian religious cults. She is particularly to be congratulated on the way in which she has tackled the important historical text inscribed on the fine, but unfortunately much broken, granite stela of Tuthmosis III. The text in question contains much matter of philological interest, including the Egyptian name for a rhinoceros—*šꜣ ḫb*.

The objects in glass, metal, wood and ivory, etc., and the beads, scarabs and amulets, are all dealt with in detail by specialists, from whose comments, as from the various registers and technical reports, much useful information is to be derived.

The photographic and other plates are excellent, clear and not overcrowded, and the indexing, without which a work of this sort loses much of its usefulness, is very thorough. Mr. Myers is indeed to be congratulated on what he has succeeded in accomplishing in these abnormal times.

A. M. Blackman.

TEXT-BOOKS OF ADVANCED MATHEMATICS

(1) Determinants and Matrices
By Dr. A. C. Aitken. Pp. vii+136.

(2) Theory of Equations
By Prof. H. W. Turnbull. Pp. xii+152.

(3) Integration
By Dr. R. P. Gillespie. Pp. viii+126.

(4) Vector Methods: Applied to Differential Geometry, Mechanics and Potential Theory
By Dr. D. E. Rutherford. Pp. viii+128.

(5) Integration of Ordinary Differential Equations
By Dr. E. L. Ince. Pp. viii+148.
(Edinburgh and London: Oliver and Boyd, 1939.) 4*s*. 6*d*. net each.

(6) Advanced Algebra
By S. Barnard and J. M. Child. Pp. x+280.
(London: Macmillan and Co., Ltd., 1939.) 16*s*.

THE volumes published under the series title "University Mathematical Texts" mark a new venture in the production of English mathematical text-books. Each of these volumes deals with a single topic, the material of which could be reasonably covered in a one-term lecture course. If the further volumes which are promised maintain the standard of excellence shown by some of those under review, the success of the series ought to be assured.

(1) It is perhaps a sign of the trend of present-day mathematical thought that two of the volumes already issued deal with algebra. The theory of matrices has recently assumed a central place in mathematics. Dr. Aitken's book develops the theory from the beginning, and covers practically all the essential parts of the subject; it commences with a chapter on the algebra of matrices, and then proceeds to define determinants and develop their properties, and to discuss the theory of linear equations and linear dependence. There follows a discussion of the Cauchy and Lagrange expansions of a determinant, the theorems of Jacobi and Binet-Cauchy and their consequences, and finally a chapter on determinants of special type.

The treatment of the subject is masterly, and this work must rank as one of the best text-books on the subject in the language. It should appeal particularly to those students who find the subject difficult at a first reading. The book is well supplied with examples, which serve to clinch the theorems proved in the text, and contain many other results of importance.

(2) The subject matter of Prof. Turnbull's book is of a very different nature, for the theory of equations is one of the oldest branches of higher algebra. Prof. Turnbull's delightful account will be read with interest not only for its excellent treatment of the theory, but also for its interesting historical remarks.

After introductory chapters dealing with polynomials and rational functions, a sketch is given of Gauss's proof of the fundamental theorem of algebra, and this is followed by an account of the theory of symmetric functions. Next follows a chapter on the numerical solution of algebraic equations, and this is succeeded by an account of Descartes's rule of signs and Sturm's theorem. The remaining chapters deal with the binomial equation, cubic and quartic equations (with an introduction to canonical forms) and a brief account of the theory of elimination. The book is most attractively written, and should meet with well-deserved success.

(3) Dr. Gillespie's book on integration seems to be less happily conceived, and it is not quite clear for whom it is intended. The first part deals with the formal technique of evaluation and transformation of simple and double integrals, and with the theorems of Green and Stokes, based on an intuitive definition of a definite integral as an area, while the latter part deals with the rigorous theory of the Riemann simple and double integrals, and at one point at least appeals to the theory of measure. The book thus falls between two stools; the first part is not sufficiently rigorous for an honours student, while the later part is too difficult for those merely reading for a pass degree.

(4) Dr. Rutherford's book gives an excellent elementary account of the algebra of vectors and of its application to differential geometry, dynamics and potential theory. The treatment is clear and concise, and the volume is remarkable for the wide range of topics treated in a small compass. It should prove a useful text-book on a theory which is now widely used in many different branches of mathematics.

(5) Dr. Ince's book deals concisely with the types of ordinary differential equations which are commonly studied in a university course. It follows the standard order of treatment, dealing first with the various soluble types of equations of the first order and then with equations of higher orders. The latter part of the book deals with linear equations, with constant coefficients and with the solution of equations in series, particular reference

being made to the hypergeometric equation and the equations of Legendre and Bessel. We should have liked to see a description of Heaviside's method for solving differential equations with constant coefficients included, as this useful method is neglected by most of the current text-books.

All these volumes are well produced and clearly printed. Their publication at a modest price will, we think, be widely welcomed.

(6) The other volume under review is of a very different kind. "Advanced Algebra" deals with such widely divergent topics as probability, diophantine equations, homographic transformations, and the elements of the theory of functions. The result is a book which is full of interesting things, but which is lacking in the unity of a text-book confined to a single topic. The first chapter deals, in an attractive way, with the algebra underlying the geometrical theory of homographic transformation, cross-ratio and involution; it is a well-conceived piece of work, but the analyst will probably be puzzled by the phrase "any point at infinity is the z-plane". Next follows an account of the resultant of two quadratic polynomials, and of graphs of functions of the type $(ax^2 + 2bx + c)/(a'x^2 + 2b'x + c')$. The proof (on pp. 21, 22) that the resultant of two real quadratics is negative if, and only if, the roots of the two corresponding equations are real and separate from each other contains an error, but the reader will easily construct a valid proof for himself. The next four chapters deal with double series, uniform convergence, and the exponential and logarithmic functions of a complex variable, matters now usually regarded as belonging to analysis. Chapters on elimination and probability follow. The next, and in many ways the most interesting, part of the book deals with the elementary parts of the theory of numbers, continued fractions and diophantine equations. There is a very readable account of the theory of quadratic residues and Gauss's law of quadratic reciprocity, leading up to a discussion of primitive roots, of the expression of numbers as the sum of two or four integral squares, of methods for the factorization of large numbers, and of the theory of the binomial equation. A chapter is devoted to the solution in integers of equations of the form $x^2 + Ny^2 = M$. This is marred by an unfortunate mistake at the outset, where it is asserted that if (x, y) and (x_1, y_1) are two pairs of relatively prime integers such that $x^2+Ny^2=M_1M_2$, $x_1^2+Ny_1^2=M_1$, then the equation $x^2+Ny^2=M_2$ has integral solutions if M_1 is an odd prime, a power of an odd prime or twice such a number; this theorem is not necessarily true if M_1 is an odd prime power, as is shown by the example $6^2+18\cdot5^2 = 81\cdot6$, $3^2+18\cdot2^2 = 81$, $x^2+18y^2 \neq 6$ for any integral x, y. The book concludes with an interesting account of infinite continued fractions, an introduction to the theory of invariants, and an account of linear transformations.

There are numerous exercises in the text and a collection of miscellaneous examples at the end. The production is up to the high standard we expect from its publishers. J. A. Todd.

THE CHEMICAL LECTURE BENCH

Lecture Demonstrations in General Chemistry By Prof. Paul Arthur. (International Chemical Series.) Pp. xvi + 455. (New York and London: McGraw-Hill Book Co., Inc., 1940.) 26s.

THE author of this useful manual rightly states that: "The task of the lecture demonstrator is unusually specialized, requiring, as it does, something of showmanship without submergence of educational objectives. Perhaps no other branch of teaching requires such nicety of balance and such care in presentation". The student who sees what appear to be simple experiments rapidly and successfully performed does not appreciate the long and difficult apprenticeship which makes such results possible, and the work of generations of university teachers which is embodied in a course of lecture experiments. It is only when he is called upon to perform these experiments himself, when he has usually to depend on his own resources, that these facts become familiar to the teacher. The number of really useful books to which he can then turn for guidance is quite small and any addition to this field of literature is, therefore, welcome. The keen lecturer, again, is always on the look-out for new experiments, and will be interested in such books.

The present work is noteworthy in its scope, which includes physical chemistry and organic chemistry as well as the usual experiments for the course in inorganic chemistry, and for its inclusion of many new experiments, several of these being collected from the *Journal of Chemical Education* and *School Science* and *Mathematics* (references to papers in these being given). The author has had experience in such work and the text shows that he fully appreciates the need for careful detail in the descriptions. Such detail is, in fact, essential, and as it can never be given in the space available in text-books, such a book as this is absolutely necessary as a supplement to these.

A large number of apparently simple experiments fail because some small detail has been neglected, and although some lecturers make a point of suggesting possible causes of failure and even think this has an educational value, they rarely hit on the real cause, and a succession of 'damp squibs' leads the student to doubt the validity of the statement that chemistry is an exact science. Lecture experiments should succeed if they are to fulfil their purpose. The causes of such failures are frequently stated in the book.

The ground covered is so wide that a detailed account of the book cannot be given. It may be said, however, that the inorganic chemistry section is well covered, although some excellent experiments are missing from it. The section on organic chemistry is brief and will require supplementing in a detailed course. The experiments on physical chemistry are particularly noteworthy, and there are many new demonstrations in this field. The physical properties of gases, solutions and colloids, energy and chemical change (including some good experiments on photo-chemistry), radioactivity, the ionic theory, electrochemistry and colloid chemistry are dealt with.

The author claims six major features for his book : wide scope, references to literature, accessibility, the selection of easily visible experiments which may be completed in a lecture period, suggestions as to the principles illustrated by each experiment, and adaptability to standard text-books. These claims are justified, and everyone who has to perform lecture experiments in chemistry will find the book useful and helpful.

THE SCIENCE OF ANIMAL BREEDING

Animal Breeding

By Prof. Laurence M. Winters. Third edition. Pp. viii + 316. (New York : John Wiley and Sons, Inc. ; London : Chapman and Hall, Ltd., 1940.) 21*s*. net.

ANIMAL breeding, says Prof. Winters, is the art of improving animals. As such, it depends for success on a skill of hand and eye which can scarcely be acquired from books, and indeed, in this third edition of his book, Prof. Winters is not so much concerned with the art as with giving students an up-to-date account of the science. His pages offer the younger generation of breeders and extension workers the gift of science to animal breeding—the organized knowledge which enlarges the scope and power of the enterprising craftsman. That the author now addresses himself to students involves an interesting transition, since the progressive breeder for whom the first edition was written has been deserted for the student whose background of fundamental sciences renders many modern investigations more intelligible.

Beginning with historical glimpses of the development of domestic animals, the book continues with the anatomy of the genitalia, the physiology of the breeding-cycle, the cytology of the gonads, and the technique of artificial insemination. Following this selection of applied sciences and at greater length is an exposition of inheritance which follows orthodox lines. Mendel's laws are explained and illustrated with some well-known simple examples, and then the more complicated genetic situations presented by selection and breeding for economic characters are considered. The choice of the most significant items from an enormous mass of literature is difficult, and it is scarcely to be expected that any two authors would agree on the way to do it. Experienced readers may therefore think that some subjects in which they are interested, such as adaptation to environment, the creation of new breeds, or progeny testing, have received too little attention for a text-book, and that others, such as selection and breeding systems, have not been considered sufficiently from the point of view of the breeder whose difficulties will ultimately have to be met by the student. The author's wide range of experimental studies with their practical background well qualifies him as a guide for students, so that it seems a pity he has not dealt more fully with improvement as the breeder sees it.

To enunciate a number of good scientific reasons for following a certain line of action is one thing ; to decide which of the multifarious and often conflicting considerations that arise in practice should receive greatest weight is quite another ; and ignorance of the latter often breeds distrust of the former. Another feature that might be criticized is the use of illustrations from the 1924 edition, for example, Figs. 69 and 117, which are rather poor by 1940 standards. Whatever may be said of the details of his treatment, no one can complain that Prof. Winters is satisfied with the present rate of improvement in livestock. He wants shows to be occasions for instruction rather than carnivals ; record of performance tests made and used ; artificial insemination, cross-breeding and heterosis exploited. In short, he wants progress to be hastened by all available methods, a desire which all his readers will share.

H. P. Donald.

The Principles of Electric Power Transmission by Alternating Currents

By H. Waddicor. Fourth edition, revised. Pp. xxi+458. (London: Chapman and Hall, Ltd., 1939.) 21*s*. net.

THAT this well-known and valued text-book, first published in 1928, has appeared in its fourth edition is a remarkable achievement and bears testimony to the author's ability. The principal alterations introduced in the present edition refer to underground cables, and recent extensive research and development work in connexion with the thermal properties of cables is set out in the revised Chapter x. There is an excellent bibliography with up-to-date references. For some obscure reason the index is not so complete as could be wished; for example, the name of J. A. Fleming appears in the text but not in the index.

When dealing with the theory of electrically long lines, the author evidently prefers the term "line angle" for the complex quantity $\sqrt{ZY}$, rather than the "propagation constant" commonly used in telecommunication practice and by other writers on power transmission. Students at universities and technical colleges, to whom the author refers in the preface to his book, are likely to desire a wider and more generalized outlook on transmission problems and theory. In view of this, it is hoped that, in a future edition, at least mention may be made of attenuation, wave velocity and the conditions underlying reflection in long lines. Recent developments in the protection of high-voltage transformer windings (non-resonating) are mentioned but no details given.

The book is well illustrated and beautifully printed, and in the reviewer's experience is known to suit the requirements of students of power engineering, and for such the book is recommended without reserve.

Gmelins Handbuch der anorganischen Chemie

Achte völlig neu bearbeitete Auflage. Herausgegeben von der Deutschen Chemischen Gesellschaft. System-Nummer 35: Aluminium. Teil A, Lief. 6: Legierung von Aluminium mit Mangan bis Rhenium. Pp. 887–1110+xxii. (Berlin: Verlag Chemie, G.m.b.H., 1939.) 27.75 gold marks.

A COMPREHENSIVE account of the composition, chemical and physical properties of the alloys of aluminium with manganese, nickel, cobalt, silver, gold, platinum and various other metals is included in the part of "Gmelins Handbuch" under notice. The views of various authorities on the composition of the solid phases in the system Al–Mn are contradictory and are set forth in a series of diagrams for comparison. Four intermetallic compounds, Al_6Mn, Al_4Mn, Al_3Mn and AlMn, have been identified, of which only the last-mentioned has a congruent melting point at 1287° C. These alloys are not affected by dry air, but disintegrate when the air is moist. Aluminium mixes with nickel in all proportions in the liquid state and a compound, AlNi, separates at 1640° C. The slow disintegration of these alloys in moist air is accelerated by the presence of other intermetallic compounds.

Much space is given to the alloys with silver, although there is still some uncertainty about the composition of the solid phases in alloys containing more than 14 per cent of aluminium. Whereas the solubility of aluminium in silver varies between 5·1 per cent at 200° C. and 6·52 per cent at 500° C., that of silver in aluminium increases from 0·75 per cent to about 48 per cent in the same temperature range. The intermetallic compound Ag_3Al melts at 779° C. Several ternary and quaternary alloys are also discussed in this number, which is packed with detail and well illustrated with diagrams.

Direct and Alternating Currents

Theory and Machinery. By E. A. Loew. Second edition. Pp. xv+730. (New York and London: McGraw-Hill Book Co., Inc., 1938.) 25*s*.

THE second edition of this text-book is a creditable effort on the part of the author to cover, in a single volume of 730 pages, the extensive field embracing the theory and applications of direct and alternating current circuits, machinery and apparatus. Numerous examples are given to illustrate the principles of direct current and alternating current machinery and in addition there is a selection of problems, at the end of most chapters, which are suitable for tutorial classes. The treatment of the subject is of an introductory nature, but, although not sufficiently advanced to suit the requirements of a degree course syllabus in a British university, this book would assist students attending a course of lectures on a general survey of the subject of D.C. and A.C. machinery and apparatus. Throughout the book there is evidence of the restriction, imposed by lack of space, on the treatment of the problems involved and this offsets much of the gain in having the whole subject in a single volume.

The final chapter, on thermionic apparatus, while commendable as a brief and interesting survey, would have been much enhanced in value had the author included worked examples and a selection of problems.

Direct-Current Machinery

By Prof. Hempstead S. Bull. Pp. vi+318. (New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Ltd., 1939.) 15*s*. net.

A STUDENT having limited time for the study of the principles of direct current machinery will find this book useful as a general survey of the subject. The treatment is elementary but, so far as it goes, is satisfactory and well presented in the 318 pages and adequate illustrations.

As there is little matter not to be found in existing text-books this is a disappointing feature and renders the book of little use to the advanced student or designer. Each chapter is provided with a useful bibliography, mainly American, and a set of problems.

The importance of the direct current motor has resulted in notable advances in the available information about heating and improvements in the design and construction of modern machines. The book contains little information about temperature rise and the disposal of heat generated in the active materials, and therefore cannot be regarded as an up-to-date treatise.

THE VITAMIN B COMPLEX IN NORMAL NUTRITION*

By Prof. C. A. Elvehjem,
University of Wisconsin

During the last decade, distinct advances have been made in our knowledge of the chemistry and physiology of vitamins. Perhaps some of the most interesting observations have been made in the field of the vitamin B complex. There may be two reasons for this situation. First, the chemical structure of the water-soluble vitamins is somewhat less complicated than that of the fat-soluble vitamins. Vitamin B_1 was first synthesized in 1936, and we have seen an average of one B vitamin synthesized a year since that time. Secondly, at least three of the B vitamins have found their physiological function as prosthetic groups of enzymes in very important enzyme systems. The work on the relation of these vitamins to metabolism has not only aided us in understanding the function of the vitamins, but in many cases it has also helped us to understand the intricacies of metabolism itself.

