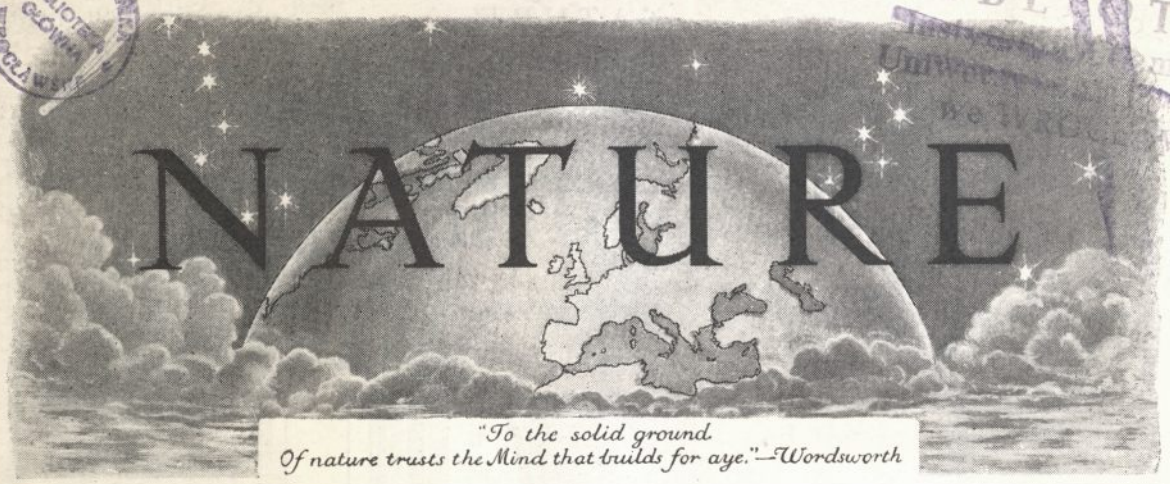
SUPPLEMENT: RECENT SCIENTIFIC and TECHNICAL BOOKS



Vol. 146, No. 3700 SATURDAY, SEPTEMBER 28, 1940 ONE SHILLING

NATURE

Vol. 146 SATURDAY, SEPTEMBER 28, 1940 No. 3700

CONTENTS

Editorial and Publishing Offices :

MACMILLAN & CO., LTD., ST. MARTIN'S STREET, LONDON, W.C.2

Telephone Number : Whitehall 8831 Telegraphic Address : Phusis, Lesquare, London

The annual subscription rate, Inland or Abroad, is £3 0 0, payable in advance

Advertisements should be addressed to

T. G. Scott & Son, Ltd., 63 Ludgate Hill, London, E.C.4 Telephone Number : City 4211

Registered as a Newspaper at the General Post Office

Editorial & Publishing Offices :
MACMILLAN & CO., LTD.
ST. MARTIN'S STREET
LONDON, W.C.2

NATURE

Telegraphic Address :
PHUSIS, LESQUARE, LONDON

Telephone Number :
WHITEHALL 8831

Vol. 146 SATURDAY, SEPTEMBER 28, 1940 No. 3700

MORAL ISSUES OF THE WAR

MAZZINI'S specification for bayonets that they should have ideas at their points is now seldom referred to, but the value of this stipulation has been proved in many campaigns since those which led to the liberation of Italy. Under the conditions of totalitarian warfare, its importance indeed is enhanced, not merely for the armed forces but for also the whole population. Under the strain of intensified air warfare and the comparative inactivity to which the large forces at present in Great Britain are subjected, if morale is to be maintained, endurance fortified and fighting efficiency enhanced, we must see to it that the rank and file are afforded the fullest opportunity for recreation and mental stimulus, and that at the least they have a clear understanding of the cause in which they contend and the part they themselves have to play.

Indeed it may be said that the need to-day is for something more than ideas. We are resisting, for the most part alone, a tyranny which has repudiated and trampled under foot all the noblest and enduring values of European civilization. Fundamentally, this is a struggle between diametrically opposed ideals or ways of living, and in the intense strain which the conditions of modern warfare impose on the whole population, the inspiration which a great and enduring ideal can give may well sway the issue by the fortifying influence it can have on morale.

From this point of view alone it is difficult to over-stress the importance of a clear understanding of the issues involved in this struggle, and what success or failure means to each one of us. The admirable new series of Macmillan War Pamphlets are well designed to serve this purpose*. In contrast with the well-known Oxford Pamphlets on World Affairs, which deal more with concrete and special technical problems, they are concerned essentially with the moral and spiritual issues. They aim at reckoning our own liberties and contrasting this freedom with the bondage of our enemies ; they probe the Nazi attitude to the Christian faith and they seek to examine and appraise the things for which we are fighting.

Not all the six pamphlets which have so far appeared are of equal merit. One or two of them are scarcely lucid enough to make the wide appeal that is the purpose of such a series, and err through intruding too much detail. There could, however, scarcely be a better statement of the issues in respect of freedom than the first pamphlet by Mr. A. P. Herbert. The struggle is between freedom and slavery, nothing less. A victory for Hitler would mean the spread of despotism and darkness ; the victory of the Allies will mean the survival and the spread of light and liberty not in Europe only but wherever the sons of Adam dwell.

Mr. Herbert's succinct but searching analysis of what we understand by our liberties, with its fundamental concept of the value of the individual, ranging over the whole field of Parliament and Press and their responsiveness and sensitivity to public opinion, and its trenchant comparison with conditions in Germany, is indeed a stimulus to the lukewarm and half-hearted, and more than justifies his contention that there cannot and should not

* Macmillan War Pamphlets. Let There be Liberty. By A. P. Herbert. War with Honour. By A. A. Milne. The Crooked Cross. By Dr. A. S. Duncan-Jones. Nazi and Nazarene. By Ronald Knox. When I Remember. By the Right Hon. J. R. Clynes. Nordic Twilight. By E. M. Forster. (London : Macmillan and Co., Ltd.) 3*d*. net each.

be neutrality in this War. We must either stand up in defence of freedom of thought, of speech, of worship, of Press and Parliament, with all that their continuance means in science, in art, in literature and music, or betray all that great moral, spiritual and intellectual heritage that has come to us from the past.

To recognize that we are the bearers of a noble trust and high responsibility is indeed heartening in days of trial. Mr. Milne's "War with Honour" aptly follows in the same theme and strikes with convincing realism into many of the pacifist arguments which seem so far removed from the world in which we find ourselves to-day. Mr. Milne points out that there are in theory three possibilities: the victory of Britain; the victory of Germany; or peace without victory. The third possibility, whether it involves leaving Hitler in possession of what he has already won, which is tantamount to a German victory, or in possession of no more of German Europe than is rightfully hers, which would be a British victory, is a wholly ineffective starting-point for the elimination of war.

Mr. Milne contends, therefore, that the only hope for the establishment of peace as desired by the pacifist lies in a victory for Britain. We have reached, he considers, a stage in human progress when the vast majority of the peoples of the world are pacifists, realizing alike the futility and the increasing barbarism of war. In a democratic country the main body of the people marks the stage of civilization which that country has reached, and for this reason offers a safeguard for peace which cannot be offered by an autocracy where the individual gangster may be the autocrat.

Mr. Milne frankly admits that the emergence of Hitler has invalidated all that he previously wrote about peace and war in "Peace with Honour". He affirms his conviction that if unresisted the abomination of Nazi rule will spread over and corrupt the whole world, and that in such a Nazi world there can be no place for decency, honesty or humanity. No man of courage, intelligence or imagination, no man who has a kindly thought for his neighbour or compassion for the innocent, no lover of truth, of beauty or of God can find a place in that world. It is this conviction that leads him to assert that it is the duty of mankind to reject such a world as much as it is the duty of a community to reject gangster rule. Only when this has been done by the use of force can civilization resume its march.

No less passionately in "Nordic Twilight", Mr. E. M. Forster affirms his belief that if the Nazis won they would destroy our civilization, and he points to the blank faces of German soldiers and airmen in any close-up photograph as showing that they have been cheated of their inheritance by a perverted education, and ruined mentally so that they may better spread ruin. Convincingly Mr. Forster shows how achievement in art and literature, in science and philosophy, is linked up with freedom of personality and expression. Already before the War German contributions in these fields were deteriorating because her culture had been allowed to become governmental. It was no longer genuinely national and capable of contributing to the general good of humanity.

The tragic picture which Mr. Forster draws of the way in which Germany's great cultural heritage has been violated by Nazi rule and its expression suppressed is paralleled by one of what is already being done to the culture of occupied or conquered countries, and a forecast of what might be done to our own if Germany should win. The picture demonstrates the impossibility of coming to terms with Hitler. A peace resulting from a Nazi victory would merely mean that Germans would no longer be killed, but they would go on killing others until no one survived to criticize them.

In the world domination thus achieved there could be no culture and no creative genius, for in their brutality and destruction the Nazis are destroying their own life. The passionate understanding which is at the heart of creation, no less than the calm use of the intellect—these are what the Nazi regime atrophies and destroys; to-day they are in the hands of the democracies to defend. It is the whole order of life that is based upon the dignity and eternal value of the individual human soul that is at stake, and these pamphlets well supply an interpretation of the issues and an understanding of what is involved that cannot but be heartening in one of the sternest hours of the struggle.

Mr. Forster closes on a note that harmonizes with those struck in two other of the pamphlets, in which the Dean of Chichester and Monsignor Knox describe the struggle inside Germany of the Protestant Church, the Confessional Church and the Roman Catholic Church against Hitler. Both alike lay bare the Nazi purpose of the eradication of Christianity altogether, and if at times these two pamphlets may seem a little too detailed for the general reader he can be left in no doubt as

to the virulence of the campaign of this new paganism against the Christian Church as such. Such a reader may well marvel at the divisions of the Church which permitted Hitler in his usual way to play off one against another, but he may also wonder whether at last the realization that all the enduring values of Christianity, the traditions and thought which have so enriched the culture and civilization of Europe are at stake, may not in the face of a common peril effect a reconciliation and an understanding which are long overdue.