How can some of the newer information about the B vitamins be used to improve public health ? We certainly have a new problem to consider in connexion with the proper use of synthetic vitamins. This is especially true in the case of the B complex, since we now have five factors available in synthetic form. Each year we see a tremendous increase in the promotion of commercial vitamin preparations containing the purified components. Does this mean merely a temporary enthusiasm because of the availability of these synthetic compounds, or does it mean a definite need for the addition of some of these factors to our regular diets ? There are certain principles which should be kept in mind regardless of whether we are dealing with vitamins as a group or with specific components.

First, vitamins should be obtained from natural foods if possible. Generally they are cheaper, more palatable, and in better balance with other factors when taken in this form. Those individuals who enjoy normal health may wonder why anyone would expect to get vitamins from any source other than his food. However, from the number of inquiries made regularly concerning the use of concentrates, it is apparent that a relatively large percentage of people are not convinced that they get adequate vitamins from natural foods. If we are to accept the above principle, we must recognize that the distribution of the individual factors in foods and the requirement of each factor must be established as rapidly as possible. This is a large assignment, but with the continual changes taking place in our available foods as well as in the types of foods consumed, we can only hope for complete dietaries if we know how these changes affect our vitamin intake. Of course, one may say that the ideal way to combat this situation is to return to the use of less-refined foods and use more of the crude products familiar to our forefathers. Some progress in this direction may be made through educational programmes ; but it would be just as difficult to return to the diets used by our forefathers as it would be to return to the use of less-refined foods and use more of the crude products familiar to our forefathers. Some progress in this direction may be made through educational programmes, but it would be just as difficult to return to the diets used by our forefathers as it would be to return to the use of the horse and trap. During the past fifty years our environment has become limited to the grocery store and the chemist's shop. Our natural foods are packaged and devitalized and the vital elements are concentrated and sold in the chemist's shop. How are we to know what to buy from the grocer and what we should get from the chemist ?

The difficulties encountered in obtaining the above facts are obvious to many of us. There is inadequate information concerning the vitamin content of foods actually consumed, and human requirements are not well established. Many of us in working on nutrition have been busy showing pictures of deficiencies in experimental animals rather than dealing with the more fundamental problems. In other words, we have been more interested in the methods used in reaching our goal than in our destination. Another imprint which animal work has left upon us relates to the glorification of certain foods as important sources of specific vitamins. The nutrition worker in his haste to make concentrates usually assays only a few foods, and if he finds one that is fairly rich, this food becomes the recognized source of this factor, while actually other foods may quantitatively be a more important source in the diet.

Most workers agree that the daily requirement of thiamin is 1–2 mgm. or 300–600 I.U. a day. It is not impossible to plan a diet which supplies this amount, but it is not a simple task. Foods that are good sources of thiamin are limited largely

* Substance of a paper presented on September 17 at the Bicentennial Conference, University of Pennsylvania.

to beans, peanuts, oatmeal, and pork products. Stiebling and Phipard in an extensive survey found the daily thiamin intake in all the groups studied to be more than 240 I.U. This figure was based on literature values for the food consumed, and it should be emphasized that loss due to cooking of the food was not taken into consideration. Baker *et al.* have concluded that the best-fed English population, while getting twice as much thiamin as people in the low-income group, consume less thiamin than the parish poor of the eighteenth and nineteenth century.

The reason for this low thiamin intake is, of course, obvious. According to Joliffe, cereals supplied 32 per cent of our calories in 1840 and only 24–25 per cent to-day. The flour used in 1840 contained 75 per cent of the original vitamin B_1 and to-day white flour contains only about 10 per cent of the original vitamin. The *per capita* consumption of sugar has increased from 8 lb. to more than 100 lb. Cereals and sugars comprise about 50 per cent of our diet. Thus a 50 per cent fraction of the calories which in the diet of 1840 provided 600 I.U. has been replaced by one furnishing but 50 I.U. This large consumption of devitalized energy foods may be more serious than we realize, but so far as vitamin B_1 is concerned the situation is not too difficult. The problem merely centres around the vitamin B_1 content of the remaining 50 per cent of the diet. Many people feel that the use of white flour is the cause of many of our nutritional ills. Again limiting the discussion to vitamin B_1, I see no objection to the use of white flour or products made from white flour provided we recognize its limitations and compensate for the decreased intake of vitamin B_1 by other foods. A pork sandwich made with white bread may supply more vitamin B_1 than a jelly sandwich made with whole wheat bread. The situation may be more serious in areas where supplementary foods are not available, and thus any attempt to increase the vitamin B_1 content of bread should be welcome by anyone interested in nutrition.

The daily requirement for riboflavin is also about 1–2 mgm. a day; but it is not difficult to obtain this amount from an average diet containing milk, vegetables and meat. Only 10 gm. of dry liver, equivalent to 2 ounces of fresh liver or a pint of milk, will supply the daily requirement. Cereals are extremely low, and any diet high in sugar and refined cereals and low in milk and animal tissues is likely to be deficient in riboflavin. Due to the availability of the bacteriological assay method, which is a great improvement over the time-consuming assays, greater progress is being made both in regard to the incidence of riboflavin deficiency and the distribution of this factor in a greater variety of foods. The incidence of riboflavin deficiency may be greater than was at first realized.

It is quite obvious that some people have had difficulty in getting a sufficient quantity of nicotinic acid from their regular food supply. Let us assume that the daily human requirement for nicotinic acid is 10 mgm. In order to get this amount one would have to eat about 2 lb. of corn meal, which is, of course, impossible. This may be an extreme example, but very many of our foods contain between 2 and 10 mgm. per 100 gm. on the dry basis, which means that we would need anywhere from 1 lb. to $1\frac{1}{4}$ lb. of these foods to supply the daily requirement. The fact remains that the only excellent sources of nicotinic acid are animal tissues, yeast, and perhaps certain vegetable materials. The original thesis of Dr. Goldberger, that a small piece of lean meat may determine the incidence of pellagra, has not changed in spite of all the newer information. The determination of the nicotinic acid content of foods has been limited largely to assays with dogs; but within the past six months chemical methods have been developed which appear to be satisfactory.

The vitamin B_6 content of foods is not clearly established, due to difficulties in the assay procedures. The existence of this factor grew out of experimental work with rats in attempts to produce a pellagrous condition similar to that observed in humans. The cure or prevention of the acrodynia in rats has been used for assay purposes; but a complicating factor enters the picture, since fats high in linoleic acid will cure the acrodynia about as rapidly as vitamin B_6. During the past year we have developed an assay procedure which is based upon growth rather than the prevention of dermatitis, and we feel that rather accurate values can be obtained by this method. For example, we have found kidney to contain 25 γ, liver 10–20 γ, and pork ham 26 γ per gram dry material. However, extensive assays are required before we can actually calculate the vitamin B_6 intake on different diets.

We are somewhat more fortunate in the case of the distribution of pantothenic acid in foods, since both the chick assay and the improved bacteriological method give quite definite values. However, we know very little about the human requirement for pantothenic acid. In fact we obtain rather peculiar results if we attempt to study the amount needed by rats. 25 μ gm. per day may suffice if all the other members of the B complex are supplied; but in the absence of certain members increasing rates of growth may be obtained by raising the intake from 25 γ to levels of 150 γ per day.

If we have difficulties with the first five members of the B complex, which are now fairly well known, one can imagine the problems encountered with the newer ones such as factor *W*, the anti-grey hair factor, and several others the existence of which has been established through studies with dogs and chicks. We may have the advantage that in many cases a food rich in one member of the B complex may also carry appreciable quantities of the other factors. However, this generalization cannot be carried very far. Thus cereals may be a fair source of thiamin and pantothenic acid, but a very poor source of riboflavin, nicotinic acid, and probably vitamin B_6. Vegetables are a good source of riboflavin but low in thiamin and pantothenic acid. Liver is an excellent source of most of the B vitamins, but is rather low in thiamin. Even milk, which supplies adequate amounts of all the factors when used as the sole article of diet, becomes limited in thiamin and nicotinic acid when diluted with inert energy foods. We are, of course, very fortunate that while we are designing our diets some of the unknown factors are thrown in without our knowledge.

The second principle which we should consider is that concentrated forms of vitamins may be used effectively under many conditions, but there is no virtue in using such preparations merely because the vitamin is present in concentrated form. In other words, one gram of a product containing 100 units of a vitamin may be no more valuable than 100 grams of food containing 1 unit per gram. In most cases the 100 grams of food would be much better, since it might contain 100 units of several different factors.

Concentrates, of course, have a very definite place in clinical medicine, and in cases of emergency the pure crystalline synthetic vitamin may be even more valuable than the concentrates. There are many valuable concentrates on the market, and these may be very valuable for patients on restricted diets. Often foods supposedly rich in certain vitamins have been used as a source of these factors without consideration of the digestibility and irritating effect of these bulky foods.

So far as we know, the synthetic forms of the B vitamins show the same biological activity as the naturally occurring forms. We know that vitamin B_1 must be converted to cocarboxylase, riboflavin to several different respiratory enzymes, and nicotinic acid to coenzymes I and II before these vitamins can function; but apparently the body is able to build these compounds if the vitamin precursors are supplied.

There is much that can be said about the misuse of this form of diet therapy, but there is one point worthy of emphasis. There is an undue effort to get the vitamin in concentrated form. If a product containing 10,000 units per gram is good, then one that contains 1,000,000 units must be 100 times better. Thus the manufacturer takes a material like yeast, extracts, adsorbs, elutes, precipitates, etc., until he gets a small amount of material very rich, let us say, in thiamin, but of necessity lacking in most of the other factors originally present in yeast. The other factors have not only been lost, but the expense of all these manipulations has also increased the price of the vitamin that is left out of all proportion to its original cost. We are beginning to recognize that nutritional deficiencies are apt to be multiple, and if a person has lived on a diet low enough in nicotinic acid to produce pellagra, it is also likely to be low in vitamin B_1, riboflavin, vitamin B_6, and perhaps others.

For many years residues from liver extract after the removal of the pernicious anæmia factor were completely ignored so far as nutritional values were concerned. More recently its value as a source of the B complex has been recognized; but even now attempts are made to sell fractions from the material on its riboflavin content or its pantothenic acid content. Liver extract is an excellent source of practically all the B vitamins except vitamin B_1. I hope someone can convince the commercial laboratories to leave this material at least partially intact because it still contains several unrecognized factors.

This brings us to the question of mixing natural concentrates and synthetic vitamins. Certainly in many cases this practice is objectionable, but in the case of related factors it may have some value. If we have a concentrate containing a combination of B vitamins and it is especially low in one of the components, the proper ratio may be restored by using a synthetic product. In fact, so long as there are unknown vitamins it may be well to include a certain amount of a natural product. One thing we must watch out for is the introduction of one vitamin out of all proportion to the others merely because this particular one happens to be relatively cheap. Often a commercial preparation is not compounded on the basis of the relative requirements of the individual vitamins but on the basis of the availability and cost of the component vitamins. However, I believe that many of these difficulties will be remedied as soon as nutrition workers make the facts available.

We have already mentioned that it may be difficult to get 1 mgm. of thiamin from our daily food supply; but there is no difficulty in supplying a patient 50 mgm. from a bottle of thiamin. I have no argument with a physician who can prove that he obtains some beneficial effect from massive doses of thiamin, riboflavin, nicotinic acid, etc.,

but from a nutritional point of view, such massive therapy means pure waste of material.

We now come to the question of adding vitamins directly to foods, or the question of fortification. The third principle which I should like to mention is that there is no fundamental objection to the addition of synthetic vitamins to food materials. We have accepted the addition of salt to our foods, and in this specific relationship I see no difference between the addition of sodium chloride or iodide and, let us say, thiamin. The addition of synthetic vitamins may be cheaper, less objectionable to our taste, and more easily controlled than relying upon specific foods or concentrates.

Most authorities agree that the fortification of milk with vitamin D is a logical procedure, and through this means many children have been protected against rickets with no extra cost. In the case of nicotinic acid, the daily requirement costs 3 cents as nicotinic acid and at least 10 cents and more in the case of almost any food you wish to buy. Surely this is a question worth considering when pellagra is an economic disease. Workers who had tried adding natural concentrates to foods, such as flour, find that even those prepared with a minimum of colour, odour and flavour are quite unsatisfactory. Certainly the addition of synthetic vitamins to foods will ensure a more uniform product than even Nature itself can produce. Dr. Roberts has suggested that the chief danger in fortification of foods is that it might tend to give a false sense of confidence that all the deficiencies of refined foods have been overcome. Surely the standardization of the amount of one vitamin in one food cannot give us false confidence any more than the standardization of the fat content of milk, which has been controlled by law for many years.

This does not mean that we are ready for the fortification of foods—there are many difficulties. I have mentioned the advantages merely because they are generally overlooked. However, it is rather amusing that many more objections are raised when a commercial company wants to add a vitamin to a food than when new processing methods are introduced which are known to be destructive to the vitamins. The difficulties encountered in fortification are so interrelated that it is difficult to know at what part of the cycle to start the discussion. Perhaps it is best to recognize first that the processing of foods removes more than one vitamin. Thus the addition of a single crystalline factor only partially restores the original value of any food. In the case of pellagra the diet is deficient not only in nicotinic acid but also in thiamin, riboflavin, probably other members of the B complex, etc. The ideal method of preventing pellagra would be to increase the meat and milk consumption, but if this is economically impossible, I see no objection to at least studying the possibility of some sort of fortification. Dr. Spies has pointed out that the use of nicotinic acid alone may lead to the development of more serious conditions, but why not also study the possibility of using other vitamins as well ? If we want to object to studies of this kind, we could go one step further and ask, why improve nutrition at all ? If you do, people will only live long enough to die of old age.

I hope you do not misunderstand me and think that I am promoting the fortification of foods ; I am merely trying to counteract some of the dogmatic statements that have been made and to present both sides of the subject. It is just as easy to demonstrate the difficulties encountered by animal experiments as it is in the field.

At the present time any attempt to add the several vitamins which are apparently necessary would merely increase the cost of the foods and move them farther than ever from the reach of the population group needing them most. The most logical approach appears to be controlled vitamin content of foods. Let us train the farmer that the vitamin content of his product determines to some extent the value of his product. Perhaps the geneticist could be induced to breed new crops for their vitamin content rather than for their yield of dry matter ; and perhaps some day we may educate the entire public to use the animal carcase in such a way as to utilize the vitamins present to the greatest advantage.

If industry removes too much of the vitamins during processing, some sort of restoration should be practised. This does not mean that each industry should try to make a complete food out of each of its products. We are still interested in a large variety of foods, some being consumed merely because we like them ; but when the final accounting is made we should have an adequate supply of all the factors. Each component of our diet should carry its fair share of the vitamin burden. Returning to our friend white flour, it apparently does not carry its share of vitamin B_1. However, from the interest shown in this problem it should soon be able to hold its own in the combat. A greater part of the original seed may be left in the flour, certain concentrates may be added, synthetic thiamin may be added, or a yeast especially high in thiamin may be used for making the bread. Further experimental work will help solve the problems, although as time goes on more difficulties will arise ; but if the agriculturist, the processor, the medical man, and the man in charge of control work will work hand in hand for the sake of improved health, deficiency diseases should be reduced to a minimum.

CULTURAL UNITY IN THE AMERICAS

SHORTLY after the Pan-American Conference in Havana last summer, Mr. Roosevelt was reported to have made a statement in which he said that the embargo then recently placed on certain exports from America was to be regarded as an American defence measure, following upon the spiritual unity which had been established in the Americas by that meeting of representatives of the American Republics. While pan-American unity thus appeared to have been held by the President of the United States as more of an accomplished fact than ever before, there were other observers, well acquainted with conditions in the Latin Americas, who did not share his optimistic view of the possibilities of securing co-operation from Central and South America in any and every action which the United States might elect to take in the defence of the western hemisphere against the aggression of non-American, or in other words against the Axis, powers. One well-informed writer, indeed, went so far as to say of the Latin Americas: "They are not interested in fighting for democracy *per se*, or for the integrity of the hemisphere as Washington sees it."

It was in fact then suggested that the attitude of the Latin States was one of watching and waiting for the turn of events in the Old World before committing themselves definitely in overt action which would define more precisely their policy in relation to the belligerent powers.

On the British side, the re-election of Mr. Roosevelt as President for a third term of office has ensured the continuance of the 'good neighbour' policy in the relations between the United States and the peoples to the centre and south. On the other side the result of the presidential election as a substantial check to those in the States who advocate a defensive policy which ends at Panama, as well as the course of recent events, in the theatre of war, while undoubtedly favourable to Mr. Roosevelt's aim to mould the Americas into a united whole, may equally well confirm the Latin Republics, at any rate for a time, in a further period of opportunist watchfulness. If the aim of the Axis powers is to embroil America and thus weaken her capacity to assist Great Britain, the attack on the Americas, owing to the development of the European situation, can come, if it is immediate, only from Japan. For the moment, the Nazi threat to South America, directed from Africa, is in abeyance. Japan must strike first at the United States, and it might well seem to the Latin peoples of America that their interests can wait on the outcome of this contest without detriment. On the other hand if, as Mr. Roosevelt claims, the movement towards unity is more deeply rooted than in political expediency, and springs from a fundamental spiritual principle to which all the peoples of the Americas equally feel themselves irrevocably pledged, the prospect of a western hemisphere united against any aggressor who threatens their liberty of thought and action is by no means so indeterminate as Mr. Roosevelt's critics would have us believe.