Mr. J. R. Clynes strikes a different note. The case for democracy against totalitarianism does not rest alone on moral and spiritual values. We are too apt to forget that democracy has a record of material progress and of the redress or removal of social injustice which no dictatorship can approach. It is to the revolution in social conditions which he has witnessed in his own lifetime that Mr. Clynes directs attention. In the vivid picture he gives in the pages of this pamphlet of the way in which conditions have changed over the whole field of education and child welfare, of industry, of unemployment and of housing, he does not conceal the fact that we have still far to go before we can rest content. None the less it is a heartening picture he draws of a silent social revolution which is still going on, giving a new sense of security and a rising standard of health and living, and in the reconstruction to follow the War should be accelerated.

Under our democratic institutions there have been indeed solid and revolutionary gains in a single lifetime. Even from a material point of view alone there are rights and privileges which we have won for ourselves and which it is an honour and a duty to defend. Built up on ordered freedom and reason and a respect for human rights and the individual soul, this civilization of ours must be upheld by every means that is just and right. To surrender one inch to the claims of Hitlerism is to endanger not merely the liberties which are the basis of all that is noblest in our cultural and spiritual heritage but also all that has been built up in the social sphere.

These pamphlets, appearing at a time when the struggle is being intensified and fiercer demands are made on our powers of endurance, are admirably calculated to fortify our resolution by the lucid way in which the issues are set before us. The choice is indeed between a victory for the enduring values of our civilization or a slavery and barbarism to which the pages of history can offer no parallel. In the heat of the struggle it is well indeed to be reminded of the greatness of our responsibility, of the solid achievements which form part of our heritage, and to glimpse something also of the possibilities of adding yet more splendid pages to that record when this present threat to the whole human race has been once and for all overthrown.

BIRDS OF BRITAIN

The Handbook of British Birds

By H. F. Witherby (Editor), Rev. F. C. R. Jourdain, Norman F. Ticehurst and Bernard W. Tucker. Vol. 4: Cormorants to Crane. Pp. xiv + 461 + plates 93–125. (London: H. F. and G. Witherby, Ltd., 1940.) 21*s*. net.

THE fourth volume of the "Handbook of British Birds" is fully up to the high standard set by the previous three volumes. The birds described in the present volume are the shags, cormorants and gannets, the petrel family (including the fulmar and the shearwaters), grebes and divers. There are full accounts of the waders, such as curlew and whimbrel, the godwits, woodcock and snipe, red-necked phalarope, turnstone, dunlin and lapwing, dotterel and golden plover, greenshank and redshank, stone curlew and oyster catcher.

Since volume 3 was produced, the authors have suffered a heavy loss by the death of the Rev. F. C. R. Jourdain, one of the most learned and distinguished ornithologists of his time. In the words of the editor of the present volume:

"It is deeply to be regretted that Mr. Jourdain, who took such an intense interest in this work, was not spared to see its completion, but he has left most careful notes and records from which can be drawn the accounts of the remaining species.

"For this work we are glad to be able to say that we have been promised the co-operation of Mr. W. B. Alexander, Director of the Edward Grey Institute of Field Ornithology at Oxford, who with the consent of the University Committee for Ornithology has kindly undertaken the completion of the 'Distribution Abroad' sections for the present volume and will write both these and the 'Food' sections for volume v. Mr. Alexander's

special knowledge of both of these subjects will be invaluable, and Mr. Jourdain's notes and records will be available for his use. Further, we are promised the same help as before in revising—by Mr. H. G. Molineux for 'Distribution Abroad' and by Professor G. D. Hale Carpenter for the insects in the 'Food' sections.

"For the 'Breeding' sections we have available the elaborate and beautifully arranged notes which Mr. Jourdain had compiled with the utmost care over many years. From these Mr. Alexander will draft the sections, and assistance in revising has most kindly been promised by several specialists in various branches of the subject."

Each bird—even the rarest and most casual visitor to the British Isles—is carefully and minutely discussed, and its habitat, field characters and general habits fully described. Its call notes and song are reproduced ; its display and posturing are recorded ; its nesting, food, distribution and migrations are chronicled, and the appearance of the bird itself is carefully described (male and female, nestling and immature bird).

In the admirable treatise on the oyster catcher, it might perhaps have been added that, at its nesting sites along Highland rivers, the parent birds feed their young, chiefly in the evenings, on large worms, which they bring in on the wing from considerable distances. It is interesting, too, that at its inland haunts the oyster catcher nests often in fields of growing oats, or rye grass, or even on the crowns of furrows where potatoes and turnips have been planted. I have often seen the eggs laid in short heather, and on several occasions the nest has been found between the metals on the main line of the Highland Railway and of the Caledonian (now the London, Midland and Scottish) Railway. Another interesting point about this handsome and attractive bird is that along the east coast of Scotland it is scarce as a nesting species, but nests commonly inland, whereas in the west it nests commonly at the margin of the tide, but is a scarce nester inland.

Under the "Distribution" of the oyster catcher the inference is drawn that this handsome bird has only in recent years nested inland in Northumberland, but my wife tells me that, so far back as 1908, a pair used to nest near her home at Otterburn on a shingle bed on the River Rede not far from its head waters.

In the account of that splendid Highland-nesting bird the greenshank, I would say that the call-note is more musical by far than the call-note of the redshank. The description of the greenshank's song, which my wife and I heard under memorable conditions, can scarcely, in our opinion, be described as "a rich 'rü-tü, rü-tü, rü-tü' ". The song has *two* distinct whistled measures. After hearing the song, I wrote down the words which conveyed it best to my mind : "teuchi, teuchi, teuchi ; clever, clever, clever". The two measures were repeated without pause and with tremendous vigour and excitement for upwards of half an hour while the songster flew swiftly backwards and forwards so high as to be scarcely visible to the unaided eye. The sombre sky and the old pines, motionless in the windless air far below that aerial songster pouring out a flood of wild music, will not readily fade from my mind. I recall that Viscount Grey of Fallodon mentioned to me on one occasion that his great desire was to hear the song of the greenshank, but that wish was not to be gratified—and indeed it is my experience that the greenshank rarely sings.

In the account of the distribution of the lapwing, it is mentioned that in the Highlands it nests to 1,800 ft. or higher. In the early summer of 1939 my wife and I found this bird, usually associated with the low country of agriculture, nesting among the western Cairngorms at an elevation of 2,800 ft., and from observations made during that summer I have no doubt that in this district the lapwing is penetrating much farther into the hills than it has done at all events during the last forty years.

As well as containing 455 pages of closely written (yet clear and legible) letterpress, the volume under review is enriched by 33 pages of coloured plates of birds delicately portrayed in flight by that well-known bird artist J. C. Harrison. In addition to these plates, there are valuable maps constructed by that distinguished young ornithologist J. Fisher, showing, among other things, the distribution of nesting gannets in 1939 off the coasts of Britain and Eire ; the breeding colonies of that mysterious yet fast-spreading bird the fulmar petrel ; and, still more ambitious, the world-breeding distribution and oceanic range of the same species.

A. Landsborough Thomson, well-known son of a distinguished father, contributes a valuable map to show the localities (often in far-distant countries) where gannets, ringed at British nesting stations, have been afterwards discovered, and it is interesting to know that the young gannet often wanders south as far as the tropics during the first autumn of its life. Among other maps to be noted is one by W. B. Alexander to show the British nesting distribution of the woodcock, and there is also a valuable map by E. P. Leach to illustrate, from the records of ringed birds, the migrations of the lapwing.

No one who is interested in birds can afford to be without this volume and the three which have preceded it. S. G.

GENETICS AND THE STUDY OF DEVELOPMENT

Organisers and Genes

By Dr. C. H. Waddington. (Cambridge Biological Studies.) Pp. x + 160 + 2 plates. (Cambridge: At the University Press, 1940.) 12*s*. 6*d*. net.

THE student of heredity is confronted with two different groups of problems. The first group, including such questions as: 'Why do two white mice produce another white mouse, but not a black or a brown one?' has been answered, at least up to a point, by the geneticists. The second, typified by such a question as: 'Why do two mice produce a mouse, and not a rabbit, a mass of Protozoa, or a sarcoma?' has been answered much less satisfactorily. Genetical results have great practical value in the fields of agriculture, eugenics, and evolution, even if they are not applied to the study of development. But genetics will remain a somewhat isolated branch of biology until this is done.

So far the most systematic attempt to link up genetics and developmental physiology has been that of Goldschmidt. However, just because Goldschmidt has been a pioneer, his theories require careful criticism. It is perhaps impossible to go as far as he had gone without sometimes losing one's way. We can, therefore, welcome Waddington's monograph, which attempts to link up genetics and embryology from a somewhat different point of view from Goldschmidt's.

The first five chapters are a summary of the causal analysis of development which has grown up from the work of Spemann. Then follow two chapters on the action of genes, and the remainder of the book is concerned with the integration of the data of embryology and genetics. Geneticists will find Waddington's classification of the kinds of localization of gene effects, and of the types of genic interaction, in Chapter vi, particularly stimulating, though it is not certain that his terminology will be finally adopted. The discussion would have been still more valuable had he given more weight to data of plant genetics, such as Anderson's account of the interaction of the gene causing leafy bracts with those controlling leaf shape in *Primula sinensis*, which offers a close parallel to Waddington's account of the interaction of the genes for aristopedia (leg-like antennæ) and those controlling leg development in *Drosophila melanogaster*. Waddington's account of the development of the wings in mutant forms of this species differs substantially from Goldschmidt's, and until this vexed question is settled, a final judgment on the validity of some of his theories is impossible.

One of the central ideas in the book is the "epigenetic landscape". Development may follow a normal track symbolized as a river valley, or any of a number of branches which diverge from it at different points, and into which development may pass as the result of an appropriate stimulus at a suitable moment. Intermediate paths are more or less completely excluded. The main valley is broad and shallow in its early stages when regulation is possible, but the later stages are sharply defined. Like other symbols in biology, I expect that this one will prove valuable for a time, but may later be rather misleading.

On the whole, however, the book is distinguished by a critical discussion of possibilities rather than a formulation of new theories. It will be indispensable to workers who are engaged in research on developmental physiology or genetics, but will prove rather indigestible by students preparing for an examination or lecturers who are rapidly preparing a course.

The last chapter is devoted to a discussion of theoretical problems, and again is slightly disappointing. After describing Bohr's theory of complementarity in its application to biology, Waddington states that "although there are undoubted technical difficulties in performing a full physico-chemical analysis on biological entities without killing them, there is no theoretical reason why this should always be so". Is this quite fair to Bohr? He at least thinks that there is such a reason, and his opinions deserve consideration. In the same chapter an unnamed dialectical materialist (perhaps Lysenko) is credited with the view that the Soviet system has affected the chemical structure of human genes. It would surely have been well to give a reference for this theory. Undoubtedly, the Russian revolution has affected human genes in many ways, notably by breaking up inbred village communities, and thus reducing the frequency of rare recessive homozygotes, and the amount of selection against them. In the next paragraph dialectical materialism is praised.

In fact this chapter exhibits a critical mind in search of a satisfactory philosophy, and is of interest for this reason. I should welcome a book by the author on philosophy in relation to biology. But I am not so sure that the discussion sheds much light on the parts played by genes and organizers in development.

Perhaps it is inevitable that such a book should be incomplete in many respects. But those who buy it as a report on progress in a most interesting field will not be disappointed.

J. B. S. HALDANE.

SCIENCE AND CRIME

(1) Forensic Chemistry

By Henry T. F. Rhodes. Pp. viii+214. (London: Chapman and Hall, Ltd., 1940.) 12*s*. 6*d*. net.

(2) Poisons

Their Isolation and Identification. By Frank Bamford. Pp. viii+344. (London: J. and A. Churchill, Ltd., 1940.) 18*s*.

(1) THIS small manual has for its objects, first to collect together information now widely diffused throughout criminological literature, and secondly, to outline the manner in which the practice of forensic chemistry is conducted in a forensic chemical laboratory.

The book is divided into two parts. Part 1 deals with the application of chemical methods to the identification of the person, and Part 2 is related to the application of chemical methods to the proof of the corpus delicti. With regard to the question of identification, such subjects as skin prints, the composition of sweat, the chemical development of skin prints, occupational dust, its classification, collection, sources, examination and the interpretation of results are dealt with. There is short allusion to the now very important subject of blood-grouping and a note on the possibility of grouping seminal stains, a procedure which has now been fairly extensively developed. In a short chapter on bloodstains, emphasis has been laid on the preliminary tests for blood, and certain crystalline tests are mentioned without reference to the most frequently used hæmocromogen crystal test. Spectroscopic and serological methods are omitted. The treatment of the examination of seminal stains is dismissed with considerable brevity.

In the second part of the book, the chemical examination of firearms and explosives and the chemical examination of questioned documents are given prominence, and these may be regarded as the best chapters. The examination of counterfeit money is also dealt with.

The concluding chapter is devoted to the field of toxicology; it covers some forty-one pages and provides a superficial introduction to this large and highly technical subject.

The difficulty of the reviewer was to determine the class of reader for which the book is intended; nevertheless, it is sure to find a large number of readers whose work and interests require information with regard to certain aspects of forensic chemistry.

(2) Bamford's recent work is an excellent laboratory manual which will be welcomed by all chemists and toxicologists whose work brings them into contact with cases of poisoning. The book is essentially practical in character and the author has included his very comprehensive experience in tried and trusted laboratory methods. The writer of this review has been afforded numerous opportunities for observing the wide scope of Mr. Bamford's work as late director of the Medico-Legal Laboratories in Cairo, which are responsible for the investigation of all medico-legal cases arising from a vast population over a very wide area.

Within the compass of some three hundred and forty-four pages, a wealth of highly valuable material has been marshalled and it covers a wide field between the introductory chapter, devoted to the question of organization and equipment of a modern laboratory, and the concluding chapter, which deals with the drugs of addiction and includes opium, its alkaloids, cocaine, nutmeg, the atropine group, gelsemine, chloroform, ether, petrol, chloral, the barbiturates, fly-agaric, the anhalonium drugs and also hashish, which receives a generous contribution. Early in the book, a classification of poisons is provided and thereafter each group is dealt with. The chapters dealing with volatile poisons, common metallic poisons and other metals are well written. In the first of these, the alcohols receive a proper place and the processes of Nicloux and of Widmark are fully described, while both the Mitscherlich and Blondlot-Dusart tests are included under phosphorus. Among the metallic poisons, arsenic receives full treatment, and the wide experience of the author is clearly reflected. His allusion to the presence of 'normal' arsenic within the human body is of value, since this is a question which arises, from time to time, within the courts of criminal law. The detection and determination of organic arsenical compounds, since special methods for their investigation are sometimes necessary, are included.

Some twenty-seven pages are devoted to the subject of corrosive acids and alkalis, the poisonous salts of alkalis, and the halogens. An outstanding feature of the book is the author's treatment of the alkaloids and his systematic scheme for their identification, in which are embodied the results of a large amount of original work.

The Stas-Otto process, one of the most difficult of analytical problems, is described in both a concise and convincing manner. Identification of the barbituric acid derivatives is included in the

contents, and among the miscellaneous poisons, the toxalbumens, poisonous plants and fungi, the sulphonamide drugs, together with the fur- and hair-dyes, are to be found. A useful table provides the various reactions of the different fur-dyes. It is a matter of widespread regret that the death of the author of this excellent handbook precluded him from seeing the finished product of the subject-matter on which he had lavished so much care and patience. His son, H. F. Bamford, and Dr. G. D. Elsdon are to be congratulated on their final preparation of the book for the press. The publishers have maintained their usual high standard in the production of this volume, which is well indexed.

The reviewer fully concurs with the concluding sentence of the foreword by Prof. Sydney Smith, to the effect that this book is the product of a highly skilled specialist in toxicological analysis and that it can be recommended with complete confidence to all those whose work entails such analysis.

J. GLAISTER.

CONSERVATION OF THE SOIL

Soil Conservation

By Hugh Hammond Bennett. (McGraw-Hill Series in Geography.) Pp. xvii+993. (New York and London: McGraw-Hill Book Co., Inc., 1940.) 40*s*.

IN many countries distant from the storm centre of world politics the perpetual war between man and Nature has in the last two decades reached an acute phase. The maladjustment between an established form of human society that had transplanted itself to the unwonted environments of the New World had culminated in the remarkable phenomenon of soil erosion, the widespread disappearance of the very basis of life itself. Nowhere did the capitalistic form of society that colonized the world from its homeland in Europe take firmer root or grow more lustily than in the United States, and nowhere has soil erosion been more virulent, or is having such far-reaching effects on the structure of society.

During the last ten years a powerful reaction against the destruction of the soil by an agriculture inappropriate to the environment has set in in the United States, and has already produced a very extensive literature. This latest book, by the Chief of the Soil Conservation Service, is significant in that it stresses, both in its title and throughout the text, the conservation rather than the destructive aspect of the subject—significant in showing that the United States are passing out of the exploitative into the constructive phase of their agricultural evolution. Dr. Bennett is especially concerned with the human side of the soil-conservation problem, that is, with the correct adjustment of the agricultural basis of society to the natural environment. He believes that the means and knowledge for this adjustment are available, but the task must be tackled on a nation-wide basis and according to an all-embracing nation-wide plan of reconstruction. Dr. Bennett is a democrat and individualist, and he recognizes the strains that must be set up in the body politic when the demands of the land for a pre-determined form of agriculture come into conflict with those of the people for a continuance of the freedom of action they have hitherto enjoyed.

So far, however, these strains have scarcely been felt. When the seriousness of the erosion question was realized by the nation the immediate task was to stop erosion, and it has only been within the last two or three years that the more difficult task of reorganizing the agricultural basis to prevent the soil exhaustion that precedes erosion has been taken in hand.

In the first part of his book Dr. Bennett describes the various manifestations of erosion; in the second and larger part the measures now being taken in the United States to check erosion and to rebuild fertile soils which will not erode. Measures to check erosion are mainly mechanical, designed to prevent water from running downhill or to curb the force of wind blowing over exposed land, but their co-ordinated application involves a revolution from an exploitative agriculture to systems based upon the inherent properties of the land. It is here that soil conservation gains a wider and more human interest. Dr. Bennett shows very clearly how a biological and ecological concept of soil conservation has developed out of the social problems that have arisen from the increasing application of mechanical measures for stopping soil erosion, and at the same time how the physical phenomenon of erosion can be traced to social and historical causes.

Although the book is entirely about the United States, much of its matter has universal validity. It is excellently planned, and more than 350 vivid illustrations complete the most comprehensive and authoritative treatise yet published on this urgent problem of the present day.

G. V. JACKS.

ANNUAL REPORTS ON CHEMISTRY

Reports of the Progress of Applied Chemistry
Issued by the Society of Chemical Industry. Vol. 24, 1939. Pp. 756. (London : Society of Chemical Industry, 1940.) 12*s*. 6*d*. ; to Members, 7*s*. 6*d*.

Annual Reports on the Progress of Chemistry for 1939
Vol. 36. Pp. 458. (London : Chemical Society, 1940.) 13*s*. net.

EACH year, when new volumes in these two series of annual reports on the progress of pure and applied chemistry are published, we realize that their appearance is an occasion of considerable moment ; to chemists because they provide an opportunity for appreciating the significance of contemporary advances in fields abutting on those already under the worker's constant survey, and to others of scientific interests because they offer brief but authoritative reviews of very many important subjects now engaging the attention of researchers in chemistry and its intimately related sciences.