No close union between peoples can last for any length of time if it is based entirely on political expediency. It crumbles as the reason which called it into being fades into the background. If the tie is to endure it must be woven of that idealistic community of interests and outlook which is drawn from a common heritage and from common elements in the culture of those whom it is sought to unite. At first sight it may seem that such common elements are to seek in the ways of life of the peoples of the Americas. If the relatively negligible influence of the Italian immigrant population of the United States be ignored, and the by no means entirely negligible effect of German and British elements in Central and South America be set aside in this connexion, as it may, the cultural history and social environment of the peoples of America north of Mexico is almost entirely derivative from Northern and Central Europe, while those of Central and South America are drawn from Southern Europe, their source the cradle of Latin civilization. On broad lines the differences which mark these two sources of the American peoples and civilizations may be summed up in the statement that, while one was in religion and sentiment Roman Catholic, the other has been drawn predominantly from members of the Protestant forms of the Christian faith with a bias towards the Calvinistic. The implications of this distinction and the cultural differentiations which are in fact found in association with the two forms of the Christian faith have been further emphasized, not to say exaggerated, in the development to which they have been subjected in a period of comparative isolation from outside, and more especially European influence, since the earlier migrations of the sixteenth and seventeenth centuries. If North America has received a large influx of immigrants in the later nineteenth century, it has speedily assimilated them to its own pattern, while Central and South America, ever since the days of the Conquistadores, have moved away from their European origins by approximation to indigenous forms of culture and belief, thus still

further widening the gap in cultures and outlook which originally marked them off from the North.

This differentiation is most readily perceptible in the lower strata of the Latin population, in which the effect of miscegenation with the indigenes is most to be remarked. Among them culture and religious belief have assimilated closely to native types under the influence of social and geographical environment. So true is this that in Mexico, for example, native elements grafted on to Roman Catholicism have evolved a synthetic form of religion in which pagan and Christian elements are inextricably mingled, but none the less combine to form a whole which completely satisfies the emotional and social needs of the population.

It is a common, but by no means inexcusable, misconception, which regards the Latin American Republics as one in culture and character. The variation between them is considerable, depending to no small degree on the extent and character of their assimilations to the indigenous population. So strongly marked indeed was this differentiation that when Bolivar, the great liberator of South America at the beginning of the nineteenth century, endeavoured to form a federation of the three States of Venezuela, Colombia and Ecuador, he failed owing to differences in outlook and social and religious habit of mind. These same differences, it is to be noted, still persist as marking off the peoples of these States one from another. A further source of misconception arises from the fact that the Portuguese origin of Brazilian culture, with all its implications, is not given its full weight. Portuguese settlers in Brazil, even more than the noble Spanish settlers in the Argentine, who are largely responsible for social conditions in that State to-day, endeavoured to reproduce in their new South American home the conditions which ruled on their ancestral lands in Portugal, recreating the distinctive type of large land holdings or *fondas* to which they had been accustomed. Further, they brought with them a readiness, derived from their racial history and custom, to overlook the colour line in their matrimonial alliances, both temporary and permanent. The Brazilian population consequently has a high percentage of admixture of both indigenous Indian and negro slave blood. It affords a strong argument in support of those who regard artistic efflorescence as one result of crossing with a negro strain. Since the South and Central American Republics broke away from European influence in the last generation and began to develop upon national lines in the arts, Brazil more than any other has forged ahead, especially in music and in the development of a literature of its own.

It is neither possible nor necessary here to enter more fully into a description of the qualities and characteristics which give each and every one of the republics of Central and South America an individuality all its own over and above the very generalized and much modified heritage of a Latin form of civilization. Enough has been said, however, to show some of the difficulties which confront any endeavour to secure a close co-operation with the North destined to survive anything more than the urge of an immediate and insistent peril. The President of the United States, in his call to the American Republics to co-operation, relies upon the devotion of all to the cause of liberty and their determination to preserve the freedom of the individual in thought and action. Yet cynical observers have admitted a doubt whether to the South American liberty means more than the right to revolution in order to resolve a situation to which democracy would put an end by resort to the polling booth.

It is clear that if any measure of that closer co-operation of the American Republics desired by President Roosevelt is to be attained, it will demand a great deal of give and take, and can be based only upon mutual understanding of the different ways in which the two groups of peoples react and have reacted to the stimuli of a developing civilization. This is fully realized among certain sections of opinion in the United States, among whom a movement has been in progress since 1936 for fostering study and understanding of the culture of peoples outside the United States. One of the results of this movement has been the holding of symposia, of which the first, which took place in 1939, was devoted to the culture of the peoples of Central and South America. In a report of this symposium published recently*, distinguished authorities have surveyed the recent cultural development and in some instances the cultural history of the more important States. The Argentine, unfortunately, was not represented. Without entering into detailed discussion, it may be said that, as a whole, the contributions emphasize not merely the differentiations to which reference has been made above, but also the strong individuality in intellectual life and social consciousness which recently has come into being and shows a healthy development in the majority of these States. If the future existence of the Americas depends upon co-operation, it is safe to predict that the extent of the contribution of that union to world order will be in direct ratio to the measure in which it will have been found possible to preserve the cultural individuality of its units.

* Concerning Latin American Culture: Papers read at Byrdcliffe, Woodstock, New York, August 1939. Edited by Charles C. Griffin. (Published for the National Committee of the United States of America on International Intellectual Co-operation.) Pp. xiv+234. (New York: Columbia University Press; London: Oxford University Press, 1940.) 13*s.* 6*d.* net.

THE RUMANIAN EARTHQUAKE OF NOVEMBER 10

By Ernest Tillotson

On October 22, at about 8.30 a.m. local time, a strong earthquake with epicentre probably near Barlag shook a considerable area in Rumania (see Nature, November 9, p. 615). In Bucharest it cracked buildings, throwing some people out of bed, also overturning movable objects. In one hotel it threw a breakfast tray fully loaded from a table to the ground. By radio and special editions of the newspapers, the people were led to expect a more intense shock, and many stayed out of doors all day. One did not come that day. It is safe to predict that an earthquake will probably reaffect an area once affected, but it is folly in the present state of seismological knowledge to predict just when and where an earthquake will occur.

The predicted return came all too soon, unexpectedly, on November 10 (see Nature, November 16, p. 647). It was heralded by minor tremors in various parts of the Balkan States on the night of November 9, but the terrific shock came on November 10 in the early morning. For what appeared to be an age, but actually for perceptibly five minutes, Bucharest and most of Rumania and the surrounding area shook more than they had done since 1802. The people of Bucharest knew it when, with a terrific crash, their new eleven-story Carlton flats crumpled into rubble. Nor was this all. The new building of the Foreign Ministry cracked from top to bottom. The Royal Palace and the headquarters of the Rumanian Army were severely damaged. The great pillars of the Post Office fell, and one crushed a motor-car and its occupants in the street. The gallery of the National Theatre crashed into the pit, and among other buildings two hundred were destroyed and four hundred damaged. Heavy rain fell while medical men, chemists, engineers, architects and private citizens called by the radio, assisted by firemen, the Iron Guard and the German troops, searched the wreckage for those trapped. Fires broke out and basements became flooded. More than a hundred and fifty are known to have been killed in Bucharest alone, and it is feared that thirty or more people are trapped beyond hope of rescue in the Carlton flats. More than a thousand badly damaged houses have had to be evacuated in Bucharest, and there is scarcely a house not affected in some way. The British Legation building had some of its inner walls cracked but was otherwise only slightly damaged.

Other areas in Rumania, including the oilfield towns and the port of Galati, were no less affected. At Ploëşti, after a vivid flash of lightning which put the telephones out of action, the earthquake severely damaged the town hall, a hotel, and the Standard Oil Company's offices. The refineries of the Standard Oil Company also have been compelled to close for ten days while repairs are done chiefly to the pipe lines. In this town also the prefecture, the chamber of commerce, and a number of private houses were destroyed, and sulphur fumes escaped from ground fissures. The Astra Romana Oil Company plant was damaged and fires broke out. At Focsani, an oil town, 70 per cent of the houses in the centre of the town are said to be razed and hundreds of people rendered homeless. At Giurgiv, an oil port on the Danube, 65 per cent of the houses are reported destroyed. At Buzeu, about sixty miles north-east of Bucharest, hundreds of buildings have been destroyed and many people killed. Damage has been done at Ramnicue and Sarat and half the villages in the Prohava oilfields have been razed. Pangui is said to have been completely destroyed and there are twenty-three dead and seventy-one seriously injured. At Jassy, four were killed and six gravely injured. In the whole district tens of thousands of peasants are homeless and the casualties are only small because of the flimsy nature of the peasant buildings.

Damage to the oil wells themselves is uncertain at present. The only fire was quickly extinguished and the pipe lines and steel casements are being examined. The prison for political prisoners at Dostrana near Campina collapsed and about a hundred people were killed. Galati, the grain and oil port, suffered severely. The cathedral and St. Helen's church were destroyed, scores of houses severely damaged, and the casualties were reported as thirty-six killed and a hundred and thirty injured. At Rutschuk, just on the Bulgarian side of the frontier, ten houses were damaged and fifteen persons injured. At present it is difficult to assess the total damage in the whole area. Telephone communications are still interrupted, and some railways have not yet resumed operation pending the examination of tracks, lines, and bridges. A conservative estimate puts the total damage at two and a half million pounds and the casualties throughout the country as four hundred killed and eight hundred severely injured.

Outside Rumania, the shock was felt in Sofia and many parts of Bulgaria though no damage is reported except at Rutschuk. It was also felt at Istanbul in Turkey, and in Moscow an earthquake at 4.40 a.m. local time stopped some clocks and moved some furniture. In Russian-occupied Poland, buildings are said to have been destroyed at Kishinov and Lwow, while at Brazov in the Carpathians terror was caused.

From all this information it is possible to construct provisional isoseismal lines. The Modified Mercalli Intensity Scale of 1931 as used by the United States Coast and Geodetic Survey has been used, which ranges from 1 to 12. A few outstanding intensities might be mentioned:

1, not felt except by a very few in especially favourable circumstances;

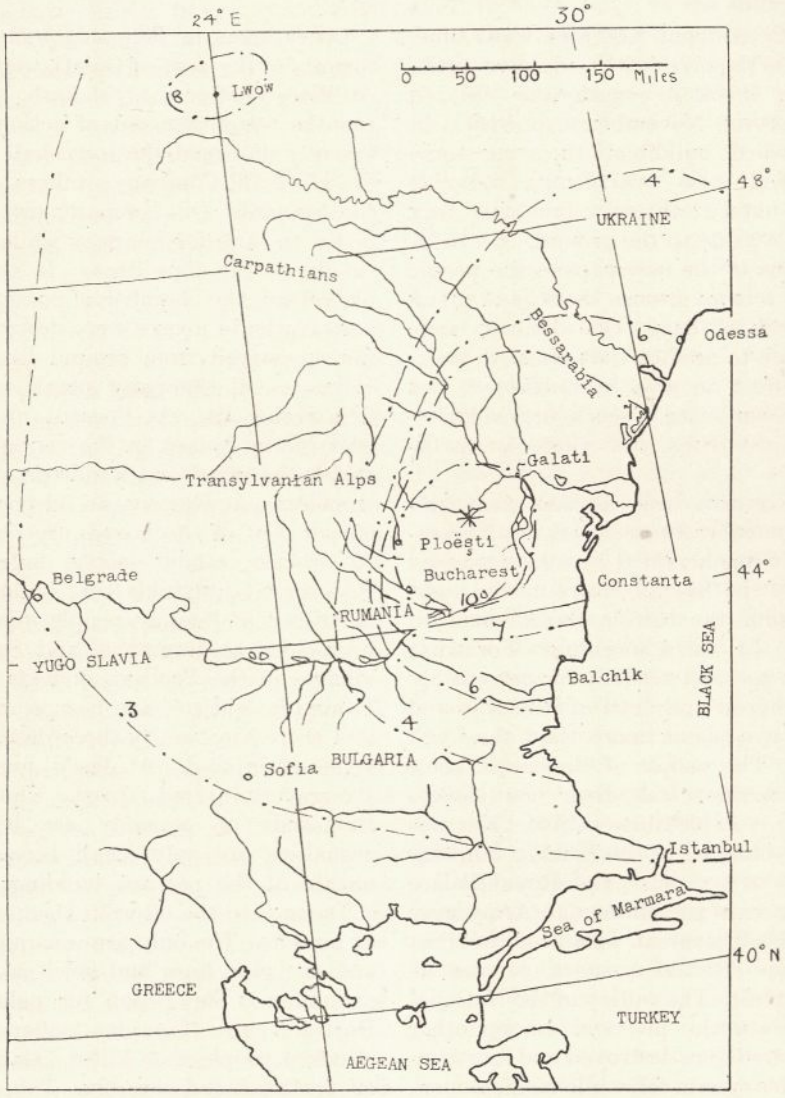
5, felt by nearly everyone; plaster cracked; unstable objects overturned;

10, most masonry and frame structures destroyed with foundations; ground badly cracked; landslides from steep slopes;

12, damage total; waves seen on ground surfaces; objects thrown upward into the air.

It will be seen that the shock reached intensity 10 on this scale in the epicentral area but not 11 or 12, which are extremely rare. There are, however, some curious points. In the Carpathians at Brazov the shock had diminished to intensity 4; but if it was the same shock at Kishinov and Lwow in Poland, it had again increased in intensity to 8 at these places, and was even of intensity 5 in Moscow. At first sight it appears as though there may have been two shocks at very nearly the same time. A thorough examination of the seismograms from near stations would decide this point. Reports from Odessa, the grain port on the Black Sea, indicate that intensity 6 was attained there, while Belgrade, Sofia and Istanbul experienced the earthquake at intensity 3.

Only isoseismal lines for which there is evidence have been drawn on the accompanying map, though it appears that, with the exception of the region near Lwow, the intensity of the shock decreased fairly regularly with increasing epicentral distance. Immediately towards the west of the epicentral area the isoseismals indicate a more rapid falling off at first than in other directions. This may be due to the geological structure. It is noticeable that the isoseismals cover a very wide area, which may point to a focus rather deeper than normal. The wide area covered by the isoseismal 10 and lack of further macroseismic



SKETCH MAP OF RUMANIA AND THE SURROUNDING AREA SHOWING ISOSEISMAL LINES ON THE MODIFIED MERCALLI SCALE

Isoseismal lines, —·—·—·—$\overset{6}{\cdot}$—·—·—; *, epicentre.

For your *Information*

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In this new edition of an outstanding zoological text-book, with its change of type and format, considerable alterations and additions to the text and illustrations have been made, and certain parts which appeared no longer to serve a useful purpose have been omitted.

The changes made in Vol. I include the re-writing of the chapter on the "General Structure and Physiology of Animals" and in so doing its scope has been enlarged. All chapters dealing with classification have been thoroughly revised. The volume was reviewed in NATURE by Prof. C. H. O'Donoghue, who said of it : "The present volume is still easily recognizable as 'Parker and Haswell' and so characterized by straight-forward, concise but nevertheless readable text and it is illustrated by clear, illuminating text-figures. On the technical side it maintains or rather exceeds the high standard set by the first edition, and those who are familiar with the latter will recognize that this is indeed praise. On the whole a praiseworthy judgment has been exercised in what has been included and what omitted, and also between the old 'Parker and Haswell' and the changes necessitated by more modern ideas in zoology."

In Vol. II recent advances in palæontology which have changed earlier views on the evolution of many vertebrates, have been introduced, but so far as possible the general plan of the book has not been altered. A new classification of fishes is used. Treatment of the Amphibia and Reptilia has been somewhat modified. In the section on mammals there is a fuller treatment of the orders and brief accounts of extinct forms.

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evidence makes it difficult on these grounds to pin-point the epicentre.

It was tentatively suggested by the Meteorological Office in Sofia that the epicentre was about 210 miles from Sofia, but the centre of the inner isoseismal is at a rather greater distance than this. At the moment it is more correct to speak of an epicentral area than of an epicentral point.

I am indebted to the Rev. J. P. Rowland, *S.J.*, for the Stonyhurst east–west Milne–Shaw seismogram of magnification 150. This has certain peculiarities which are well worth mentioning. Of the first waves to arrive, *P* were impulsive at 01h. 43m. 45s. G.M.T., the double amplitude being nearly 4 inches. These waves had nearly died down when a very strong impulsive *S* wave arrived at 01h. 47m. 17s. G.M.T. The maximum amplitude for the whole shock appeared to be an *S* wave coming immediately after the *S* onset. It exceeded the limits of registration (paper 9 in. wide) and the *S* waves included some oscillations too rapid to be recorded. Father Rowland estimates provisionally that the ground oscillation at Stonyhurst was at least one eighth of an inch. The surface waves (*L*) had a maximum double amplitude on the seismogram not exceeding 3 inches, and the waves from the shock had not quite died away after nearly 4 hours. *PP*, *PPP*, P_eP, *SS*, *SSS* and S_eS waves could be discerned but no *PS*, *PPS* or *SSP* waves. *sP*, *sS* and SR_1 pulses were identified but not *pP*. Three of these latter are characteristic of earthquakes with a deeper focus than normal, and from the Brunner Chart a depth of focus of 300 km. was estimated together with an epicentral distance of 2,330 km., or nearly 21°.