It has long been impossible for chemists to obey the late Prof. H. E. Armstrong's injunction to "read everything", and doubtless even abstract publications are read from cover to cover only by their editors ; but here at least is a concentrate in readable form and, upon judicious selection, in assimilable quantity. While the reports on applied chemistry continue in most cases to present a compact yet comprehensive and heavily documented survey of the year's developments in numerous industrial processes based on chemical operations, those on pure chemistry have assumed the character of essays on recent progress in selected phases of chemical thought and experiment. Thus, for example, in the Chemical Society's volume an account is given of synthetic work on the steroids accomplished during the period 1937–39 ; the article on the structure of liquids is a sequel to that contained in the report for 1937 ; stereochemistry is surveyed over the past four years ; while the reporters on nutrition are faced with the task of reviewing "about 6×10^3 new papers per annum", of which between one third and one half deal with the vitamins. The analytical section contains an account of the use of the microscope, and deals also with the analysis of dusts and smokes, including the collection of siliceous dusts of importance in the study of silicosis. A chapter on crystallography deals first with crystal physics (thermodynamics and structure), then with inorganic compounds, and finally with the structure of organic substances, including insulin. Another section is concerned with reactions in non-aqueous solvents, while in yet another, dealing with nuclear fission as a possible basis for a chain reaction, it is argued that in uranium containing ten times the normal concentration of the 235-isotope the capture of neutrons, although producing explosion, would not form an effective basis for the construction of a super-bomb.

In the volume devoted to applied chemistry one finds frequent reference to the incidence of the War on industry, with at least one encouraging declaration that research of an emergency nature has not yet been required, and certain interesting facts relating to the industrial resources of both belligerent and neutral countries are quoted. In relation to the fact that aluminium is usually manufactured from bauxite mined chiefly in France and the Guianas, there is a reference to the industrial possibilities of Indian bauxite from which 95 per cent of the metal is stated to be recoverable. Elsewhere one finds a plea for industrialists to enlist the sympathy of university professors in a much wider application of the idea of fellowships for industrial research ; and one feels that there is plenty of such sympathy to be had for the asking. There are new natural sources of rubber stated to be worth investigation ; aeroplanes assist the dispersal of noxious insects ; a new safety glass is very strong and resistant. As an example of how an advance in one branch of applied chemistry raises new problems in another may be quoted the production of a new synthetic polyamide filament, Nylon, a substitute for silk ; the new problems concern the dyeing of this near approach to a synthetic protein fibre.

There are heartening comparisons, for example, in respect of drugs, dyes, and fine chemicals, between the industrial condition in which Great Britain now finds herself and that which she suffered in 1914 ; and for this we must pay tribute to the immense amount of fundamental research which has been carried out during the intervening period. Indeed the dependence of industry on scientific institutions for the initiation and prosecution of such fundamental investigations is particularly emphasized in the opening paragraphs of the chapter on pulp and paper : "Most of the information about developments in the pulp and paper industry now comes from

universities, state-controlled departments, trade research institutes, etc. ; even the patent literature reveals little of what is going on in works and commercial laboratories. . . . It may be expected that the move towards centralised research on fundamental problems will continue in all countries, and that the rate of progress in any country will be closely related to the extent to which its research institutes are supported".

A. A. ELDRIDGE.

TECHNOLOGY OF SOUND TRANSMISSION

Sound Transmission in Buildings

Practical Notes for Architects and Builders. By R. Fitzmaurice and William Allen. (Department of Scientific and Industrial Research.) Pp. viii + 50. (London : H.M. Stationery Office, 1939.) 4*s*. net.

ONE might justly express surprise that a report under this title should deal with an acute social problem of this critical stage in our civilization. "The gramophone and the loud-speaker are undoubtedly the greatest source of difficulty in a modern building. Not only have they become almost universal but year by year they become capable of greater undistorted acoustic output and the tendency is for them to be worked at a higher level of sound intensity on account of the greater realism which can thereby be obtained," say the authors of this report. Their main concern is to show how the fundamental principles which have been found to underlie modern types of sound-insulated structure must be put into building practice if good-neighbourliness is to survive in the life of the modern city.

The work on which this was based was carried out at the National Physical Laboratory and the Building Research Station. It began with simple cases of sound transmission through walls and floors, but investigations on the elements of a building structure taken separately proved insufficient ; interaction between walls, floors, etc., proved of the first importance. Units were built up on steel frames at the Building Research Station for this purpose and tests were also made of actual buildings. The conclusion reached is that so long as rigidly connected structures are used, no overall insulation to air-borne sounds can be expected to improve on that afforded by a 9-in. brick wall.

Suggested practical constructions are given in this book to show how noise-insulation technique stands to-day. The subject is dealt with under three headings. The first section deals with the modes of transmission of air-borne and impact sounds, in which it is pointed out that though mass and rigidity of structure may stop the former, nothing but definite discontinuities can isolate the latter. In the second section figures are given in the form of simple nomograms to show the type of homogeneous construction which should be employed with a given external disturbance to give sufficient quietude for carrying out certain classes of occupation inside the building. These data are cleverly presented to avoid the usual tabulation of decibels or phons which might embarrass the architect unused to such technical terms. Three such figures are given : (1) for external air-borne noise ; (2) for indoor air-borne noise ; (3) for impact noise. The third section will possess the greatest interest to the practising architect and builder, for in it are given illustrative specifications in the application of discontinuous construction to flats, semi-detached houses, hospitals and offices. Experience gained in the construction of suspended ceilings and floating floors is placed at the disposal of those who will in the future be called upon to make use of it. No detail is too small to be overlooked ; fireplaces, chimney-stacks and the plumbing fixtures are all designed specially to suit the construction, since these must be independent of the floating boxes of which the rooms virtually consist, and must be isolated from them in the outer shell of the building.

The authors claim that, armed with the information they give, it is possible to visualize a solution for almost any problem in noise insulation which may arise in connexion with building in the future. For example, it may be possible to do away with structural floors as separate elements and to use only floors and ceilings not rigidly connected to the shell. Buildings could then be constructed on a unit system, each story being separated from the next by a resilient pad. Although formerly it was thought that tie-rods were the weakest part, from the sound-transmission point of view, of a discontinuous structure, it has recently been found that wall ties of certain types used in cavity wall construction are quite effective insulators. These and other possible simplifications in structure will be tested at the Building Research Station.

The authors and publishers are to be congratulated on this book. There is bound to be a large amount of reconstruction—in the literal sense—after the War, and it is to be hoped that it may result in the application generally of the ideas here presented.

THEORY OF NUMBERS

(1) Elementary Number Theory
By Prof. J. V. Uspensky and Prof. M. A. Heaslet. Pp. x + 484. (New York and London : McGraw-Hill Book Co., Inc., 1939.) 26*s*.

(2) Modern Elementary Theory of Numbers
By Prof. Leonard Eugene Dickson. Pp. vii + 309. (Chicago : University of Chicago Press ; London : Cambridge University Press, 1939.) 18*s*. net.

(1) THIS is a systematic text-book on the elements of the theory of numbers, intended for beginners. The greater part of it deals with the usual elementary topics : divisibility, the H.C.F. process, congruences, and binary quadratic forms (but without the classical theory of reduction and equivalence). The proofs of the theorems are given in full and ample detail, and there are frequent numerical illustrations, and sets of examples for solution by the student. Most of these are quite straightforward, but there are several which strike one as distinctly difficult in relation to the text.

There are also three chapters of a less elementary character : one on Bernoulli's numbers, one on various Diophantine equations, and one on Liouville's method and the representation of numbers as sums of three and four squares. (Incidentally, in the first of these, the statement in words of von Staudt's theorem is not quite correct.) These chapters will naturally make difficult reading for students. The fact that they "contain some material not to be found readily in other texts" means that they are necessarily out of harmony with the rest of the book.

The book as a whole is very well written, though with a certain prolixity in the earlier chapters. An excellent minor feature is the provision of short historical and biographical notes on the mathematicians with whom various famous theorems are associated. The three appendixes on magic squares, the calendar, and card-shuffling, may serve to attract the student's interest and attention, but have no very intimate connexion with the subject-matter.

Probably the book will be of greater value to American than to English students. The printing is good, but the price is rather on the high side.

(2) The title of Prof. Dickson's book is perhaps not entirely appropriate. One part of the book is elementary but not modern, the other part is modern but not elementary, except in a technical sense. The former, consisting of the first four chapters (about 90 pp.), provides a concise introduction to the theory of numbers, one chapter being devoted to each of : foundations, congruences, quadratic residues, and binary quadratic forms. The rest of the book is an account of various topics, chiefly quadratic forms and modifications of Waring's problem, upon which Prof. Dickson and his pupils have worked in the last ten or fifteen years. Their work has resulted in simplifications of former proofs and extensions of former results, and the book provides clear evidence of the productiveness of the research school which Prof. Dickson has established at Chicago.

In the chapters on quadratic forms (Chapters v, viii, ix, xi, xiii), the main results proved are : Ramanujan's theorem (the first complete proof of which is due to Prof. Dickson), which enumerates those fifty four forms $ax^2 + by^2 + cz^2 + dt^2$ (a, b, c, d positive integers) which represent all positive integers ; Legendre's theorem on the solubility of $ax^2 + by^2 - cz^2 = 0$ with x, y, z not all zero ; Dickson's own theorem on forms $ax^2 + by^2 - cz^2$ which represent all integers ; and Meyer's theorems on the solubility of $a_1x_1^2 + \ldots + a_nx_n^2 = 0$ when $n = 4$ or 5.

In two chapters (vi, vii) on cubes, the author proves Wieferich's result that every positive integer is representable as the sum of nine non-negative integral cubes, and extends the result to representation by $a_1x_1^3 + \ldots + a_9x_9^3$, where the a's have particular numerical values, or by $P(x_1) + \ldots + P(x_9)$, where $P(x)$ is one of an enumerated set of particular cubic polynomials. In a chapter entitled "Waring's Problem", he also proves Wieferich's theorem that every positive integer is representable as the sum of thirty-seven integral fourth powers. All the proofs involve some numerical computation. There is also a chapter (x) on sums of polygonal numbers.

In order to make the book practically self-contained, the author gives in an appendix a proof of Dirichlet's theorem on the existence of primes in a given arithmetical progression. Apart from some preliminaries on infinite series, due to Prof. W. T. Reid, the proof follows very closely that given by Landau ("Vorlesungen über Zahlentheorie", vol. 1, pp. 83–96).

The style is a strictly business-like one, and the author does not give much indication of the general theories which sometimes underlie particular results. The references to the history and literature of the topics treated are often inadequate. In the chapters on Waring's problem, for example, there is no mention of Hilbert or of Hardy and Littlewood.

It is not quite clear for what class of reader the book is designed. The ordinary student cannot be expected to make much progress beyond the earlier chapters. The expert will find it a convenience to have an elementary account of quadratic forms in three and four variables to which he can refer, but he is unlikely to be interested in the various modifications of Waring's problem, or in the introductory chapters. The book, however, will certainly be of great value to research students whose field is related to one of the topics dealt with. H. DAVENPORT.

PREPARATION OF REPORTS

(1) Writing the Technical Report

By Prof. J. Raleigh Nelson. Pp. xv+373. (New York and London: McGraw-Hill Book Co., Inc., 1940.) 16*s*. 6*d*.

(2) Industrial Surveys and Reports

By Prof. Walter Rautenstrauch. Pp. x+189. (New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Ltd., 1940.) 15*s*. net.

THE literature available for the guidance of scientific workers in the preparation of reports of scientific and technical papers is already considerable, as a glance at the bibliographies contained in Soule's "Library Guide for the Chemist" or the "Manual on Research and Reports" issued some years ago by the Committee of Research of the Amos Tuck School of Administration and Finance shows. The bulk of this literature is of American origin, to which indeed the two present volumes are no exception, and it cannot be said that, whether in industry generally or in particular fields of science, the scientific worker has yet shown himself anything like as competent in his standard of presentation of the results of his work as is to be desired.

(1) Prof. Nelson's excellently written book, however, leaves no scientific worker with any excuse for failing to obtain a reasonable standard of proficiency in this respect. An outstanding weakness of many technical reports is failure to realize the reader's point of view or the purpose which the report is intended to serve. Prof. Nelson insists that the report is a document prepared for a designated reader or group of readers who need it for certain definite uses. This definition of the report is emphasized throughout the book, and with it emphasis is placed on the design of the report as a structural whole. These two conceptions dominate the whole argument and plan of the book. They are kept clearly in mind in treating of the need for classification and organization of material as a basis for writing and in the recognition of the shaping and determining effect of the objective on the structural characteristics of a report. The technical ideal of fitness for the purpose is as valid for reports as in the design of other structures qualified to carry their loads.

The first of the four parts of Prof. Nelson's book deals with the design of the report, the second with suggestions as to the form and style of the report, covering such matters as stationery and typing, use of words, abbreviations, tabulation, annotations, etc., while the third part deals with criticism of the report with the object of helping a writer to examine his own work with a view to continual improvement. Throughout these parts Prof. Nelson's lucid writing is assisted by the free use of admirably selected illustrations. His points are ably and clearly made, and nothing but sheer indifference or laziness can account for poor reports from any scientific worker who takes the trouble to read this book. Outstanding not only for the lucidity of its exposition but also for the numerous practical examples it contains and their lavish treatment and clarity, it is unquestionably the best guide to the writing of reports which has yet appeared. The careful explanation of the functions which the various features in a report have to serve, such as the introduction, the headings, summary and conclusions and the use of the paragraph in the design of the report are well worth attention even from the experienced writer. Prof. Nelson has earned the gratitude of all scientific workers who are concerned with the skilful, orderly and accurate exposition of the results of their work.

(2) Dr. Rautenstrauch's book has much slenderer claims on the interest of scientific workers. He gives us an excellent opening chapter on the general principles of report writing, in which many of the principles enunciated by Prof. Nelson are much more briefly mentioned. For the rest, the title of the book is misleading. The application of these principles is limited to investigations in financial matters and does not include the wider field which the term "Industrial Survey" would naturally suggest to those familiar with the reports of such surveys prepared by various universities, for example, in recent years at the request of the Board of Trade or the like.

R. BRIGHTMAN.

SOCIAL AND TECHNICAL TRAINING IN WAR-TIME

ONE of the novel features of the present situation is the presence in Great Britain of an army of more than two million soldiers largely without the soldier's proper task of fighting. The maintenance of the morale and welfare of large bodies of inactive forces is a major problem which has been too much for many commanders in the past. The problems it raises for us already demand close attention and will become the more searching with the shortening of the days as winter approaches. We cannot ignore the classical examples of the demoralization of idle armies.

While this is true, the question of the Army welfare should not be approached purely from the negative point of view of preventing demoralization. There is a general desire among the public of the country to alleviate any discomfort or monotony with which the troops are threatened. This desire has received official recognition, and a prime responsibility of the Army Welfare Organization established last November is that of directing this goodwill into the channels in which it can render the most effective service. If this is wisely and efficiently done we may well find that, without impairing that valuable tradition of the British Army of the responsibility of the regimental officer for the well-being of his men, we have not only effectively combated boredom but also in so doing developed an even closer and fuller sense of comradeship between the citizen and the forces, which should prove an invaluable asset in dealing with the post-War problems of reintegration and reconstruction.

Looked at even from this point of view, the organization of welfare work will involve many problems if gross disparities in different localities are to be avoided, either through the varying interests and resources of the Territorial county associations and the needs or conditions of the troops in different areas. Nor should it be considered that the problem is purely one of providing entertainment or amenities or facilities for games or sport. The universities in a number of areas have already turned their attention to the educational needs of the troops in the areas they serve, by providing programmes of lectures. Such extra-mural work may well require wide extension as part of an organized attempt to see that the minds of those called to the colours do not stagnate or become set in service grooves.

The possibilities in this direction merit immediate exploration. Even if only a minority of the men desire these educational courses they deserve the best encouragement and some considered attempt to find the right kind of instruction. Moreover it should be remembered that in many areas the men will be well outside the normal radius of a university, and if the whole country is to be covered effectively some scheme of co-operation may well have to be devised between the universities themselves, as well as between them and the army welfare authorities. Steps are now being taken in connexion with this (see NATURE of September 21, p. 396).

Behind all such educational schemes, the provision of entertainment or sport, or of opportunities for pursuing hobbies such as gardening, carpentry, music, there is a deeper significance which should not be forgotten. If by using the goodwill and services of individual citizens or civil authorities already recognized, the War Office can find the gardens, the workshops, places for various kinds of music required, and in doing so encourage on the part of the citizen a keen sense of comradeship with his fellow citizens under arms, there is an equally important reverse side of the picture. The soldier in his turn may in the same process become the better fitted to take his place again in civil life after the War.

It is this sense of the possibilities which we have in such educational work or recreation activities of fitting men to take their place more readily and happily in the new social or industrial order to be established after the War that is all important. If we are really alive to the opportunities which confront us in this field and do not allow them to escape us, we may well find attention to what at the moment appears to be a secondary aim—that of preparing men and women to take their place efficiently and harmoniously in a new order—will also serve best the immediate task of eliminating boredom and preserving morale. The adaptability or flexibility of mind, no less than the wider outlook and the sense of social responsibility and ideal of service and fitness which are so important an element in training for modern warfare, are the same qualities upon which we must build a higher ideal and nobler conception of citizenship.

A like opportunity may well confront us in the training schemes for industrial workers for war needs which are being introduced by the Ministry of Labour. Whether we are concerned with the training schemes which are being initiated primarily to increase the numbers of highly skilled workers for the engineering factories for munition production, with the training of workers displaced from

less essential industries or occupation for munition work at the lower levels of skill, or with the training of women, the training cannot but contribute to increased mobility and flexibility of labour after the War. To the value of this as a national asset, reports of the Commissioners for the Special Areas testify.

It is well indeed that we should appreciate the long-term as well as the short-term advantage to the nation of such training schemes, for there are difficulties which are only likely to be overcome if the long view is kept carefully in mind and resolutely pursued. The experience gained in the Special Areas with the junior instruction centres and training schemes to meet local needs, even though these were limited to persons who had attained the age of eighteen years, shows that even on the worker's side there are prejudices to be overcome and personal or social obstacles to rehabilitation in the way. It is essential that the worker himself should be roused to a sense of the new and permanent opportunity now opening before him or her and become inspired with a new self-respect and sense of civic or social responsibility.

Nor are the obstacles only from the side of the worker. Training to the extent now demanded is beyond the resources of the Government training centres themselves, even if engineering employers respond freely to the Minister of Labour's appeal for the release of suitable men to become instructors in the training centres, the number of which Mr. Bevin hopes to extend from 19 to 40. Besides this there has been initiated, in association with the President of the Board of Education and the Secretary for Scotland, a scheme of short courses of training through the technical colleges, by which it is hoped to add at least a further 50,000 to the 100,000 trainees coming from the training centres.

With all this there must be the fullest co-operation of employers in the training arrangements being set up not only in garages, maintenance shops and other shops with unused capacity, but also in the factories already on War production, if we are to secure the maximum utilization of our man-power essential to supply our wartime needs. Here is indeed a problem demanding technical knowledge as well as wise administration and loyal co-operation on the part of the management if a full and rapid solution is to be obtained. The introduction of training programmes into a works or other organization is no simple matter, as is well shown by F. Cushman in his recent book*. For all the American jargon which it contains, many of those called upon to arrange such training schemes might do worse than consult this book.

Besides his analysis of the factors and principles involved in developing and carrying out a programme of training, Mr. Cushman emphasizes the fundamental importance of the attitude of the executive. Mr. Bevin has already indicated in no uncertain manner that there are quarters in which this still leaves very much to be desired. The Government does not, however, as yet appear to realize that the nation is in no mood to tolerate any failure to apply compulsion to deal with recalcitrant elements who impede the maximum development of our War effort.

If, however, there are numerous technical details in such training schemes which must be worked out by careful scientific study, the long-range view must still be kept carefully in mind. Efficient production demands not merely skilled or technically proficient workers, but also workers who are keen on their job and see its part in relation to the national effort. It is the conception of national service which lies behind the great response to the appeal to "Go to it" which has characterized these last few months.