I am indebted to the Director for the readings of the Kew seismogram. *iP* (dilatation) occurred at 01h. 43m. 18s. with the epicentral distance estimated at 2,090 km. The onsets, maxima and periods of the various phases were very similar to those at Stonyhurst, and the waves could be traced for more than 4 hours. An average estimate of the initial time of the shock is November 10, 1940, 1h. 39·2m. G.M.T. and the epicentre near latitude 45° N., longitude 27° E.

There has been some discussion in Great Britain, South Africa and the United States (NATURE, January 6, 1940; March 16, 1940; and *Earthquake Notes*, September 1940) of the possibility of the waves from one large earthquake acting as a trigger action for an earthquake in another part of the world. The matter has not been decided; but in this connexion it might be mentioned that on the day of the great Rumanian earthquake, shocks were felt in Poland and Moscow, the latter said to have been the greatest in the history of the city, also shocks in Santa Barbara (California) and Santiago de Chile.

Aftershocks of the Rumanian earthquake have been violent and frequent. Five of these were at 8.30 a.m., 8.35 a.m. and 9.30 a.m. on November 11 and two shocks on the night of November 12. These were not registered at Kew.

Altogether, the shock constituted one of the great earthquakes of the world, but not one of the greatest. It was the greatest in Rumania since 1802, but was not so great as the Turkish earthquake of December 1939 (NATURE, January 6, 1940).

OBITUARIES

Sir Herbert Wright

THE death of Sir Herbert Wright, which took place recently at Chalfont St. Giles, removes yet another of the prominent figures of the earlier days of the plantation rubber industry. Born in 1874, he was educated at the Royal College of Science, London, and went to Ceylon as scientific assistant to the director of the Royal Botanic Garden, Peradeniya. He later became acting director, and from 1900 until 1906 was controller of the Agricultural Experiment Station in Ceylon.

During this period Wright was actively engaged in the many problems of the rapidly expanding Hevea rubber industry of Ceylon, and soon came to be regarded as one of the leading authorities on the subject. The results of his work and observations on rubber were published from time to time in the *Tropical Agriculturalist* of Ceylon, and in a book entitled "Hevea brasiliensis or Para Rubber, its Botany, Cultivation, Chemistry and Diseases", published in 1905; second and third editions of this work appeared in 1906 and 1908. Another book on rubber, "Rubber Cultivation in the British Empire", from his pen appeared in 1907.

Other tropical crops besides rubber occupied Wright's attention, notably cacao. He published a work on this crop ("Theobroma Cacao or Cocoa") in 1907, in which he presented the results of botanical and experimental work in other countries, and brought them into line with recent research in Ceylon. Citronella and lemon grass were other important Ceylon crops to engage his attention, and with the co-operation of planters he carried out a series of experiments on their growth, oil production, and general behaviour at different altitudes and in response to different soil conditions. He also made

contributions to the subject of foliar periodicity in the local flora, and made an intensive study of the genus Diospyros in Ceylon.

From 1907 until 1917 Wright was editor of the *India Rubber Journal*, London, and was associated with various public companies and trusts dealing with tropical agriculture. During 1931–38 he was chairman of the finance committee of the governing body and treasurer of the Imperial College of Science and Technology, South Kensington. He also held other offices in connexion with the Imperial College at different times. He was a fellow of the Linnean Society, and was knighted in 1930.

Mr. E. L. Rhead

By the death on October 19 of Mr. Ezra Lobb Rhead, one of the last remaining representatives of the older school of metallurgists passed away. For forty-five years he lectured on metallurgy and assaying in the Manchester College of Technology, being a representative of the University's Faculty of Technology from its inception in 1904.

He was a teacher with a special gift for, and love of, his profession, who inspired in his pupils a real affection. Of the thousands of students who passed through his department, many have risen to positions of eminence. From all parts of the world his old students corresponded with him, and this continued friendship was a source of great satisfaction to him, especially, perhaps, in the years after his resignation from his lectureship. His interest in the welfare of the teaching profession was particularly marked in his support of the Association of Teachers in Technical Institutions, of which he was the president in three successive years.

Mr. Rhead contributed papers on a wide variety of subjects to the metallurgical societies and institutions in which he was interested. He was the author of several text-books on metallurgy, foundry practice and assaying, and he enjoyed the confidence of manufacturers, to whom his scientific knowledge and practical experience were always available.

Perhaps the outstanding characteristic of Rhead was the affection which he inspired in all those who really knew him, and the great kindness of heart which he invariably showed to those who asked for his help and advice.

F. C. Thompson.

Mr. W. G. Spencer, O.B.E.

Mr. Walter George Spencer, the well-known surgeon and medical historian, died on October 31 after a short illness in Westminster Hospital at the age of eighty-three. He was educated at Weymouth College and St. Bartholomew's Hospital, and qualified in 1885. Throughout his career he was closely connected with Westminster Hospital, of which he was vice-president, as well as lecturer and successively assistant surgeon, surgeon, and consulting surgeon.

He was also a prominent figure at the Royal College of Surgeons, where he was a vice-president, a member of the Court of Examiners, and gave the Arris and Gale, Erasmus Wilson, Bradshaw and Vicary Lectures. During the War of 1914–18 he served as major in the R.A.M.C., and was attached to the Fourth London General Hospital. Besides his clinical activities he took a keen interest in experiments on animals, and contributed two important papers to the *Philosophical Transactions*, the first in 1891 in conjunction with Victor Horsley on "The Changes Produced in the Circulation and Respiration by Increase of the Intracranial Pressure or Tension", and the second in 1894 on "The Effect Produced upon Respiration by Faradic Excitation of the Cerebrum in the Monkey, Dog, Cat and Rabbit". He also delivered a Hunterian Lecture at the Royal College of Surgeons in 1920 on "Animal Experiments and Surgery".

Mr. Spencer did valuable service at the Royal Society of Medicine, where he was president of the Sections of Surgery in 1920–21 and the History of Medicine in 1926–28, as well as honorary librarian in 1916–28. He was also honorary librarian for many years at the British Medical Association, and a member of the Committee of the London Library, at which he was a frequent visitor until shortly before his death. His chief contributions to medical history were his "Westminster Hospital: An Outline of its History" (1924), his collaboration with Sir D'Arcy Power and Prof. G. E. Gask in the revision of Plarr's "Lives of the Fellows of the Royal College of Surgeons of England" (1930), and a translation of Celsus in the Loeb Classical Library (1935-38). He also took an active part in the organization of the second International Congress of the History of Medicine held in London in 1922, when he acted as honorary treasurer and co-editor with the present writer of its proceedings.

J. D. Rolleston.

We regret to announce the following deaths:

Mr. H. H. Baker, president of the New South Wales Branch of the British Astronomical Association, on August 13, aged seventy-two.

Dr. F. W. Edwards, F.R.S., deputy keeper of entomology in the British Museum (Natural History), on November 15, aged fifty-one.

Prof. E. W. MacBride, F.R.S., emeritus professor of zoology in the University of London, on November 17, aged seventy-three.

Dr. S. P. McCallum, University demonstrator in physics, Oxford, on November 16, aged forty-five.

M. Charles Nordman, director of the Paris Observatory since 1920, on November 15, aged fifty-nine.

Prof. Hans Rosenberg, an authority on astronomical photometry, formerly director of the Kiel Observatory and lately director of the Observatory at Istanbul, on July 26, aged sixty-one.

Prof. George Rutledge, professor of mathematics in the Massachusetts Institute of Technology, on September 21, aged fifty-eight years.

NEWS AND VIEWS

Royal Society Medallists

His Majesty the King has been graciously pleased to approve the recommendations made by the Council of the Royal Society for the award of the two Royal Medals for the current year to Prof. P. M. S. Blackett, F.R.S., for his studies of cosmic rays and the showers of particles which they produce, for his share in the discovery of the positive electron, for his work on mesons and many other experimental achievements, and to Dr. F. H. A. Marshall, F.R.S., for his contributions to the physiology of animal reproduction.

The following awards of medals have been made by the President and Council of the Royal Society: Copley Medal to Prof. P. Langevin, For.Mem.R.S., for his pioneer work in the electron theory of magnetism, his fundamental contributions to discharge of electricity in gases and his important work in many branches of theoretical physics; Rumford Medal to Prof. K. M. G. Siegbahn for his pioneer work in high precision X-ray spectroscopy and its applications; Davy Medal to Prof. H. C. Urey for his isolation of deuterium, the heavy hydrogen isotope, and for his work on the use of this and other isotopes in following the detailed course of chemical reactions; Darwin Medal to Prof. J. P. Hill, F.R.S., for his contributions to problems bearing on the interrelationships of the main groups of the Mammalia and on the phylogenetic history of the Primates, a subject with which Charles Darwin himself was so much concerned; Sylvester Medal to Prof. G. H. Hardy, F.R.S., for his important contributions to many branches of pure mathematics; Hughes Medal to Prof. A. H. Compton for his discovery of the Compton effect, and for his work on cosmic rays.

The Dublin Institute for Advanced Studies

In Dublin, by an act of the Oireachtas, the Dublin Institute for Advanced Studies was founded in October. For the time being it consists of two constituent schools, the School of Celtic Studies and the School of Theoretical Physics. The general government of the Institute is entrusted to a Council, to which Rev. P. Browne (chairman), Dr. R. I. Best, Prof. D. A. Binchy, Prof. F. E. W. Hackett, Prof. E. Schrödinger were appointed by the President of Eire, whilst the President of University College, Dublin (Prof. A. W. Conway), the Provost of Trinity College, Dublin (Dr. W. E. Thrift) and the President of the Royal Irish Academy (Eoin MacNeill) are members *ex officio*.

The Institute will provide facilities for advanced studies and research in special branches of knowledge and for the publication of the results of such studies, irrespective of whether they have originated from the Institute or not. In particular, the scope of the School of Theoretical Physics is described as the investigation of the mathematical principles of natural philosophy and their application to the sciences in which they obtain. Both the training of advanced students in methods of original research and the provision of research facilities for professors and lecturers on leave of absence from their academic duties will be included. Seminars and lectures on topics which lie on the frontiers of knowledge are to be held. Financial aid for producing and publishing works within the scope of the School (but not necessarily originating from it) is envisaged. Admission to the Schools is granted by the Council of the Institute, to which applications, or inquiries of any kind, should be directed (64–65, Merrion Square, Dublin). Moderate fees will be charged, but a limited number of scholarships, including a substantial contribution to maintenance, are available. The first senior professor appointed to the School of Theoretical Physics is Prof. E. Schrödinger, formerly of the University of Graz. Apart from the Council of the Institute mentioned above, each School has a Governing Board. This Board, for the School of Theoretical Physics, includes: Prof. A. W. Conway (chairman), Prof. F. E. W. Hackett, Prof. A. J. M'Connell, Prof. W. H. McCrea (Belfast), Prof. A. O'Rahilly (Cork), Prof. E. T. Whittaker (Edinburgh).

Mr. Roosevelt and the "New Order"

With remarkable propriety, the occasion for Mr. Roosevelt's first public address after the presidential election was Armistice Day, November 11, when he spoke at the tomb of the Unknown Warrior at Arlington Cemetery. Equally appropriate was his choice of a theme—a review of the progress of democracy since the Declaration of Independence, when, as he said, a New Order came into being. In showing how the gospel of democracy has been carried among peoples, great and small, by the Americas, "all of the Americas" and the British Isles with them, the President brought the War of 1914–18 into a truer perspective, not as a useless sacrifice, but as a phase in the resistance to the doctrine that might is right which then made a definite effort to destroy this New Order after its relatively short trial. The struggle of 1914–18, Mr. Roosevelt continued, preserved the New Order of the ages for at least a generation; and had the Axis of 1918 been successful over the associated nations, resistance on behalf of democracy in 1940 would have been impossible. At the same time, he recognized and impressed upon his hearers the need for great flexibility in the methods of democracy. Certain facts of 1940 did not exist in 1918. There is need for the elimination of aggressive armaments, the breaking down of barriers in a more closely knitted world and a need for restoring honour

in the written and spoken word. To attain these purposes the processes of democracy must be much improved.

In thus foreshadowing in general terms the process of future growth in the democratic idea, Mr. Roosevelt was contemplating democracy as of the spirit, as a way of life and not merely as a political system, contrasting it with another 'New Order' of which much has been heard recently. Of the methods of this latter no graver indictment could be set forth than in the preamble to the proposed post-War agreement of co-operation between Poland and Czechoslovakia, in which it is shown that among its other crimes the Nazi regime is exterminating the intellectual class and all manifestations of cultural life, while despoiling these countries of their treasures of art and science and persecuting all religious beliefs. Against the spirit of these and other Nazi crimes "unparalleled in all human history", the agreement between Poland and Czechoslovakia aims at setting up an association "which would become a new order in Central Europe and a guarantee of its stability", no less than the 'New Order' of the President of the United States, based upon "respect for the freedom of nations, the principles of democracy and the dignity of man".

Photographic Exhibitions of Indian Art and Religion

The exhibition of photographs illustrating Indian art and religion at the Imperial Institute, South Kensington, London, which was opened by Mr. L. S. Amery, H.M. Secretary of State for India, on November 13, will repay careful study. It does, in fact, convey a clearer view of Indian genius and mentality than many collections of a more spectacular and imposing character. As Mr. Amery pointed out in declaring the exhibition open, just as Europe in the Middle Ages had embodied its ideas and ideals in the cathedral, so in India Hinduism had attained the highest artistic expression of its religious conceptions in the temple; and ornamentation and decoration were the natural media in which both the artistic and the mental perceptions of India were illustrated. In order to understand India, Mr. Amery went on to say, it is necessary to have a perception of her architecture, her sculpture and her temple symbolism. The selection and grouping of the photographs in this exhibition, as well as the carefully prepared captions, are such as to give the visitor who examines them with attention, even if his previous knowledge of Indian art be slight, something more than a superficial view of the three aspects of Indian culture to which Mr. Amery referred; moreover, he will be impressed by the subtlety which pervades all Indian religious art, whether Hindu, Buddhist or Jain, and makes it in virtue of its all-pervading symbolism so remarkable a vehicle for conveying theological and philosophical concepts and ideas.

The arrangements for the exhibition have been made by the India Society and the Warburg Institute. The photographs, which attain a high standard of technical skill, are the work of Dr. Stella Kramritsch, lecturer on Indian art in the University of Calcutta. They illustrate developments in Hindu temple architecture and religious art, inclusive of such reform movements as Buddhism and Jainism from 200 B.C. to A.D. 1700. Broadly speaking, the arrangement is chronological; but since, as already indicated, interest centres upon religious concepts rather than æsthetic principles and achievement, though the latter are by no means passed over, examples are grouped and classified to illustrate these concepts. Naturally, in the early phases the Indianization of classical Greek art in Northern India figures prominently, while the group covering the setting of the temple demonstrates characteristic examples of the geographical environment as well as external form. Attention may be directed in particular, however, to the illustrations of the growth and meaning of symbolism, as well as of the worship of the symbol, and its plan in Indian religion and philosophy, the most striking example of this to the Western mode of thought being the manner in which the rhythms of the body as in dancing, or its functions as in sexual relations, are made to express a state of mind on a cosmic principle.

Antiseptics in War-Time Surgery

The winter session of the Pharmaceutical Society's evening meetings was inaugurated on November 14 by Prof. A. Fleming, professor of bacteriology in the University of London, who delivered a lecture on "Antiseptics in War-Time Surgery". He said that in the present War surgeons should be able to undertake their work more efficiently than they were in 1914 in view of the chemical antiseptics which are now available but were then lacking. Thus the present situation in respect of the treatment of war wounds is infinitely more satisfactory than it was in the War of 1914–18. The antiseptics in use in 1914 have since been shown to be of little value for use in war-time surgery. Carbolic acid, for example, is effective when used otherwise than in connexion with the human body, but inside the body its lack of value is shown by the diminution of its efficiency with increasing concentrations, this being due to its action in destroying the leucocytes. Consequently carbolic acid is not of any great use as an antiseptic in the treatment of wounds.

Prof. Fleming also pointed out that the dyes are of little value as they are absorbed by the cotton wool used in dressing the wounds. Regarding antiseptics belonging to the sulphonamide group, he gave a warning against placing too much faith in them. They are not, he said, general antiseptics but are specific to certain bacteria; further, the action of these antiseptics is neutralized by chemicals, pus and dead bacteria and they are therefore of little value in the treatment of seriously septic wounds, in which pus and bacteria were inevitably present. The virtue of this new group of antiseptics is in their high solubility; they dissolve to form high concentrations in the wound. The sulphonamides are of great value in the treatment of fresh wounds where pus and bacteria are absent, since they inhibit the growth of certain important bacteria, and there is nothing in the fresh wound to inhibit the action of the sulphonamide.

The Albanian Fauna

The extensive fighting in Albania is in a region rich in natural history interest, particularly ornithology, where Hugh Whistler, Dr. Ticehurst, Prof. P. A. Buxton, W. E. Clyde Todd and Ludwig von Fuehrer have made collections in recent years (*Ibis*, 1929, 1932, 1936) and 272 bird forms have been listed. Nesting chaffinches examined from Albania have been found to be *Fringilla cœlebs balearica* and not the typical form, but there is much of British interest in the bird life. Jays are fairly common in the valleys, up to 1,200 ft., and they have been seen at 1,500 ft. in the Logra Forest on the Acroceraunian Mountains. Magpies (*Corvus cernix sardonius* and *Corvus monedula soemmerungii*) are not so common as formerly reported, and not usually above 2,500 ft. Orioles are common. In his expeditions from Valona to the Acroceraunian Range in 1935, Whistler for the first time verified the great black woodpecker occurring in the country (*Ibis*, April 1936), while birds collected by Ludwig von Fuehrer in 1932 are now in the Carnegie Museum at Pittsburgh. The Spanish sparrow and blackbird are widespread, though local, and there are tree-creepers, marsh-tits, rock-nuthatches, numerous Spanish wheatears, and the robin nesting at 2,500 ft. in the Logra Forests. The imperial eagle nests in open country, the goshawk in the Jinokastro valley, and there are hobbies, peregrines, sea-eagles and harriers; white storks inhabit the ruined towers in summer and a colony of pygmy cormorants nests in the middle of the Lake Terbuf. Colonies of egret nest on the marshes at Durazzo, Valona, etc., along with garganey, pintail, bitterns, purple herons, Kentish plover, pelicans, and yellow-legged herring-gulls, and the adjoining woods have six species of woodpecker, hazel grouse, capercailzie, Cetti's warbler and subalpine warblers. The alpine accentor and alpine chough inhabit the mountains, the thick-billed reed-bunting, bearded reedling and penduline tit the plains, the dipper is common at the mountain streams, the crested tit in the fir forests and the red-rumped swallow in many districts.

Leeds University Union's Loan

The University Union, comprising the whole body of students of the University of Leeds, has decided to lend to the Government free of interest the sum of £1,000. In consequence of the postponement of the construction of the proposed swimming bath and of the extension of the existing gymnasium, the Union found itself with a balance of money which had been set aside for use in connexion with those new developments. In these circumstances the Union Committee felt that this money might appropriately be placed in the hands of the Government until such time as it can be devoted to its original purpose, that is until building work again becomes possible after the War. The University authorities approved of the Committee's proposal and of its wish to forego interest on the loan. The Union has also invested the sum of £400 in Defence Bonds.

The New "Nomenclator Zoologicus"

It is satisfactory to be able to report that the publication of the "Nomenclator Zoologicus", an announcement respecting which was made in Nature of February 25, 1939, p. 326, has now been completed. Moreover, in spite of the inevitable difficulties that have arisen out of the conditions under which the later volumes have been produced, the final one has appeared nearly two months in advance of schedule. The work, which covers the literature from 1758 to the end of 1935, is contained in four volumes, the last of which includes a supplementary list of addenda and corrigenda. It contains in all about 227,000 entries, including cross-references, though it is probable that these do not represent more than about 190,000 genera or subgenera treated as distinct by present-day systematists. Of these, the Arthropoda represent more than 70 per cent of the whole, the Insecta alone representing 50 per cent.

In the preparation of the work, the editor, Dr. S. A. Neave, Imperial Institute of Entomology, 41 Queen's Gate, London, S.W.7, has had the ungrudging assistance, not only of most of the staff of the British Museum (Natural History), but also of numerous other zoologists both in Great Britain and abroad. The work is published for the proprietors by the Zoological Society of London, which has borne the main cost of compilation. Thanks to grants from outside sources, including the Carnegie Corporation of New York, it was found possible to issue the complete work of more than 3,800 pages to original subscribers at the low price of six guineas; but it has now been found necessary to raise this to ten guineas.

Luigi Luciani

Prof. Luigi Luciani, the celebrated Italian physiologist, was born at Ascoli Piceno on November 23, 1840. He received his medical education at Bologna and Naples, and qualified at Bologna in 1868. After acting as assistant to Vella in the Institute of Physiology at Bologna he spent nearly two years in the corresponding institute at Leipzig under Ludwig. On his return to Bologna he became lecturer in experimental pathology and also devoted himself to the study of the physiology of respiration. In 1875 he was appointed professor of physiology at Parma, where he remained for five years. In 1880 he succeeded Giannozzi in the corresponding chair at Sienna, and shortly afterwards became professor of comparative physiology at Florence, where he remained from 1880 until 1892. During this period his most important work, namely, that on the cerebellum and fasting, was carried out. Finally, he occupied the chair of physiology at Rome, which he held until his retirement in 1917. His original work consisted mainly of his studies on the physiology of the cardio-vascular system, the cerebral cortex and cerebellum muscular movements and fasting, the last being carried out on Succi, the professional fasting man. He was also interested in phonetics, psychology, and the history of medicine. His most important publications were those on the functional

localization of the cerebellum (1885), the physiology of fasting (1889), and human physiology (1898–1903), the latter having been translated into English, German and Spanish. He died on June 23, 1919.

Louis Stromeyer Little

MR. LOUIS STROMEYER LITTLE, an eminent surgeon and astronomer, was born in London on November 23, 1840, the third son of Dr. William Little, the orthopædist who gave his name to cerebral diplegia. He was educated at St. Paul's School and at Kiel and Hanover. He qualified M.R.C.S. in 1862 and the same year became assistant surgeon at the London Hospital, and later was appointed to the National Orthopædic Hospital and St. Mary's Hospital for Women and Children. In 1866, when an epidemic of Asiatic cholera occurred in the East End of London and application was made to the London Hospital for assistance, he took an active and successful part in its treatment by intravenous injection of saline solutions. On the outbreak of the Schleswig-Holstein War in 1864, Little first joined the Prussians, but afterwards joined the Danish forces. In 1869 he went to Shanghai where he soon acquired the best medical practice in the Far East. He also developed the knowledge of astronomy which he had acquired in London to a remarkable extent, and not only built an observatory at Shanghai, but also established the first telegraphic longitude observed in China by means of telegraphic signals with Nagasaki, 600 miles away on the opposite shore of the Yellow Sea. This achievement gained him the fellowship of the Royal Astronomical Society in 1877. After residence in China for nearly thirty years he returned to England via South Africa, where he was awarded the South African Medal for his services in the Boer War. He died on October 4, 1911.

Prof. Carlo Giacomini

PROF. CARLO GIACOMINI, an eminent Italian anatomist and anthropologist, was born at Sale near Alessandria on November 25, 1840. He obtained his medical qualification in 1864 at Turin, where he divided his time between anatomy and clinical medicine until 1880, when he was appointed professor of anatomy and gained a high reputation as a teacher. The classical researches with which he is connected are those on the anatomy and teratology of the brain, his method of preservation of the cerebral convolutions, the anatomy of the negro, and investigations on anomalies of development of the human embryo. He was also co-editor of *L'Osservatore*. The Museum of Anatomy at Turin owes much to him for its collections. He died at Turin on July 25, 1892.

The Newcomen Society

ON November 13, at the Iron and Steel Institute, the Newcomen Society held its annual general meeting, and then listened to the reading of two papers. In the report of the Council for the year 1939–40, it was stated that 322 new members have been elected and the membership now stands at 1,512. The majority of the new members are citizens of the United States. Though owing to the stress of war two London meetings were cancelled, a good series of papers were read and many other activities were carried on. The Council sent a chaplet to Handsworth Church on November 15, 1939, to mark the centenary of the death of William Murdoch, and joint action was taken with the Smeatonian Society to place a tablet in the chambers in Gray's Inn occupied by Smeaton during 1783–1793; but the completion of this memorial has had to be deferred. Among the members whose death has been recorded during the year was Mr. L. F. Loree, who is regarded as the founder of the Society in the United States. After the report had been passed, the meeting re-elected Col. C. E. Davies, of New York, for a second year as president. The papers read were respectively by Mr. E. W. Hulme and Dr. H. W. Dickinson, the latter dealing with the work of Henry Cort, the inventor of the puddling process for the manufacture of wrought iron, while Mr. Hulme's paper was entitled "Prehistoric and Primitive Iron Smelting: Part 2, The Crucible Processes of the East". It has been decided owing to the conditions prevailing that no meetings will be held in December and January, but if possible a resumption will be made in February.

Eradication of Bracken

BRACKEN has become an increasing menace in recent years, and vigorous efforts are being made to find cheap and efficient means for its eradication. Although systematic cutting or crushing can be entirely successful, the process is slow, about eight cuttings at the rate of two a year being required. A more rapid method of destruction is achieved by either broadcasting or spraying with sodium chlorate, but as 2 cwt. per acre is needed the cost (approximately £4 an acre) is prohibitive. Chlorate, however, is much more toxic when introduced directly into the plant, and Dr. G. H. Bates has devised a mechanical method whereby the chemical can be applied to the cut end of the bracken frond. The chlorate added in this way rapidly kills the aerial portion, and ultimately destroys the underground rhizomes of the plant; only 15–20 lb. of the chemical is required per acre.

The apparatus and method of use are described in Bulletin 14, Rubber and Agriculture Series, published by the British Rubber Publicity Association, 19 Fenchurch Street, London. Bracken crushers or cutting machines which break or bend the stem are not suited to this direct application technique, as unbroken continuity of the vessels is essential for proper penetration of the chlorate; but with hand scythes or machines with reciprocating knives it works well. A small attachment strapped to the worker's belt has been devised for use with a hand scythe. It does not weigh more than 10 lb. when filled with solution and needs only be replenished about four times daily. A rubber tube serves as a feed on to a sponge rubber pad, backed by a meta plate which is attached to the scythe blade. The rate of flow can be controlled. A somewhat similar device

which has proved very efficient has also been constructed for attachment to a motor-scythe, and no special skill is required in its use. Experimental work on the subject is being continued, and it seems possible that given good weather conditions, complete eradiction of bracken may ultimately be obtained after a single cut.

Rationing of Manufacturers' Supplies

It has recently been suggested to us that in placing orders for material or apparatus, an authority for the order should always be quoted in order to secure release of material. In an article on "The Manufacturers' Order Book" by "Sala" which appears in the *Electrical Review* of November 8, the whole problem raised by questions of priority is discussed. Almost every manufacturer of materials required in the war effort has to decide whether to refuse orders for the time being or to limit the acceptance of orders so as to bring them into line with his estimated output. The manufacturer can obtain but little guidance from his customers as to the urgency of their requirements, for each will rightly demand preference in view of the material being required for urgent Government work. It may also happen that material ordered through the usual trade channels is required for some vitally important part of the war effort and demands priority over orders received direct from Government departments. One way out of the difficulty is for the manufacturer to see that each customer will get a portion of his requirements. This rationing of supplies rarely solves the difficulties. The manufacturer realizes the inadvisability of refusing orders particularly as he generally has no means of authenticating their vital importance in comparison with the uncompleted priority orders still on his books. He feels that the responsibility of limiting or reducing the amounts specified in a consumer's order should not be left to the manufacturer.

Mosquito Control in Great Britain

The Ministry of Health has recently published a "Memorandum on Measures for the Control of Mosquito Nuisances in Great Britain" (No. 238, Medicine, 1940) by Lieut.-Col. J. A. Sinton and Mr. P. G. Shute. While mosquitoes may carry malaria in certain circumstances in Britain, as happened during and after the War of 1914–18, it is mainly because of the nuisance caused by the bites that anti-mosquito measures are undertaken in Great Britain. Of the 29 recorded species, eight are so rare or so seldom bite man that they may be considered unimportant from the public health point of view. *Anopheles maculipennis* is the potential carrier of malaria and during the past twenty-five years more than 500 cases of the disease have been proved to have been locally contracted in almost every instance through its agency. The habits, economy, and means of control of this and other British mosquitoes are dealt with in this memorandum. The information given is up to date and has obviously been carefully collated. If anti-mosquito measures are to be applied effectively and economically the species concerned must be identified and its habits taken into account. Specimens are identified free of charge at the Malaria Laboratory of the Ministry of Health or at the British Museum (Natural History). Once a given species is named the advice given for its control may be followed. The memorandum, it may be added, is to be obtained from H.M. Stationery Office or through any bookseller, price 6*d*. net.

A Parachute Fishing Net

Dr. J. F. G. Wheeler, director of the Biological Station at Bermuda, has succeeded in designing a workable net in the form of a parachute for catching small deep-sea planktonic organisms. The novel idea of a fishing net without a towing line is adapted from the method used by Prof. Maurice Ewing in his work on the sub-sedimentary rocks beneath the sea. The net fishes upside down. At the top is a fine mesh followed by a wider weave net; it then broadens out to a canvas-like material which has metal 'eyes' punctured into the bottom. From these 'eyes' are attached ropes or bridles. These come down in a V fashion to a small cord to which is attached a wire receptacle in which is placed a large lump of rock salt. Beneath this are suspended two weights. At the top of the net, and inside it, is a funnel-like pipe leading into a bucket. Affixed to the top of the bucket are a float (a can filled with petrol) and a flag.

The net is nine feet three inches across its mouth and nearly thirty feet long. The two concrete weights total 138 lb. The apparatus is easily thrown into the sea. On its downward journey the net swells out and opens in a parachute-like form, retaining its shape on its descent. It catches as it goes down the minute plankton which enters the mouth and passes into the bucket through the funnel. The net touches the bottom. The salt has by this time dissolved (the requisite amount having been roughly calculated) and the weights are released. The closed parachute is then brought to the surface by the float. The net was successfully used at a depth of more than 1,000 fathoms. Its advantages over a tow-net are that it can be handled easily by a small crew in calm weather, and can be left to itself while the boat is elsewhere. Also that the specimens are in better condition when brought to the surface.

The American Museum of Natural History

The Americas for the moment are fortunate in being so far removed from the theatre of war as to be able to continue scientific investigation in the field, even though it be only on a restricted scale. During the past summer, the American Museum of Natural History has sent expeditions for zoological and palæontological research to Alaska, Kansas, Texas and Dakota (*Science*, August 16, 1940). The expedition under Dr. Walter Grainger, curator of palæontology in the Museum, which is exploring the Big Badlands of South Dakota for fossils of the three-toed horse, the pygmy rhinoceros, and cats, especially the sabre-toothed tiger, is accompanied by

Junius Bird, assistant in the Museum's Department of Anthropology. Mr. Bird will conduct excavations in the recent deposits overlying the fossil beds, in which have been found evidence of early human occupation, such as chalcedony tools, including scrapers and knives, and sherds of a black pottery.

An expedition under Dr. Grace Ramsay Fisher, of the Department of Education of the Museum, has been engaged in recording the life and work of Indian artist craftsmen in Mexico, a field in which surviving primitive conditions still afford a profitable field of research and recordings. Collections will illustrate typical examples of representative native craftsmanship in weaving wool, cotton, and plant fibres, embroidery and beading, pottery, showing the regional designs, leather, metal and lacquer work, masks, musical instruments and toys. The areas covered were central, south-east and south-west Mexico, and coloured motion pictures illustrate the life of their villages. This material ultimately will be circulated by the Department of Education for use in schools and other educational institutions.

Leprosy in Brittany

IN his inaugural thesis (*Thèse de Paris*, 1940, No. 229), Dr. Y. M. Marhic states that leprosy disappeared from Brittany at the end of the seventeenth century, and no further mention was made of its occurrence there until 1892, when Zambaco Pacha, during a visit to the province, rediscovered the disease. Since then it has been the custom to describe Brittany as a leper country like the Mediterranean coast. Zambaco Pacha, however, found only two cases of leprosy in Brittany which were not indigenous, and since then only five cases in all have been described in Brittany in the course of forty-seven years, namely, one by Jeanselme (probably indigenous), one by Loussot-Netter (indigenous), three by Gouin, two of which showed *B. leprœ*, and two doubtful cases by Laferre, which were probably examples of leprosy without bacilli. Marhic therefore comes to the conclusion that leprosy does not appear to be more frequent in Brittany than in the other French provinces.

Jute-Growing in the U.S.S.R.

THE All-Union Institute of Plant Cultivation of the U.S.S.R. has for the past thirteen years been carrying on experiments in the cultivation of jute, and has proved that this important industrial crop can be grown successfully in the Soviet Union. From among 150 varieties imported from India and various other tropical and sub-tropical countries and planted by the Institute in certain districts of Transcaucasia and Central Asia, the species *Corchorus capsularis* and *Corchorus olitorius* have been selected. These plants yield 13–25 per cent fibre, and produce a crop of seeds, which will make it possible to cultivate jute in the U.S.S.R. on an industrial scale. At present the Institute is endeavouring to acclimatize species and varieties with a greater yield.

Announcements

SIR ARTHUR HILL, director of the Royal Botanic Gardens, Kew, has been awarded the George Robert White Medal of the Massachusetts Horticultural Society.

SIR ARTHUR MACNALTY, chief medical officer of the Ministry of Health and of the Board of Education, is retiring on reaching the age limit. The Minister of Health and the President of the Board of Education have respectively appointed Sir Wilson Jameson to be chief medical officer of the Ministry and the Board. Sir Wilson Jameson is relinquishing the post of medical adviser to the Secretary of State for the Colonies, from which in the circumstances the Secretary of State did not feel that he could refuse to release him. He is also relinquishing the post of dean of the London School of Hygiene and Tropical Medicine and professor of public health in the University of London.

THE Ministry of Food announces that the Flour (Vitaminization) Advisory Committee, which has recently been appointed, will have the assistance in its official capacities of Prof. D. M. S. Watson, F.R.S., of the Scientific Sub-Committee of the Food Policy Committee of the Cabinet, of Mr. P. N. R. Butcher, of the Ministry of Health, and of the following officers of the Ministry of Food: Sir Norman Vernon (director of flour milling), Prof. J. C. Drummond (scientific adviser), Dr. T. Moran (deputy scientific adviser), and Mr. J. H. Pillman (manager for imported flour).