For this reason alone our conception of training must embrace not merely technical fitness but social fitness also. Behind our training schemes there must be the planning which will ensure that immediate use is made of the skill of the trainees, that they are not kept waiting about for long periods while their skill and keenness both deteriorate. We must have clearly in mind the jobs for which we are training men and women, quantitatively as well as qualitatively.

Behind this short-term planning there must also be the more or less deliberate long-range planning in regard to the needs of the individual and of the community in the new order to follow the War. Such planning, even if little more at present than stimulating the ideal of service and citizenship, promoting adaptability and flexibility of mind and also skill, and the wise, sympathetic but determined handling of all those factors or intransigencies, whether in regard to the dilution of labour, professional privilege, co-operation in training schemes or the like, which no less in reconstruction than in this hour of peril are anti-social and inimical to the common weal, may well make the vital contribution to morale and drive which is all-important in a free community. If Mr. Eden and Mr. Bevin are alive to the wide opportunities which lie before them they may well make in these next few months a most significant contribution not merely to the winning of the War but also to the building of a new world. They will deserve the whole-hearted support of every citizen of vision and good will in their efforts to make full use of these possibilities.

* Training Procedure: a Discussion of the Problems encountered in Planning, Organizing, Operating and Maintaining Efficient Training. Programs in Industrial, Business and Public Service Organizations. By Frank Cushman. Pp. x+230. (New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Ltd., 1940.) 12*s.* net.

THE TOTAL SOLAR ECLIPSE OF OCTOBER 1, 1940

BY PROF. F. J. M. STRATTON, O.B.E.,
UNIVERSITY OF CAMBRIDGE

NOT for the first time a European War has sadly interfered with plans for the observation of a total eclipse of the sun. European expeditions to South Africa and South America have all been necessarily abandoned. Four expeditions from Great Britain (from Aberdeen, Cambridge, Greenwich and London) have had to be given up, though some of the apparatus which was to have been used by the British parties have been sent out to South Africa for the use of parties from the Royal Observatory, Cape of Good Hope, and from the Radcliffe Observatory, Pretoria, the great mirror of which suffers one more long delay in completion and arrival. The only other expeditions likely to observe the eclipse—save local parties of university students and keen amateur astronomers —come from the Commonwealth Solar Observatory at Mount Stromlo, Canberra, Australia, and from the National Geographic Society and the National Bureau of Standards of the United States.

For obvious reasons, it is not possible to give full details of the plans and personnel of the various parties. Both have been subject to change not only since the members of the expeditions from Great Britain were forced to withdraw but also afterwards. Taking the expeditions in the order of their position on the eclipse track we should have started with an account of the programme of the Aberdeen party to Brazil under Prof. J. A. Carroll, the interferometric study of wave-lengths and widths of the lines of the chromospheric and coronal spectra. This has been abandoned and we turn next to the other expedition to Brazil, the American party led by Dr. Irvine C. Gardner, chief of the Optical Instruments Section of the Bureau of Standards. Their eclipse camp will be set up at Patos, on high plateau land 200 miles inland from the Brazilian coast, where totality will last for nearly five minutes. Other members of the party are Dr. E. O. Hulbert of the Naval Research Laboratory, Dr. Paul A. McNally, S. J., director of the Georgetown College Observatory, Dr. C. C. Kiess and Dr. T. R. Gilliland of the Bureau of Standards and Mr. R. H. Stewart of the National Geographic Society.

The programme includes a complete motion picture record in colour of the eclipse, special large photographs of the corona both in black-and-white and in colour, studies of sky brightness, sky radiation, sky spectra and of temperature and density changes in the atmosphere during the eclipse. Other points to be examined are the polarization of the coronal light, the flash and coronal spectra and the varying behaviour of the radio reflecting layers. The spectrographs designed for the eclipse are slitless, using aluminium concave gratings, one of 15,000 lines to the inch made by Prof. R. W. Wood of Johns Hopkins University and one of 30,000 lines to the inch made by Dr. H. G. Gale of the University of Chicago. One instrument will cover the range 3,000–5,500 A. and the other 5,000–10,000 A. The focal lengths are approximately 11 ft. and about 40 inches of spectrum will be secured.

A new feature of the work of this eclipse party lies in the tying together of the different instruments by a combined electric and vacuum control system, which will make the operation of the numerous units almost automatic. The scientific workers free from the task of operating controls during totality will be able to observe the eclipse visually. The method by which a roll of paper punched with the necessary holes and slots is run through a programme clock making electric contacts which open and close shutters, wind films and measure exposures to the fraction of a second has certain obvious advantages. Whether this replacing of the human element by the machine leads to ultimate general success or not under eclipse conditions remains to be proved.

The next party to observe the eclipse will be from the Cape Observatory under Dr. J. Jackson. The party cannot now be joined by an expedition from the Royal Observatory, Greenwich, under the Astronomer Royal. Another attack on the determination of the Einstein coefficient is being made to determine whether the high value found by one or two observers is supported. The party will be at Calvinia, and advantage may be taken of the wonderfully transparent sky there for Dr. Stoy to put through a limited photometric programme with the astrographic telescope before the eclipse. Dr. Allen from Canberra will join the party at Calvinia, working on the photometry of the flash spectrum and of the coronal spectrum. The relation between the polarization and wave-length in the continuous spectrum will be especially studied in order to help to determine the nature of the reflecting particles in the corona. It is unlikely that Dr. Woolley will be able to get away from Government work in Australia, so that the full programme originally planned, which

PRINTED IN GREAT BRITAIN BY FISHER, KNIGHT AND CO., LTD., ST. ALBANS

included an examination of the absolute magnitude of the sun, is unlikely to be completed. Dr. Higgs from Canberra will proceed to Victoria West for radio investigations. Mr. Mackie from New Zealand had planned to accompany the party from Australia to study the photometry of the corona, but it is not certain that he will be able to make the journey.

Prof. H. Dingle's plan to observe the flash spectrum close to the cusp from a station on the edge of the belt of totality has had to be abandoned, and the only other expedition known here is the one from the Radcliffe Observatory, probably at Nelspoort. This was to have been a joint expedition with the Solar Physics Observatory, Cambridge (Prof. F. Stratton and Dr. A. D. Thackeray), and the apparatus used will mainly consist of instruments taken out to previous eclipses. The recent sad death of Mr. E. G. Williams has robbed this party of an experienced eclipse observer and British astronomy of one of its most promising younger workers. Dr. Redman will work with a camera with a moving film, taking intermittent stationary photographs of the flash spectrum through second and third contact. This will provide a valuable duplication in a different form of part of the programme at Calvinia. The Hills 4-prism quartz spectrograph may also be used in an attempt to secure new lines in the extreme ultra-violet in the coronal spectrum.

A very reduced programme is necessarily being attempted by a diminished number of parties from Great Britain, but there is very considerable importance in the researches that are being attempted and it is to be hoped that fine weather conditions will favour all the parties.

OBITUARIES

Sir Denison Ross, C.I.E.

WE regret to record the death of Sir Denison Ross, Orientalist and first director of the School of Oriental Studies in the University of London, which took place in Istanbul on September 20 at the age of sixty-nine.

Edward Denison Ross, son of the Rev. Dr. A. J. Ross, was born in Stepney, London, on June 6, 1871, and was educated at Marlborough and at University College, London. Afterwards he studied Oriental languages in Paris and at Strassburg. He then travelled in the East in company with the late F. H. Skrine, visiting remote countries in central Asia, of which he had already made the acquaintance in literature, when in collaboration with Ney Elias he had translated the "Tariki-i-Rashid: a History of the Moghuls of Central Asia" by Mirza Haider Dughlat, a relative and contemporary of the Emperor Baber, the founder of the Moghul Empire in India. The events and observations of Ross's travels were recorded in "The Heart of Asia", written in collaboration with his fellow-traveller.

During 1896–1901, Ross occupied the chair of Persian art in University College, London. In the latter year he went East to become principal of the Madrasah, the well-known institution for the education of Moslems in Calcutta. To this appointment was added in 1906 that of curator of the records of the Government of India and assistant secretary of the Department of Education. In 1912 his services were recognized by the award of the C.I.E. Two years later he returned home and was appointed an assistant in the Department of Prints and Drawings of the British Museum and keeper of the Aurel Stein Collection of Antiquities and Prints there. In the two years during which he held this appointment he began the arrangement of the vast and invaluable collection of examples of Buddhist art which had been brought to the Museum from Central Asia by Sir Aurel Stein, with whom his friendship was one of long standing.

When in 1917 the School of Oriental Studies was opened in the University of London on lines recommended by a committee over which the first Lord Cromer had presided, it was almost inevitable that Ross should become the first director. His personality, his social gifts, and his enthusiasm for linguistic studies, no less than his successful achievement in Calcutta, where he had not only established the study of the Tibetan language but had also brought together a vast and unrivalled collection of Arabic and Persian manuscripts, singled him out as the man most suitable for an appointment imposing upon the holder the task of building up an institution, of which the significance as an imperial asset, outside its academic ambit, was not immediately apparent to more than a relatively restricted circle.

The choice of Denison Ross as director of the School was fully justified. Within a few years it had gained recognition as a great imperial institution. Thanks to a large teaching staff of widely ranging qualifications its instruction in the languages and cultures both of the East and of Africa not only fulfilled the primary academic function of a university institution, but also served the invaluable purpose of contributing to the administration of the Empire by equipping both officers and missionaries for the more efficient performance of the duties they had undertaken, or were about to undertake, among backward and other peoples of the British dependencies. Concurrently with his directorship, Ross held the appointment of professor of Persian in the University of London. He retired from both offices in 1937 and was made emeritus professor in 1938.