THE following appointments have recently been made in the Colonial Service: P. R. Akehurst, agricultural officer, Nyasaland; L. H. Browne, agricultural officer, Nigeria; J. W. D. Goodban, agricultural officer, Nigeria; A. P. MacWilliam, agricultural officer, Trinidad; D. B. Murray, agricultural officer, Nigeria; P. Paine, agricultural officer, Nigeria; M. F. H. Selby, botanist, Nigeria; N. Harris, geologist, Uganda.

DR. R. LESSING, of 50 Queen Anne's Gate, London, S.W.1, has a complete set of unbound copies of NATURE dating from 1918 up to the current issue. He is prepared to present these to any person, school or institute. Application should be made to Dr. Lessing direct.

THE Huxley Memorial Lecture of the Royal Anthropological Institute will be delivered by Mr. H. J. E. Peake at 2.30 p.m. on November 26, at the rooms of the Institute, 21 Bedford Square, London, W.C.1. The subject of the lecture will be "The Study of Prehistoric Times".

THE second of the Cantor lectures of the Royal Society of Arts will be delivered by Prof. S. J. Davies at 1.45 p.m. on November 25, at the Society's rooms, John Adam Street, Adelphi, London, W.C.2. The subject of the lecture will be "Recent Developments in Internal Combustion Engines".

LETTERS TO THE EDITORS

The Editors do not hold themselves responsible for opinions expressed by their correspondents. They cannot undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of NATURE. *No notice is taken of anonymous communications.*

IN THE PRESENT CIRCUMSTANCES, PROOFS OF "LETTERS" WILL NOT BE SUBMITTED TO CORRESPONDENTS OUTSIDE GREAT BRITAIN.

Energy of Aliphatic Carbon Links

THE information about the strength of carbon links, obtainable from thermo-chemical measurements on organic substances, is of an indirect nature. If R is an alkyl (or other) radical, we can, from the heats of formation of RH, RX (and XY, YH), derive the thermal effect Q of a substitution of the type

$$RH + XY = RX + YH + Q;$$

and for a series of different radicals R these heats vary as the substitution heats in the corresponding reactions of the type

$$RH + X = RX + H + Q'.$$

For the magnitudes of Q' listed below, the heats of the reactions $X + Y = XY$ and $H + Y = YH$ are required, and have been taken from the compilation of Bichowsky and Rossini[1], with the exception of $H + OH = H_2O$ taken as + 115 Cal.; the differences in Q' between different radicals R are, however, independent of these further assumptions and depend only on differences in Q.

TABLE 1. SUBSTITUTION HEATS, Q'. (EXOTHERMIC HEATS TAKEN AS POSITIVE)

	$X = CH_3$	$X = Br$	$X = OH$	$X = \beta\cdot$
CH_3H	−15·4	(−33·9)	−16·0	—
C_2H_5H	−13·0	−30·5	−10·2	−68·0
n-C_3H_7H	−12·7	−30·1	− 8·8	−67·5
sec-C_3H_7H	−10·8	−27·9	− 4·5*	−66·0
tert.-C_4H_9H	−10·0	−25·9	− 0·6*	−64·6

In Table 1 the data for $X = CH_3$ and OH come from the papers of Rossini[2]. $\beta\cdot$ signifies a free valence in the β position, released by the removal of an H-atom. "Substitution" by $\beta\cdot$, e.g. for $R\text{-}\overset{\alpha}{C}H_2\text{-}\overset{\beta}{C}H_2\cdot$, would consist in $R\text{-}CH_2\text{-}CH_2\cdot = R\text{-}CH = CH_2 + H$. Measurements by Kistiakowsky and his school[3] were used for the columns Br and $\beta\cdot$, following the assumption substantiated by them that heats of addition on two neighbouring carbon atoms are independent. The substitution heat of Br on CH_4 was obtained by extrapolating the four figures below it, relating their trend to that of the two neighbouring sequences. In the CH_3 column the C–H bond strength in CH_4, which comes in as an additive constant, is given the value 103·6 deduced later in this letter.

TABLE 2. BOND ENERGIES.

	C–I	C–I (smoothed)	C–Br	C–H	C–CH_3	C–OH	α–β
CH_3–	53–54	55·0	69·7	103·6	88·2	87·6	—
C_2H_5–	52·2	51·2	65·9	96·4	83·4	86·2	56·6
nC_3H_7–	50·0	50·7	65·5	95·5	82·8	86·7	—
sec. C_3H_7–	—	(48·4)	63·1	91·6	80·2	86·5*	53·0
tert. C_4H_9–	45·1	46·3	61·0	86·9	76·9	87·6*	51·4

Table 2 shows the results of a combination of these Q' values with measured bond energies of C–I [4]. The 'smoothed' column is obtained by plotting the measured values against the Q' for RBr; the *sec*.-propyl value being thus interpolated. (Plotting the measured values against the velocity constants of the gas reaction $Na + ClR$ also leads to 55·0 for the CH_3–I bond.) The difference between R-Br and R–I bond strengths was assumed independent of R; this view is supported by unpublished measurements of Dr. G. N. Burkhardt on the equilibria $RCl + I' \rightleftarrows RI + Cl'$ for various alkyl radicals. This difference was evaluated as 14·7 (± 0·6) from data quoted by Conn, Kistiakowsky and Smith[3] on the heats of addition of hydrogen bromide and iodide respectively to ethylene and isobutene, and from the heats of formation of methyl bromide and iodide, ethyl bromide and iodide, and methylene bromide and iodide given by Bichowsky and Rossini[1]. The last column, $\alpha - \beta$, signifies the energy of the second valence in a double bond linked to the α-carbon of radical R (from which a β-hydrogen has been removed).

The most interesting result of this scheme seems to be the uniform trend of all the bond strengths (C–OH being almost constant), while C–H shows the strongest variations. This was not formerly expected; perhaps because it involves changes in the C–H bond energy on a much greater scale than hitherto thought likely. We shall attempt, together with Prof. M. G. Evans, in a forthcoming publication, a theory of carbon bonds in which the uneven rate of variation in the vertical columns of Table 2 is related to differences in the size and steepness of gradation of the ionic terms of the bond energies in question, as indicated by the parallel trend of increasing dipole moments in the R-halogen bonds.

E. C. BAUGHAN.
M. POLANYI.

University,
Manchester.

* The first comes from the difference in heats of combustion of *n* and *iso*propyl alcohols given by Parks and Huffman ("Free Energies of Some Organic Compounds" New York, 1932), combined with the heat of formation of *n*-propyl alcohol from propane (Rossini); the second from the difference in the heats of combustion of normal and tertiary butyl alcohols (Parks and Huffman) combined with Knowlton and Rossini's results for the difference in the heat content of *n*-pentane and *iso*pentane. Corrections for evaporation heats are made according to H. C. Brown (*J. Chem. Soc.*, 990; 1903). These results are probably uncertain to ± 2 Cal.

Q' for CH_3 and OH refers to 25°C., the Br and $\beta\cdot$ data to 82°C., and the C–I bond-strengths were determined between 400° and 500°C.

[1] Bichowsky and Rossini, "Thermochemistry of Chemical Substances" (New York, 1936).

[2] Rossini, F. D., *Bull. Bur. Standards J. Research.*, **13**, 29,189 (1934); Knowlton, J. W., and Rossini, F. D., *ibid.*, **22**, 115 (1939).

[3] *J. Amer. Chem. Soc.*, **60**, 2764 (1938) and earlier papers referred to there.

[4] Butler, E. T., and Polanyi, M., NATURE, **145**, 129 (1940). Some data are from unpublished material.

Complex Rotatory Dispersion of Optically Active Tetrahydrofuryl-2-carbinol

The dextro- and the lævo-rotatory forms of tetrahydrofuryl-2-carbinol, obtained by crystallization of the brucine salt of its hydrogen phthalic ester, exhibit complex rotatory dispersion, the carbinol obtained from the (−) hydrogen phthalic ester having

$$\alpha\,{}^{20}_{6708}\ -2{\cdot}23^\circ,\quad \alpha\,{}^{20}_{6438}\ -2{\cdot}36^\circ,\quad \alpha\,{}^{20}_{4603}\ +0{\cdot}56^\circ,$$

$$\alpha\,{}^{20}_{4032}\ +5{\cdot}69^\circ,\quad \alpha\,{}^{20}_{3392}\ +28{\cdot}4^\circ,\quad (l = 1).$$

Determinations of specific rotatory power of the carbinol at increasing dilutions in aqueous solution give a family of curves of which the inflexions, maxima and reversals of sign are displaced towards the ultra-violet as the dilution increases. (This effect has been observed with tartaric acid by Lowry and Austin[1].)

A similar family of curves is given by the specific rotatory powers of the carbinol dissolved in the simple aliphatic alcohols (5 per cent solution), the characteristic features of the curves being moved towards the longer wave-lengths as the molecular weight of the solvent alcohol is increased.

In dioxan solution the specific rotatory power in the visible spectrum is practically independent of concentration. The rotatory power of the carbinol is not peculiarly sensitive to temperature changes and the rotatory dispersion of its esters is simple.

A more detailed description will be published elsewhere when circumstances permit. We have to thank Dr. C. B. Allsopp, of Cambridge, for determinations of rotatory power in the ultra-violet.

M. P. Balfe.
M. Irwin.
J. Kenyon.

Chemistry Department,
Battersea Polytechnic,
London, S.W.11.
Oct. 17.

[1] *Phil. Trans.*, A, **222**, 249 (1922).

Classical and Quantum Reflections of X-Rays in Crystals

It appears desirable that we reply, though very briefly, to the comments that have appeared in Nature[1,2] on our first note[3] on this subject and which were evidently written before our second and supplementary note[4] had been published. Our purpose in these communications was very definite, namely, to indicate it as a necessary consequence of classical optics and of quantum mechanics that there should be two types of X-ray reflection in crystals, due respectively to static and to dynamic stratifications of electron density; in the language of quantum mechanics, these correspond respectively to an elastic collision of the photon with the crystal lattice and to an inelastic one in which part of the energy of the photon is transferred to the crystal as an optical vibration of its lattice structure.

From the optical point of view, the two types of reflections are on a very similar footing; we have respectively $2\,d\sin\theta = n\lambda$ and $2\,d^*\sin\psi = n\lambda$. Here $\psi = \frac{1}{2}(\theta + \varphi)$, where θ and φ are the glancing angles of incidence and quantum reflection measured with reference to the crystal planes under consideration. The dynamic spacing d^* and the corresponding static spacing d are connected by the vector relation $\overrightarrow{1/d^*} = \overrightarrow{1/d} + \overrightarrow{1/\triangle}$, where $\triangle$ is the phase-wave-length of the lattice vibration. The scalar magnitudes of d and d^* become indistinguishable when $\triangle$ is infinite or when, though finite, it is transverse to d. The law of quantum reflection then assumes the very simple symmetric form $2\,d\sin\frac{1}{2}(\theta + \varphi) = n\lambda$. More generally, $d^* = d$ when $\theta = \varphi$, but deviates in one direction or the other from it according as θ is greater than or less than φ.

For the experimental proof of our thesis, it is necessary that new reflections should be observed which are not greatly inferior in definition to the usual Laue spots, and in which reflections corresponding to different wave-lengths appear clearly resolved from each other as demanded by the Bragg formula. These features are precisely those which were observed and reported upon by us. The streaks and diffuse spots in Laue patterns noticed by earlier workers were not particularly relevant to our thesis, especially in view of the very varied and entirely different but apparently quite plausible explanations of them which had been put forward in the literature. It can, we believe, scarcely be contended that these earlier observations are, in any real sense, an anticipation of our fundamental observations and conclusions.

We have observed that the quantum reflections given by diamond are sharply defined over a wide range of incidences and continue to be visible even when the crystal is cooled down to liquid air temperatures. These facts wholly exclude any explanation of these reflections in the terms of the diffuse thermal scattering of X-rays (Faxen[5], Zachariasen[6]). Measurements made by us over a wide range of incidences also show that neither in the case of ionic crystals nor in the case of diamond are the observed positions of the reflections in agreement with a formula of the Faxen-Zachariasen type.

C. V. Raman.
P. Nilakantan.

Department of Physics,
Indian Institute of Science,
Bangalore.
Sept. 20.

[1] Knaggs, Lonsdale, Müller and Ubbelohde, Nature, **145**, 821 (1940).
[2] Zachariasen, Nature, **145**, 1019 (1940).
[3] Raman and Nilakantan, Nature, **145**, 667 (1940).
[4] Raman and Nilakantan, Nature, **145**, 860 (1940).
[5] Faxen, *Z. Phys.*, **17**, 266 (1923).
[6] Zachariasen, *Phys. Rev.*, **57**, 597 (1940).

Isolation of Acetylsulphathiazole from Human and Rabbit Urines following Administration of *M.* and *B.* 760

Several reports have been made in the American clinical literature during the early part of this year of concretions in the urinary system and of crystals in the urine of humans treated with sulphathiazole (*M.* and *B.* 760). In some instances[1,2] these concretions and crystals are merely referred to as a derivative or a conjugated form of sulphathiazole; in other instances[3,4], however, the statement is made that the crystals are acetylsulphathiazole, although no chemical evidence for their identity is given.

During work in progress in this laboratory on the fate of sulphonamide drugs *in vivo*, we have had occasion to examine crystals from both human and rabbit

urines following administration of sulphathiazole. In each case, crystals were isolated, purified and compared with an authentic sample of synthetic acetylsulphathiazole (first described by Fosbinder and Walter[5]). The crystals of both human and rabbit origin were identical in all respects with the synthetic acetylsulphathiazole. Sulphathiazole urines were centrifuged and the deposit allowed to stand with dilute hydrochloric acid. The deposit was then collected and extracted with a large volume of boiling ethyl alcohol, from which acetylsulphathiazole separated on cooling. It was purified by recrystallization from 80 per cent aqueous methyl alcohol. It formed rhombic prisms which were very sparingly soluble or insoluble in most solvents tried. The purified acetylsulphathiazole from human urine had m.p. 257° C. and from rabbit urine, 258°; neither depressed the melting point of synthetic acetylsulphathiazole, m.p. 257° (Fosbinder and Walter[5] give m.p. 256°–257°).

In addition to this acetyl derivative, rabbit urine following administration of sulphathiazole contains appreciable amounts of a conjugated glucuronide, presumably a derivative of a hydroxysulphathiazole. We have isolated this conjugated compound as a barium salt and a study of its structure is now in progress. This compound would appear to be analogous with the glucuronide of hydroxysulphapyridine isolated by Scudi[6] from dog urine after administration of *M.* and *B.* 693, and with the glucuronide of a hydroxysulphanilamide which we[7] have isolated from the urine of rabbits treated with sulphanilamide.

W. V. THORPE.
R. TECWYN WILLIAMS.

Physiology Department,
Medical School,
Hospitals Centre,
Birmingham, 15.
Oct. 17.

[1] Pepper and Horack, *Amer. J. Med. Sci.*, **199**, 674 (1940).
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Cryolite Films on Glass Surfaces

MANY years ago Mr. Dennis Taylor patented the tarnishing of optical surfaces for the purpose of increasing the amount of light transmitted. To-day, cryolite treatment of surfaces has become a routine operation. The common explanation of the phenomenon is that: (1) equal portions of light are reflected back from the outer and inner surfaces of the film; (2) the phases of these portions are such that they interfere with and neutralize one another so far as visual reflection is concerned; (3) the cryolite film must have a definite thickness.

Such a theory might explain the reduced reflection on the basis of interference. It does not explain the increased transmission, the factor of real importance. In practice, so far as transmission is concerned, precise control of the thickness is not necessary. It is determined only by mechanical considerations. Is there any need to seek for an explanation other than the orthodox and well-tried surface transmission phenomenon?

From Young's formula, $\frac{(N-1)^2}{(N+1)^2}$, the proportion of light transmitted through an air – glass surface, whether entrance or exit, may be determined. In the case of an interface, the more general formula, $\frac{(N_1-N_2)^2}{(N_1+N_2)^2}$, may be used.

If 100 units of light fall upon a flint lens having a refractive index of 1·65, 94 units pass through the entrance air – flint surface and 88·4 pass through the exit surface, the total loss being 11·6 units.

If cryolite films having a refractive index of, say, 1·35 are formed on the flint glass surfaces, then 97·8 units will pass through the air – cryolite entrance surface, 96·82 will pass through the cryolite – flint interface, 95·85 will pass through the flint – cryolite interface and 93·75 through the exit cryolite – air surface, the overall loss being 6·25 units instead of 11·64. These figures agree with practical experience.

If the refractive index of the film were reduced to 1·285, the overall loss would be reduced to the minimum of 6·05. Any further reduction of the refractive index of the film would lead to an increase of the loss. If the refractive index of the film were reduced to unity, or if it were increased to 1·65, corresponding with the flint lens, the conditions in both cases would be those of an unprotected flint lens. As the best value for the film is the square root of the refractive index of the glass medium, it is obvious that the best results are obtainable the higher the refractive index of the glass, for the reason that it is difficult to obtain practicable films of much lower refractive index than that of cryolite.

So far as reflection is concerned, although the thickness within fairly wide limits does not appear to affect transmission, there is an apparent effect upon back reflection, a portion of which is variable in intensity as the result of interference.

JAMES WEIR FRENCH.
(Chairman.)

Barr and Stroud, Ltd.,
Anniesland,
Glasgow, W.3.
Oct. 29.

Hyperfine Structure in the Arc Spectrum of Bromine

IN a recent publication[1] we showed that the deviation from the interval rule in the $5s\ ^4P_{5/2}$ term of the BrI spectrum fits quite well the quadratic interaction formula

$$E = a_0 + \tfrac{1}{2}aC + bC(C+1),$$

which arises when the nucleus has an electrical quadrupole moment. We have detected an arithmetical error in our calculations, and when the correction is made, the fit is even better than that previously reported. Thus the two *independent* check values for the constant b are now 0·175 and 0·170 (formerly 0·175 and 0·161), leading to two independent values for a which are 47·14 and 47·10 (units are cm.$^{-1} \times 10^{-3}$). The corrected interaction formula now becomes

$$E = 230{\cdot}1 + \tfrac{1}{2}\,47{\cdot}12C + 0{\cdot}172C(C+1).$$

We wish to take this opportunity for correcting a few minor misprints in our published tables of structures (which contain some 200 components). These appeared only on printing and have no effect on the reported analysis. In λ 4513 read 180 for 150; in λ 4391 read $\widetilde{90}$ for $\widetilde{182}$; in λ 8334 (Fig. 3) read 163, 195 for 153, 185 (calc.), and 162, 195 for 152, 185 (obs.), in λ 4592 read $\widetilde{165}$ for $\widetilde{65}$.

S. Tolansky.
S. A. Trivedi.

Physics Department,
University,
Manchester.
Oct. 28.

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Ability of Respiratory-Stimulating Factors to Overcome Toxic Action of Germicides on Moulds

It is well known that germicides depress the respiration of both the micro-organisms and the tissues with which they come in contact. It has been shown that the depressant actions of a germicide on the respiration of the micro-organism and of the host tissue are directly correlated with the toxicities of the germicide for the organism and the host, and a comparison of these respiratory effects by manometric methods has been proposed for the evaluation of germicides[1].

In our laboratories it has been found[2] that the depressant action of germicides on the respiration of tissues can be overcome *in vitro* by the addition of various fractions from yeast which have been found previously to increase the respiration of yeast and tissues[3]. It has also been found that for certain of these fractions the ability to stimulate the respiration of yeast parallels the ability to stimulate yeast proliferation[4], although this is not always the case. In view of these two lines of work it became of interest to determine the effects of germicides and of certain of these respiratory-stimulating fractions (*RSF*) on the growth of moulds.

In typical experiments 28 Petri dishes were prepared containing Czapek's medium with different concentrations of germicide. These dishes were divided into four sets of seven each. The dilutions of germicide in each set were 1 : 1000, 1 : 10,000, 1 : 20,000, 1 : 50,000, 1 : 100,000 and no germicide, two sets containing phenyl mercuric nitrate[5] and two containing *n*-butyl-parahydroxybenzoate[6]. The medium in one set of each group contained one per cent of the *RSF*. Two sets were seeded with *Aspergillus niger* and two with *Penicillium glabrum* by placing one loopful of a sterile water suspension of the mould in the centre of the Petri dish. The fungi were grown at room temperature in the dark and were examined at intervals for a period of 14 days. Phenylmercuric nitrate alone was effective in inhibiting completely the growth of *A. niger* in a concentration of 1 : 100,000 and of *P. glabrum* at 1 : 20,000. Addition of one per cent of crude *RSF* (corresponding to Fraction *A*[3]) not only increased growth in the lower germicide concentrations where some growth took place normally, but caused growth equal to that of the control with the usually completely inhibitory germicide concentrations of 1 : 100,000 and 1 : 50,000 for *A. niger* and 1 : 20,000 for *P. glabrum*. Similar although quantitatively different results were obtained with Butaben. All experiments were repeated using Sabouraud's medium with similar results.

Experiments have further indicated that the crude yeast *RSF* also contains factors inhibitory to mould growth, that both the inhibitory and stimulatory factors are soluble in 85 per cent acetone, but that the inhibitory factor can apparently be removed by adsorption on charcoal. The acetone-soluble fraction is the most active of the fractions in increasing the respiration[3] and growth[4] of yeast and is inactive on the respiration of rat skin.[3] On the other hand, the acetone-insoluble fraction increases the respiration of skin but is not particularly active in stimulating growth and respiration of yeast or growth of moulds. It may thus be possible to use these active fractions in overcoming some of the toxic effects of germicides on the host without greatly impairing germicidal efficiency, and this possibility is being studied.

These facts are consistent with an interrelation between proliferation and respiration, although in many cases a more direct correlation has been found between glycolysis and growth[7]. This interrelationship is under investigation, as is the purification of the factors responsible for the observed effects.

Details of these experiments will be published later.

Elton S. Cook.
Cornelius W. Kreke.

Research Laboratories,
Institutum Divi Thomae,
Cincinnati, Ohio.
Oct. 2.

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Siegesbeckia orientalis in Britain

It is interesting to note that almost simultaneously with the publication of the note in Nature of October 12 of the twelve-year establishment of a colony of the alien composite *Siegesbeckia orientalis* at Freshfield Station, Lancashire (botanical vice-county 59), I have been able to add to my herbarium a specimen from a new station at Rufford, twelve miles inland westwards, and it is of further interest that some of the flower-heads have six bracts. It appears that the Rufford colony has been growing for some years in a sandy wild garden but was only recently identified in our work on the local flora for the Rufford Village Museum exhibit. It was locally believed that the plants might have been introduced with poultry food for they flourish abundantly and spread rapidly, especially after a bonfire. There is, nevertheless, the possibility of birds or hares transporting seeds adhering to sticky bracts from the Freshfield site.

Eric Hardy.

Merseyside Naturalists' Association,
Liverpool.
Oct. 19.

RESEARCH ITEMS

Iron Age Cypriot Jugs

Three jugs of Iron Age date from Cyprus have been figured and described by James A. Stewart (*Man*, October 1940). These jugs are now in the Biblical Museum, Melbourne. Their provenance is unknown; but it is believed that they are derived from one of the cemeteries between Avios Jakovos and Enkomi. The first has an ovoid body with ring base and strap handle, buff clay and surface slip painted in black with red filling, showing a bird flying to the right, with a lotus bud before it. Eyes consisting of concentric circles appear on either side of the spout. The second jug is of the same type with differences in size and form—yellowish-buff clay and surface slip painted wholly in black figuring a horned quadruped in profile to right, all four legs being hind legs with bird-like claws rather than hoofs. The head is fitted with concentric circles, the neck with basketry panels. The third jug is of similar type. The decoration on buff clay and slip is in black paint with red filling. On either side of a complex lotus design is a flying bird feeding from the lateral bloom. In the field above the bird's head is a swastika. The period is probably Cypro-Archaic I, eighth–seventh centuries B.C.

More Life-Histories of North American Birds

Arthur Cleveland Bent has added a thirteenth to the magnificent series of volumes describing the life-histories of North American birds, and in it he includes the parrots and parakeets, cuckoos, kingfishers, goatsuckers, swifts, and humming birds (*Bull. U.S. Nat. Mus.*, **176**, 506; 1940). The work is compiled with the usual thoroughness, as full a life-history as possible being given of the best-known subspecies of each species, with more restricted comments on any peculiarity shown by the remaining subspecies. Plumages are described in sufficient detail to enable the reader to trace the sequence of moults and plumages from hatching to maturity and to recognize the birds at any stage and at any season, and the range of each species and its forms is outlined. Many fine photographs of nests, nesting-sites, and young birds illustrate the monograph, which contains numerous statements of unusual interest. For example, in 1832 Wilson described the flocks of the Carolina parakeet, brilliant in its colourings of red, yellow, bright green, and soft blue, as being so large that "when they alighted on the ground, it appeared at a distance as if covered with a carpet of the richest green, orange and yellow", and the author traces the steps by which this, the only representative of the parrot family that bred within the United States, became exterminated by the direct intervention of man in the early years of the present century.

Mammals of Malaysia

The scientific workers of the Raffles Museum at Singapore have added enormously to the knowledge of the fauna of their province, and now the present director, F. N. Chasen, has brought together his own and other observations upon mammals in a "Handlist of Malaysian Mammals" (*Bull. Raffles Mus.*, No. 15. pp. xx+209; 1940). The area dealt with is bounded in a general way by the 100-fathom shelf, and includes besides the Malay Peninsula, Sumatra, Borneo and Java, and the adjacent small islands. As a whole the mammalian fauna is evenly distributed throughout the area, pointing to land connexions in times geologically not remote, but there are indications of affinities with different mainland faunas. A large constituent, of Indo-Malayan origin, is widespread over the whole region, although in many cases it is absent from Java. Northern influences from Indo-China are apparent in western and eastern drifts, and an eastern drift entered by way of Borneo where many species stopped, while others went on to Java. Finally there is an element now confined to the area, predominantly inhabiting the mountains at an altitude of more than 3,000 ft., and best represented in Borneo, which is most favourably constituted for the retention of old and the production of new animal forms. In Malaysia the mammals have been much more plastic than the birds, and in some cases the species are so split up that a list of the subspecies is little more than a list of the islands upon which the species is represented. Descriptions of thirty-nine new forms appear in the Handlist.

Development of Wings in Drosophila

Highly interesting facts are reported by C. H. Waddington (*J. Genetics*, **41**, 75–137; 1940) from his work on the genetic control of wing development in Drosophila. The place in development of the wing at which mutant genes first show their effect and in some cases the reasons for the appearance in the imago can be deciphered by studies in the ontogeny of the wing. Sixteen stages in the development of the wing are described in wild-type flies. The first observable effects of thirty-eight mutant genes are shown to influence the development at one or more of these stages.

Genetics of the Tails of Mice

Several genetic characters which affect the structure of the mouse's tail also affect other structures or processes of the body. One of these inherited characters, short tail—Danforth—is associated with spina bifida, suppression of kidneys and parts of the uro-genital system (L. C. Dunn, S. Gluechsohn-Schoenheimer and V. Bryson, *J. Hered.*, **31**, 343–348; 1940). The homozygotes *Sd Sd* die within twenty-four hours of birth, probably as a result of auto-intoxication through an aberrant urogenital system. On continual crossing of the heterozygotes with the inbred Bagg strain of mice through several generations, it was found that the tail became shorter. Another character, brachy short tail (*T*), when combined with the characters of the inbred strain, tends to increase of length. It is suggested that the difference is due to the different morphogenic channels of development on which *Sd* and *T* act. It is probable also that the viability of the heterozygous *Sd sd* form is decreased in association with the Bagg inbred strain. This has developed so far as to make *Sd* approach the state of a dominant lethal.

Biochemistry of Flower Pigments in Verbena

G. H. Beale, J. R. Price and R. Scott-Moncrieff (*J. Genetics*, **41**, 65–74; 1940) show that the various pigments in the flower of Verbena are exceptional in their genetic behaviour. In Verbena, delphinidin derivatives may be either dominant or recessive to pelargonidin, while mixtures of derivatives of pelargonidin and delphinidin or of both with cyanidin are known. In addition, clear-cut segregation of different glycosidal types, of acylated and non-acylated anthocyanins and of qualitative differences in flavone occur in Verbena. These exceptional phenomena are considered to be the result of the interspecific origin of the garden Verbena.

A Lower Carboniferous Brachiopod

A DETAILED study of *Daviesiella llangollensis* (Davidson) and related forms, including morphology, biology and distribution, has been made by F. W. Cope (*J. Manchester Geol. Assoc.*, 199–231; 1940). It has been found that the extra pair of muscle impressions in the ventral valve of *D. llangollensis*, previously believed to be additional adductors, are in fact secondary divaricator impressions. In North Derbyshire *D. llangollensis* (s. lato) is present in beds of S_2 and basal D_1 age; and specimens from these beds are divisible into two related groups: a lower one, confined to S_2, containing specimens differing from the lectotype in the condition of the secondary divaricator impressions (*D. derbiensis* sp. nov.); and a higher one, from the S_2–D_1 beds, in which the specimens are identical in every respect with the lectotype of *D. llangollensis* (s. str.). In North Wales, including Anglesey, and Westmorland the stratigraphical position of each species is the same as in North Derbyshire. It is concluded that the members of the *llangollensis*-gens are very shallow-water forms. The distribution of *D. llangollensis* is indicated on a sketch map which shows that the brachiopod appears to be present only to the north of the old Carboniferous St. George's Land. There is so far no evidence that the brachiopod exists in the South-Western Province of the Avonian.

Inactivation of an Enzyme

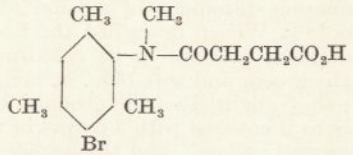
INFORMATION about the action of an enzyme might be obtained from the quantum yield on deactivation by light. If the specific activity is located in a definite part of the molecule a low quantum yield would be expected, whilst if the quantum yield is unity, inactivation may result from an alteration of almost any part of the large molecule. Urease has a high molecular weight of 483,000 and its light absorption must be distributed among several absorbing centres. E. W. Landen (*J. Amer. Chem. Soc.*, **62**, 2465; 1940) has measured the absorption spectrum of urease in a pyrophosphate buffer solution at $p\mathrm{H} = 5{\cdot}6$. A maximum molecular extinction coefficient occurs at about 2700 A. and a minimum about 2480 A. The quantum yield for inactivation is fairly constant over the region of wave-lengths 3103 A.–2537 A. and has the value 0·0008 molecule per quantum. It increases at shorter wave-lengths and reaches the value 0·00938 at 1860 A. The direct radiation from a low-pressure mercury discharge tube was more efficient in deactivating urease than monochromatic radiation of 2537 A., and this was shown to be due to radiation of wave-length shorter than 2350 A., probably the mercury line at 1849 A. The small quantum yield indicates that the enzyme activity resides in a unique region of the molecule. The divergence of the results from those of Kubowitz and Haas made in 1933, before the molecular weight of urease was known, are discussed and it is considered that the different experimental conditions are partly responsible.

Methylboric Acid

ALTHOUGH numerous monoaryl and alkyl boric acids have been prepared, the simplest compound of this class, methylboric acid $CH_3B(OH)_2$, has been missing. A. B. Burg (*J. Amer. Chem. Soc.*, **62**, 2228; 1940) has now prepared this acid and its anhydride, which is trimeric $(CH_3BO)_3$, by an improvement of a method tried by Khotinsky and Melamed in 1909, namely, the action of methyl magnesium iodide on methyl borate. The crude product was dehydrated to methylboric anhydride by means of anhydrous calcium sulphate in a special apparatus. By treating the anhydride (m.pt. −38°, b.pt. 79°) with a deficiency of water and removing the excess of anhydride by distillation, methyl boric acid was obtained. This is volatile, but the vapour is extensively dissociated into anhydride and water, and its melting point is 95°–100° with decomposition. In contrast to the hydrolytic action of water, ammonia and trimethylamine form addition compounds with $(CH_3BO)_3$. By the action of boron fluoride a new compound, methylborondifluoride, is formed: $(CH_3BO)_3 + 2BF_3 = 3CH_3BF_2 + B_2O_3$. The compound $(CH_3)_2BF$, which was also not previously known, was prepared from dimethylboric anhydride (from phosphorus pentoxide and dimethylboric acid) by the reaction: $3(CH_3)_2BOB(CH_3)_2 + 2BF_3 = 6(CH_3)_2BF + B_2O_3$. Methylboric anhydride probably has a hexatomic ring structure with alternate boron and oxygen atoms in the ring, as is indicated by electron diffraction measurements.

Restricted Rotation in Arylamines

OPTICAL activity due to restricted rotation between a carbon of the ring and the nitrogen atom attached to it has been reported by Mills in the case of certain arylamines. R. Adams and L. J. Dankert (*J. Amer. Chem. Soc.*, **62**, 2191; 1940) now report the resolution through its brucine salt of N-succinyl-N-methylbromomesidine, the formula of which shows that the molecule should exhibit a restricted rotation. The



compound was synthesized from mesitylene by way of nitromesitylene, mesidine, bromomesidine and N-methylbromomesidine, which was purified through the nitroso compound. The optically active forms were stable in boiling ethanol or aqueous sodium hydroxide, but gradually racemized in boiling *n*-butanol. The optical activity was shown to be due to restricted rotation between the carbon of the ring and the nitrogen atom and not to an asymmetric nitrogen atom, since the active forms were brominated to the inactive N-succinyl-N-methyldibromomesidine and were nitrated to the active N-succinyl-N-methylnitrobromomesidines.

AUTOMOBILE RESEARCH

On the invitation of the Institution of Automobile Engineers, a representative of Nature was privileged to inspect its new Research Laboratory at Brentford and to see a cross-section of the important work which is being done there under the superintendence of the director, Dr. E. Giffen, for the benefit of the automobile industry. The chairman of the Research Committee, Mr. W. A. Tookey, explained how its scope has been developed during the ten years since this co-operative work was taken over by the Institution and organized on a wide basis whereby it consists of representatives from the Institution, from affiliated members and from Government departments.

The work of the Committee is financed by grants from the Department of Scientific and Industrial Research and by contributions from the Society of Motor Manufacturers and Traders and from the affiliated members, who now number more than three hundred firms—including many who have their own research departments but at the same time find it an advantage to work in close co-operation with the Research Committee.