That so great a breadth of outlook in the work of the School of Oriental Studies was in fact attained

in the early years of its existence was largely due to Ross's influence and inspiration. Not only had he an extraordinary enthusiasm for the study of languages, but he was also capable of inspiring a like interest in others. He himself spoke a number of European as well as Oriental languages; and it is a mark of his versatility that concurrently with his tenure of the chair of Persian he was also honorary lecturer in Portuguese at King's College, London. Nor was his interest that of the philologist only. His travels in Russia, Asia Minor, Central Asia, China and Persia had made his acquaintance with their tongues both intimate and colloquial. As was shown by much of his written work—he was an indefatigable and voluminous writer on an almost unlimited range of topics—a language was for him not so much an end of study in itself as an instrument for understanding the culture, the art, the institutions and the history of a people. This came out clearly in such of his written work as his study of the life and times of Omar Khayyám, or his introduction to Beckford's "Vathek", but can be most readily appreciated from his introduction to the catalogue of the exhibition of Persian art held at the Royal Academy in London, and in his contributions to the "Cambridge History of India". Apart from his studies and translations of works on Arabic, Persian and Indian history, literature, and art, one of his more noteworthy publications was a polyglot list of birds in Turki, Chinese, and Manchu.

Ross was a fellow of University College, London, and of the University of Calcutta. He was the recipient of academic honours from numerous universities, was knighted in 1918, and was awarded the Gold Medal of the Royal Asiatic Society in 1935. Early in the present year he was invited to become the head of the British Information Bureau at Istanbul, a position for which, as results showed, his personal gifts made him peculiarly well fitted in the present crisis in world affairs.

Dr. J. Burtt-Davy

JOSEPH BURTT-DAVY, who died on August 20, was born on March 7, 1870, at Findern, Derby. He was educated privately. During 1891–92 he worked as an assistant in the Director's Office at Kew. On leaving Kew he went to California, where he worked as a research student and held various botanical posts in the University, finishing there in 1902 as instructor in botany. It was there that he also met his wife. Afterwards he served as assistant curator in the United States Department of Agriculture, Washington, D.C. During his stay in America he published several short papers on the vegetation of California, the vegetation and crops of the Colorado delta, and he contributed the accounts of the glumaceous families of Monocotyledons for Jepson's "Flora of Western Middle California".

In 1903, Burtt-Davy was appointed agrostologist and botanist in the Department of Agriculture at Pretoria, a post he held until 1913. During that time he made large collections of Transvaal plants which formed the basis for the fine national herbarium now housed at the Union Buildings, Pretoria. On leaving the Government service he started farming on his own account at Vereeniging in the Transvaal. He made this a success and retired soon after the War of 1914–18 in order to commence work on his "Flora of the Transvaal and Swaziland", settling at Kew for some years for this purpose. This entailed an immense amount of work, in which he was helped by various members of the Kew staff, whilst at times he employed two private assistants.

After publishing the first two parts of his Transvaal Flora, and preparing most of Part 3, however, Burtt-Davy gave up the work to take up the post of lecturer in tropical forest botany at the Imperial Forestry Institute, Oxford. There he helped to train many young forestry officers for departments overseas, who in return made herbarium collections for the forestry herbarium at Oxford. In this way Burtt-Davy brought together a most valuable herbarium of ligneous plants, which it will be necessary to consult for any floristic works that may happen to be written in the future.

Besides his floristic work, Burtt-Davy wrote many papers on various branches of botany. His largest and most important economic work was his book entitled "Maize, its History, Cultivation, Handling and Uses". He was particularly interested in ecology and wrote on the "Climate and Life Zones of the Transvaal", and on the "Suffrutescent Habit as an Adaptation to Environment". Burtt-Davy will be greatly missed by his many friends in forestry and botanical circles, and particularly at the annual meetings of the British Association, which he attended regularly. J. HUTCHINSON.

Miss E. L. Turner

MISS EMMA LOUISA TURNER, who died in Cambridge on August 13, was born in 1867. She was the pioneer of women bird photographers and was awarded the Gold Medal of the Royal Photographic Society. She was one of the first ten women fellows of the Linnean Society, and one of the first honorary lady members of the British Ornithologists' Union. She was also a president of the Norfolk and Norwich Naturalists' Society, vice-president of the Royal Society for the Protection of Birds and an honorary member of the Federation of University Women.

Though her early life was spent in Kent, Miss Turner will always be identified with Norfolk for her ornithological work there, both on the broads where, living in a houseboat at Hickling, she made an intensive study of marsh birds, and on Scolt Head where she spent much time alone as a voluntary watcher and made valuable records of bird migration.

Miss Turner had a gift for expression both in the spoken and written word and her lectures and books equally reflected her keen sense of humour. She was a valued supporter of the Cambridge Bird Club and her friendly readiness to assist with advice and encouragement gained for her the real affection of the undergraduates and the many friends with whom her bird work brought her in contact. P. B-S.

NEWS AND VIEWS

Unity and Resolution

THESE were the keynotes of the address broadcast by the King on September 23. The nation is now united as never before, united in both work and suffering: "we are a nation on guard and in the line. Each task, each bit of duty done, however simple and domestic it may be, is part of our war work." The British peoples entered the War a little more than a year ago, with the knowledge that they were opposing a formidable foe, but confident in the justice of their cause. Since then, "Great nations have fallen. The battle, which was at that time so far away that we could only just hear its distant rumblings, is now at our very doors. The armies of invasion are massed across the Channel, only twenty miles from our shores. The air fleets of the enemy launch their attacks, day and night, against our cities. We stand in the front line, to champion those liberties and traditions that are our heritage."

In the great struggle now going on, we are supported by the efforts of the numerous contingents of our Allies, by the good will of all who love freedom, which, as in the United States, has shown itself in many ways, and particularly by the British Commonwealth of Nations itself, from every part of which men and material are flowing in, eager to share in the sacrifices needed for victory. "As in London, so throughout Great Britain, buildings rich in beauty and historic interest may be wantonly attacked, humbler houses, no less dear and familiar, may be destroyed. But 'there'll always be an England' to stand before the world as the symbol and citadel of freedom. . . . We live in grim times, and it may be that the future will be grimmer yet. Winter lies before us, cold and dark. But let us be of good cheer. After winter comes spring, and after our present trials will assuredly come victory and a release from these evil things."

The George Cross and Medal

IN the course of his broadcast address, the King announced the institution of two new honours, the George Cross and the George Medal, to reward the performance of deeds of valour by civilians, men and women, in all walks of life. Although it is intended that awards shall be made for gallantry arising out of enemy action, it will also be given for other brave deeds. The George Cross will rank with and immediately after the Victoria Cross, and will take the place of the medal of the Order of the British Empire for Gallantry; a small military Division will permit of its award to members of the Fighting Services who have performed acts coming within the terms of the warrant. The George Medal will be given more freely, but the standard will be high.

The Future of Polish Science

SINCE the restoration of Poland after the War of 1914–18 concentrated efforts have been made to develop and co-ordinate the scientific work of the country. During a difficult period of reconstruction, great progress was achieved and, in addition to the six universities, a number of other centres were available for learning and research. Before the outbreak of the present War, there were approximately 850 professors, 520 assistant professors and 1,600 research assistants and readers; the number of students being about 48,000. With the overrunning of Poland by Germany and the U.S.S.R., systematic and thorough methods have been employed to destroy its scientific life. This is being achieved in German-occupied Poland by the imprisonment of university staffs and scholars, the commandeering of specimens and equipment for use in the German Reich, the destruction of publications and libraries, and the closing of all centres of learning and higher education. Similar conditions exist in Soviet occupied territory. Professors and research students have no means of continuing their work and the future of Polish science has been further jeopardized by the closing of secondary schools, thus destroying the source of future students. Fortunately, however, some forty-six Polish scientific workers have been able to reach England. They comprise among their subjects, anatomy, zoology, bacteriology, chemistry, physics and branches of engineering and mechanics; the majority can speak at least three languages. It is the Polish Government's earnest endeavour to conserve, through these men, the future of science in Poland. A few will be able to obtain British Council scholarships and will be placed by the Council in British research institutions. The remainder will be given partial assistance from the very modest funds possessed for this purpose by the Polish Government.

The difficulties confronting the research workers who have no personal contacts in Great Britain are very great, not least among them the understandable antipathy and mistrust of foreigners which now exists in the country. The importance of securing the future of science and learning in Poland, however, will be fully realized, and by assisting to bring about the admission of Polish workers to research institutions in the British Commonwealth of Nations, British men of science can thus help to ensure a nucleus of Polish intellectuals. Also it must not be forgotten that Poland is an ally of Great Britain, who has at no time and in no way failed her, and that a common bond of hardship has drawn the two countries together in friendship.

Sir Frank Stockdale, K.C.M.G., C.B.E.

THE appointment is announced of Sir Frank Stockdale, who has been agricultural adviser to the Colonial Secretary since 1930, to be Comptroller for Development and Welfare in the West Indies. Sir Frank's departure from the Colonial Office will be felt by the many officers in the agricultural services of the Empire with whom he was on terms of personal intimacy and by all who had learnt to value his wide knowledge of the science and practice of tropical

agriculture. He is returning to the scene of his early labours, for in 1905 he was mycologist to the West Indian Department of Agriculture. Afterwards he served as assistant director of science and agriculture in British Guiana, and as director of agriculture in Mauritius and in Ceylon. He held the latter post until 1929, when the then Colonial Secretary, Mr. Ormsby Gore, selected him as agricultural adviser to strengthen the liaison between the rapidly developing scientific branches of colonial agriculture and the administration in Whitehall. He fulfilled this function brilliantly, and the very active interest now shown by the Colonial Office in promoting scientific agriculture in the territories under its jurisdiction is largely a consequence of his work. He was knighted in 1937.

Much of Sir Frank's time was spent in studying agriculture in the Colonies themselves, very few of which he has not visited. His reports on these visits are admirable, if summary, examples of the conditions and problems confronting colonial agriculturists. Of recent years his special interests have been agricultural co-operation and soil conservation—two matters which happen to be of vital importance to the restoration of prosperity in the West Indies. The post of Comptroller for Development and Welfare has been instituted on the recommendation of the West India Royal Commission 1938–39, which recommended the establishment of a West Indian Welfare Fund financed by an annual grant of £1,000,000 to be administered by a comptroller with wide powers of discretion. The post is the keystone of the programme of social reform and rehabilitation recommended by the Commission. Sir Frank Stockdale is succeeded at the Colonial Office by Dr. H. A. Tempany, who has had long experience of colonial agriculture in the West Indies, Mauritius and Malaya. He has held the post of assistant agricultural adviser to the Colonial Secretary since 1936.