The new laboratory has been designed and built specially for the work being carried on there and provides excellent facilities for the many classes of investigations which arise in connexion with the engine, the transmission, the chassis and the operation of automobiles. Some of these give rise to questions of fundamental and general importance which at the same time involve problems of design and operation. A series of investigations illustrative of this range of interest is being developed at the present time which relate to the frothing or aeration of oil and to its harmful effects in service. In the chemical laboratory the fundamental causes which give rise to aeration of the lubricant are being investigated, and it may be anticipated that the results will yield information of wide application wherever frothing occurs either as an advantage or as a disadvantage in industry. Parallel investigations are being carried out in the chassis laboratory and in the engine laboratory to determine the effectiveness of de-aerating devices and to ascertain the influence of aerated oil on the behaviour and loading capacity of engine and other bearings.

Another investigation of a fundamental nature which is in course of development is intended to study systematically the factors which control the scuffing of piston rings, a phenomenon which can occur both under idling conditions and at high loads and temperatures. The work is being carried out on a single-cylinder, liquid-cooled unit coupled to a hydraulic dynamometer. The temperature of the jackets is closely controlled by the use of ethylene glycol in conjunction with a cooler, and the supply of lubricant to the cylinder walls is also under regulation. At the moment, the experimental work is directed towards the establishment of a satisfactory testing technique, and when this has been done it is proposed to examine the relative merits of various surface finishes and treatments for piston rings, and of different designs of rings.

The equipment of the cold room which forms a notable feature of the general laboratory has been designed to enable a detailed study to be made of the starting performance of engines at low temperatures. It can be operated at thermostatically controlled temperatures down to $-25°$ C. and is large enough to accommodate two full-size engines, mounted on test-beds run into the cold room on a movable ramp. A large capacity tank containing a low freezing point coolant is placed above the engines and by means of an electrically driven impeller and a system of three-way cocks the coolant can be circulated through either engine. The advantage of this arrangement is that it allows prolonged motoring test runs to be made without excessive temperature rise due to engine friction. The engines can also be driven through a swinging field dynamometer and a 10 : 1 reduction gear outside the cold room which enables a range of speed from 10 to 200 r.p.m. to be employed, while the incorporation of a free wheel in this gear permits the engine to accelerate when starting.

A line of research of very timely importance is one which is being arranged in order to study systematically the power loss resulting from the use of producer gas in a converted petrol engine. The gas used is produced from anthracite in an "Emergency" dry type producer which, in order to simulate road conditions, is mounted on a bumping rig and is subjected to a cooling air blast, in addition to the circulation of water through the jacket. The engine is a six-cylinder, side valve unit of 3·5 litres of a type commonly used in trucks up to three tons capacity. Immediately beyond the throttles, the gas and air are fed into a common pipe which acts as a mixing chamber. This pipe is connected to one branch of a tee-piece mounted on the engine intake manifold, the other branch being arranged to carry the normal petrol carburettor, which is enclosed in an airtight box. The arrangement of the controls in conjunction with this system of connexions permits the engine to be run either exclusively on producer gas or on producer gas combined with varying degrees of petrol enrichment. Provision has been made for manual adjustment of ignition timing, and in addition to studying the performance of the standard engine on producer gas, possible means of making good the power loss by raising the compression ratio, by increasing the calorific value of the fuel and by the injection of steam in the producer have been under investigation.

These by no means exhaust the tale of the activities of the station for many investigations of a routine nature are being pursued, such as gear testing, crankshaft fatigue testing, and measurements of the durability of bearings and bearing materials under different conditions. These are all yielding information of the utmost value to the industry and providing an accumulated fund of knowledge which will lead to improvements in design and higher efficiency in operation. This is well illustrated by a test which was seen in operation in the general laboratory and which had been arranged to obtain data as to the transmission of heat from a brake drum to a wheel rim and tyre. On buses operated under severe city service conditions, particularly in hilly districts, trouble arises in consequence of the excessive temperatures which reach the tyres and inner tubes, by

transmission of heat from the brake drums. At one end of the axle in the apparatus used for the test the wheels rotate against a continuous braking force applied through the normal brake rods, the braking load being shown on a spring balance. The wheels at the other end are prevented from rotating by a torque arm and a spring balance indicates the brake torque applied to them and transmitted through the differential. Temperatures are measured at various parts of the apparatus by means of copper-constantan thermocouples. For parts which are rotating, the leads are soldered to pairs of copper and constantan slip-rings. In this way frequent temperature measurements can be made at selected points in the wheel rim, the brake drum, and the brake lining.

It has been possible to indicate in this survey only the more outstanding of the tests in progress, but the full extent of the research work which has been completed can best be seen in the list of reports which have been prepared by the Laboratory. Among the latest of these are papers dealing with fuel economy and with the distressing phenomenon of brake squeak. In addition the research department abstracts and classifies technical information from English and foreign papers, and these abstracts and the full resources of the library are available to assist members in any technical problem or inquiry which may arise. In these ways the Laboratory is playing a most important part, and its new premises and equipment, used with the vigour that is apparent in its direction, give the assurance of even greater usefulness in the future.

PLANNING THE POST-WAR WORLD

IN his presidential address to the Institution of Electrical Engineers delivered on October 24, Mr. J. R. Beard reminded his audience that exactly twenty years ago, when chairman of the North-Eastern Centre of the Institution, he read a paper on "Post-war Conditions and Developments, with particular reference to the Electric Supply Industry". On re-reading it to-day, he found that purely technical achievement has fulfilled, and in many cases exceeded, the expectations then expressed. Where we have largely failed is in having no clear idea of the purpose for which these technical achievements should be used, and also in lacking ability to arrange that co-operation with non-technical people and interests which is necessary if the engineer is to produce the structure that he knows to be most efficient and useful to the community.

As a starting point, it is assumed that we all recognize that the War has brought about, and is bringing about, tremendous changes not only in our environment but also in our whole outlook on life, and that we are all prepared to agree with *The Times* that "To liberate Europe from Hitler does not mean to reverse the whole process of economic integration which has been set in motion. . . . Much harm may be done to our cause, both in Europe and oversea, by the insinuation that we stand for the old order and that our only aim is to restore the *status quo* in Europe and to maintain it at home. This charge should be emphatically and authoritatively refuted".

There is herein implied some, possibly belated, recognition that the old order is no longer producing a healthy and happy community and that, for one reason or another, apathy, selfishness and discontent, too much freedom in some directions and too little in others, were gradually undermining the character and vigour of the democratic nations. The malaise from which the democratic nations have been suffering is aptly summed up by the eminent American writer, Walter L. Lippman: "The muddle of the democracies comes from something deeper than their form of Government; it comes from the gradually accelerated destruction of all convictions about the nature of man and his destiny. . . . For how can this planet be governed by people who have ceased to believe that there is good and that there is evil?"

Dorothy Thompson, another American writer, suggests that the primary origin of the War was the secession of Germany from Western civilization and that we are fighting a great civil war to force Germany back into it. She defines Western civilization as follows:

"It is not democracy, not parliamentary government and certainly not capitalism. All of these are merely manifestations of something else—temporary forms to express a more permanent content. Nevertheless, Western civilization is definable. It is the synthesis of three things: the Christian ethic; the scientific spirit; and the rule of law. The essence of the Christian ethic is that the weak have rights as well as the strong, and that the strong must set limitations on their own power. The essence of the scientific spirit is that the search for truth transcends the State and may not be limited or suppressed by the State. It presumes the separation of State and culture, that is, the separation of culture from force. The essence of the rule of law is that contract is superior to arbitrary force, it presupposes a continuity of relationships . . . from whose sovereignty no one is exempt, not the King, not the President, not the powerful, not the weak".

Mr. Beard concluded by considering electrical planning in the Empire. Where central or national generating authorities have been set up, the functions of supervision have usually been carried out by them—as in Eire, Victoria and most of the Canadian provinces. South Africa, Quebec and Southern Rhodesia have followed more closely the example of Britain in establishing a separate supervising authority, but on a narrower basis and with little control of municipalities. Similar bodies, with varying powers and functions, also exist in British India, New South Wales, Queensland and Kenya, but elsewhere in the Empire supervision is usually exercised directly through Government departments, which are in many cases primarily devoted to some allied activity such as local government or public works.

The variety of conditions under which electricity is generated is so great as almost to defy classification, but there has been a strong trend, particularly in the Dominions, towards some form of monopoly. For the most part this has resulted from the establishment of independent Government commissions,

of which Victoria, Ontario, Eire and South Africa are the best known examples, though there are smaller organizations such as the one in Trinidad.

Frequently a Government department has built and operated generating stations, gradually becoming a monopolist in the field of generation and bulk transmission. This has happened in such varied places as New Zealand, Western Australia, some Indian States, Malta and the Gold Coast. Over the rest of the Empire private and municipal enterprise dominate the field, though the trend towards monopoly is still clear.

In failure to take account of the difficult problems ahead lies our greatest danger. It is a danger specially to be guarded against by the younger electrical engineers, who must as years go on carry more and more of the responsibilities of the profession and whose lives will, to a great extent, coincide with the years of opportunity for the reconstruction of society and the building of a better world than they have inherited. These words of Sir Philip Sidney should be their inspiration : "It is the temper of the highest hearts to strive most upwards when they are most burdened".

ELECTRICAL AND MECHANICAL TRANSMISSION OF ENERGY

THE Andrew Laing Lecture to the North-East Coast Institution of Engineers was given on November 1 at Newcastle-on-Tyne by Prof. W. M. Thornton. He chose as his subject the foundations of the electrical and mechanical transmission of energy. From the earliest times men have sought to find the 'nature of things', and of the great branches of science into which their investigations have been gathered that of physics is both the most general and the most profound. It is essentially an experimental science ; but its greatest advances have been made by the use of mathematics. The applications of physics that form the scientific part of engineering have been the most effective when experiment and theory have moved together in rapid interchange, and in no part of the subject has this been more marked than in that which deals with the transformations of energy. It is only within this century that the identity of energy, for so long a subject of debate amongst scientific workers, has been firmly established. It is as real as matter itself.

The ten years between the discovery of X-rays by Röntgen in 1895 and Rutherford's establishment of the electrical constitution of matter have been described as the most fruitful in the history of science. To this amazing period we owe X-rays, the discovery of the electron, radioactivity, radium itself, relativity, the quantum theory of radiation, the development of radio-communication and the discovery that atoms are hollow planetary systems of elemental charges of positive and negative electricity, the proton and the electron. This last, together with the relation that is a consequence of the theory of relativity, namely, that matter is a form of energy, and hence mass, electricity and energy are convertible terms, places the doctrine of the identity of energy on a firm basis of reality.

In order to possess energy, the body or system of bodies in which energy is for the time located must either be in motion, in which case the energy that it has by virtue of its motion is called kinetic, or be part of a state of elastic strain, when it is termed potential energy or energy of position. A weight when raised acquires potential energy from the added electric strain of the ether of space that carries gravitational forces. In order that energy should be transmitted from one place to another it must be transformed from one of these states to the other, and the means by which this is in general done is the problem to which Prof. Thornton directed special attention. It is a problem of great theoretical and some practical interest. It is known that there is one law governing the whole range of the transmission of energy, whether in electric or mechanical engineering. This law is little known and is rarely referred to. Though occasionally used in the solution of electrical problems, it has never hitherto been applied to the consideration of those which deal with the transfer of energy by mechanical means.

There are problems of the transfer of energy which are met daily to which as yet there is no complete answer. How, for example, does a pendulum work ? At the end of its swing the energy is all potential, in the middle it is all kinetic. There is an almost perfect conservation of energy, but no one knows how the transformation takes place from the one form to the other. Its complete solution would require an understanding of the physical nature of gravitation and of the ether that has evaded scientific research from the time of Newton onwards.

One property of gravitational force that engineers may accept without question, though there are mathematical devices to evade it, is that to hold the planets in their orbits, it must be able to support great tensile forces. How these forces are derived physically from the matter of the sun and the earth is as yet unknown, though since matter is electrical in its constitution a gravitational field must have an electrical component in order to take hold of it. For many purposes the conception and use of this component is sufficient to illustrate the universal law which has been referred to, and on the assumption that all mechanical forces are electrical in their origin it may even be used to explain the working of a pendulum.

An equally familiar property of space is that it transmits radiation, from the extremely short and rapidly oscillating X-rays, through the regions of light and heat to the relatively long and slow waves of radio. These waves are in every case electromagnetic ; they all travel at the same speed through space, which we know to be the most perfect non-conductor of electricity, and in the case of radiation from the sun they carry the immense thermal energy by virtue of which life on this earth is possible. How this transmission of energy can take place through an insulating medium was shown some seventy years ago by James Clerk Maxwell, who based his electric theory of light on Faraday's discovery of magneto-electric induction and the polarization

or strain of insulating materials of dielectrics in an electric field of force. Maxwell's theory led in the end to the invention of radio, and brought the antipodes within reach of a telephone call. But even Maxwell, though he had found by mathematical analysis the velocity with which electromagnetic waves travel in space, that is, the velocity of light, and knew that both the electric and magnetic fields in these waves were transverse oscillations of the ether at right angles to one another, did not find or state the law connecting them and the mode of transmission of their energy. This was done some twenty years later by Prof. J. H. Poynting who, in extending Maxwell's theory, derived the simple and powerful relation known as Poynting's theorem or law. It is that everywhere in Nature, energy flows by the mutual reaction of electric and magnetic fields, that it is delivered in a direction at right angles to the plane containing both of them, and that the power is simply proportional to the product of the fields. The passage of every form of electrical or mechanical energy obeys this law, and now that we know that there is nothing in the material universe but electricity, it may even be regarded as one of the most illuminating physical relations in Nature, since electricity or electrification moves everywhere according to this rule.

A field of force in physics is defined as a state of stress that is in its origin electric or magnetic. It produces attraction between unlike charges or poles and repulsion between those of the same signs. A short account was given of Rutherford's electrical theory of the constitution of matter, pointing out that in the metal of a 2,000-ton ship there are a little more than a ton of electrons. For energy to travel there must be in every case, electrical or mechanical, an electric field and a magnetic field at right angles to it. Around and in an electric wire carrying a current there are two electric fields, one outwards or inwards at right angles to its surface through the insulation around the wire, and the other along the conductor commonly called the ohmic drop.

Modern high-tension cables have a cylindrical sheath of solid insulation of very high quality round the conductors which can easily carry an electric field of 10,000 volts per cm. This intense concentration of power is not in the wire but in the paper or rubber insulation surrounding it. Any electromagnetic energy that enters a metal never comes out of it except as heat, or in the case of machines, as mechanical stress.

At the end of a line where power is utilized there must be a relaxation of the electric field in order that energy may be transferred. There is no difference in principle between direct and alternating current transmission, for in the latter case both the electric and magnetic fields reverse together and the direction of the energy path does not change with that of the current. But if there is a difference in phase between the current and the voltage we have to multiply their product by the cosine of the phase angle to get the true power. Radio-transmission plays a large part in modern life and though the means by which it is done are highly technical and complicated, the movement of energy in free space once it has left the transmitter is relatively simple. The great masts and aerials that we see are in effect condensers to which very rapidly alternating voltage is applied. While a vertical antenna is being charged, in the millionth of a second, the current is moving upwards against the electric field that is piling up at the top, the direction of which is downwards.

When we come to consider the movement of energy in mechanical systems of transmission, we encounter the release of energy known as combustion. Sir William Ramsay was one of the first of chemists to realize the electrical nature of atomic forces.

Prof. Thornton concluded by carrying the general argument to its logical end. Before the coming of the electrical theory of matter, the highest flight of scientific imagination was to conceive a dead universe of cold worlds; but now we know that all that is necessary to bring it to an end, to uncreate it, is that the equal number of positive and negative charges that make up its atoms must be made to cancel one another out and 'leave not a rack behind'. But the energy that formed the universe will still remain, eternal and unchanged.

VISIBILITY AND ROAD ACCIDENTS

MOST research work on road accidents has been concerned with the physical or mental state of the driver of the car, but H. H. Ferguson and W. R. Geddes, in *Occupational Psychology* (**14**, No. 4), describe some recent work done in New Zealand on road accidents from a very unusual point of view. These writers investigated the beliefs of pedestrians regarding their own visibility, to see how far these beliefs compared with their actual visibility.

The method in outline was to get the subjects to walk along a straight, level, unlighted, open-country, dustless road, away from, or towards, the headlights of a stationary car. They had to indicate by pegs those points along the road at which they believed: (*a*) that it was just possible, but not likely, that they were out of the range of the visibility for the driver; (*b*) that they had a normal degree of certainty that they were just beyond the range of visibility for the driver; (*c*) that they were certain of being just outside the range of visibility for the driver.

It had been discovered that the greatest distance at which a typically attired moving pedestrian could be distinguished as a pedestrian with reasonable certainty was approximately 320 ft., while beyond 463 ft. nothing could be seen of the pedestrian.

When the results were analysed a wide range of distribution of distances was revealed. A considerable number of the subjects considered themselves to be visible when actually well beyond the range of visibility; one subject thought he was visible at 814 ft.

The authors hold that, if these findings were to be substantiated by further research, publicity should be given to this possibility of error, for the belief that one is visible when one is actually invisible is a dangerous belief. This is an interesting contribution to the complex problem of road accidents. If this possibility of error is important in New Zealand it is still more important in Great Britain, and particularly in black-out conditions.

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