Supplies of Vitamin C

STATEMENTS have recently appeared in the German scientific press to the effect that German men of science have discovered that the hips of the wild rose are a rich source of the antiscorbutic vitamin C, and that the German State railways have arranged to grow wild roses along the tracks. It is said that half a million plants are to be acquired for this purpose alone, and that other waste lands are to be used in the same way. Actually the discovery that hips are so active is not a new one. It was one of the various materials found to be unexpectedly potent as the result of the introduction of a chemical method of testing for vitamin C. This method was worked out largely in Great Britain. Another fruit found to be unexpectedly active was the blackcurrant. The latter is at least eight times as potent as orange juice or lemon juice, and dried hips about thirty times.

For some years past, hips have been used as a raw material for vitamin C, not only in Germany, but also in parts of Scandinavia and in the U.S.S.R. In the latter country pine needles have likewise been worked up on an enormous scale to provide vitamin C in the northern regions where scurvy has been rife in the winter months. A dried preparation of rose hips has been available commercially for some time in Great Britain. It has the disadvantage of a somewhat fibrous consistency; and while synthetic vitamin C is so cheap, it seems doubtful if the labour of collecting and extracting the vitamin from wild hips would be worth while here in England. With our plentiful supplies of potatoes, we need fear no shortage of vitamin C, even in a long war.

Archæology During and After the War

MR. A. W. CLAPHAM in his presidential address to the Society of Antiquaries of London, of which the text is now available in full (*Antiq. J.*, **20**, 3, July 1940), raised two points of current interest. He deplored that several archæological excavations had suffered untimely interruption on the cessation of field work on the outbreak of war, and also expressed the alarm which he felt in common with all interested in archæological studies at the way in which military exigencies are endangering or causing the disappearance of earthworks, barrows and other monuments of antiquity. While the Society is exercising such vigilance as is possible in the circumstances, Mr. Clapham feared that little could be done except complete a record, before the threatened relics vanished for ever. The action of the Society in urging upon the Colonial Office that steps be taken for the protection of the antiquities of the Hadramaut, of which Miss G. Caton-Thompson had given an account, has as yet produced no result. Dr. R. E. Mortimer Wheeler, however, has been fortunate enough to be able to complete the work in Brittany begun in 1938, although further investigations had to be abandoned when work ceased abruptly in August 1939.

Turning to the question of archæological investigations in a post-War future, Mr. Clapham, however regretfully it is admitted, was fully justified in predicting a much restricted activity in which the large-scale excavations of past years will not be possible. The heavy expenditure involved will place such undertakings beyond the bounds of possibility. He was the less inclined to deplore this outcome of the War on the ground that in the field of British archæology the major problems of the prehistoric periods had been resolved and future work might well be confined to filling in details and closing gaps in archæological knowledge. Of one period, however, he made an exception and pointed to the Dark Ages as a field still almost wholly unexplored. In the work of conservation, also, which he regarded as an important sphere of activity for the post-War archæologist, he stressed the importance of the much-neglected study of carved stones and architectural features and their care as well as their display. In going on to discuss the possibility of the formation of a national museum of British sculpture he raised, as he showed himself to be aware, a question which is as difficult as it is urgent.

A.R.P. Wardens' Warning System

THE life of an A.R.P. warden is in general a strenuous one. Night after night he may be called from his bed for alarms real and false. Many nights also are spent at a post on stand-by duty, which, but for the present call-up system, could have been passed in the comfort of his home. In the *Electrician* of September 6, it is recalled that some years before the War many local authorities installed special control systems for street lighting which at the time, it was anticipated, would be permitted to be used in the event of the outbreak of hostilities. These systems were described in the *Electrician* and each one incorporated a signalling arrangement for calling fire and ambulance services, police, wardens and other A.R.P. workers. Unfortunately, the complete black-out of our streets ordered last September rendered the control system of little immediate use, though we learn that the wardens' call unit which forms a component of the system is being used in at least one provincial town. This unit consists of a plug-in device for insertion in a lamp-holder and is carried by the warden as part of his equipment. Whether he is at home, or at the house of a friend, plugging the unit in the supply network puts him within calling range of the A.R.P. authorities, whenever wanted, by its response to a D.C. impulse transmitted over the mains from the local control point.

Any device which will permit A.R.P. workers to spend more time at home will tend to improve the efficiency of the civil defence service as a whole, for with proper rest and normal social intercourse, those who man the service will be better able to meet the demands upon their time and energies. There must be many local authorities with similar systems installed but not yet in use, and it is suggested that regional commissioners sanction their employment at once. Those authorities who are as yet without such call-up systems should in their turn be prevailed upon to bring their local defence arrangements in line. For their information it may be mentioned that the systems cost relatively little to instal, and the call-up units less. The increase in efficiency of the A.R.P. service turn-out in the case of a preliminary or general alarm is out of all proportion to the expenditure involved.

Physical Society Colour Group

AT a meeting held on May 16, under the authority of the Council of the Physical Society and attended by a number of those interested in colour problems, it was unanimously agreed to form a Group with the title of "The Physical Society Colour Group". The objects of this Group will be to provide an opportunity for the various groups of people concerned with colour—physicists, chemists, industrialists, etc.—to meet and become familiar with each other's problems, to enable a representative opinion to be formed on various questions of standardization, specification, nomenclature, etc., and generally to encourage colorimetric investigations and to ensure that this country shall keep abreast of developments abroad. At the above meeting the following officers of the Group were elected: *Chairman*, Dr. W. D. Wright; *Hon. Secretary*, Mr. H. D. Murray; *Committee*, Mr. H. W. Ellis, Mr. J. Guild, Mr. J. G. Holmes.

It will be appreciated that the objects envisaged in the formation of this Colour Group can best be achieved by co-operation of all those interested in colour problems, in whatever field these problems may arise. For this reason, it is felt by those responsible for the formation of the Group that it should be regarded as a meeting ground for all in science and industry who have a common interest in colour, rather than as a self-contained and independent society. Accordingly, a number of societies have been invited to become founder societies of the Group and to co-operate in its activities. It is hoped to hold the first general meeting of the Group, to be followed by the first scientific meeting, in the middle of October. The general subject for discussion will be "Colour Tolerance". Further information can be obtained from Mr. H. D. Murray, Physical Society, 1 Lowther Gardens, Exhibition Road, London, S.W.7.

Highway from Alaska to the Argentine

A WIDE high-speed double-track road from Alaska to the Argentine is proposed by the American Automobile Association as an important factor in plans for the defence of the Americas. In a letter to Senator Morris Sheppard, chairman of the Senate Military Affairs Committee, and Mr. Andrew J. May, chairman of the House Military Affairs Committee, Mr. Thomas P. Henry, president of the Association, stated that along many stretches of the proposed route, the road is already built. He urged that the linking up of these separate sections should be undertaken with the least possible delay.

"For many years," he wrote, "American motorists have been looking forward to the eventual completion of an All-America Highway from Alaska to the Argentine, connecting the lands of the Western Hemisphere. Hitherto it has been regarded mainly as a tourist asset, a means of opening up new travel objectives and as a promoter of friendship between the various peoples. But the present world crisis puts an entirely new light on the project. The United States, embarked already on a programme of building up its national defences, and pledged to protect the entire hemisphere against aggression, has a greater need of the highway than ever before".

Depopulation in France

IN a recent thesis (*Thèse de Paris* 1940, No. 311) Dr. H. Birnbaum remarks that for more than a century the population of France has shown only a very slight increase; from 34 millions in 1840 it has risen to only 42 millions in 1940. At the same time there has been a very pronounced fall in the annual number of births, namely, from about a million in 1840 to a little more than half that number in 1939. During the same period owing to the progress of medicine and hygiene as well as of certain technical acquisitions the average duration of human life has increased by about twenty years, so that the average span of life in 1940 is about 60 years as compared

with 40 in 1840. According to Dr. Birnbaum, depopulation in France is due to individual and voluntary limitation of births, whether this limitation is due to anticonceptional measures or to criminal abortions, of which latter more than 300,000 are carried out on married women in France every year.

Retail-Store Training

A BULLETIN by K. B. Haas (Vocational Division Bulletin No. 205, Business Education Series No. 12) which has been issued by the Office of Education, United States Department of the Interior, under the title "Co-operative Part-Time Retail Training Programmes", reviews the history and progress of retail-store training programmes. It discusses the need for training programmes in secondary schools and extension classes and describes the kinds of training programmes which have prospects of success. Proved methods for promoting, initiating, co-ordinating, supervising and teaching the various types of retail-training courses in different communities are indicated as well as both the factors contributing to the success of such programmes and mistakes which have been made. The qualifications necessary for teachers of such subjects are discussed, and emphasis is placed on the co-operative part-time type of instruction on the secondary level.

The Colonial Service: Recent Appointments

THE following appointments and promotions in the Colonial Service have recently been made: P. G. Coleman, agricultural officer, Malaya; M. D. ffrench-Mullen, agricultural officer, Fiji; F. B. Leech, veterinary officer, Nyasaland; G. C. L. Bertram, chief fisheries officer, Palestine; C. L. Gulliver, meteorological assistant, Nigeria; A. S. Richardson (deputy director of Agriculture, Uganda), director of agriculture, Nyasaland; D. H. Hodgson (conservator of forests), deputy director of forests and deputy adviser on forestry, Malaya; H. E. C. Lushington (assistant conservator of forests), senior assistant conservator of forests, Ceylon; J. G. Watson (deputy director of forests and deputy advisor on forestry), director of forests and adviser on forestry, Malaya.

The Night Sky in October

THE moon is new on October 1 and 30 and full on October 16. Jupiter and Saturn are in conjunction with the moon on October 18d. 0h. and Venus on 28d. 4h. U.T. The 4th magnitude star, α Cancri, is occulted on October 25, the disappearance occurring at 1h. 48·3m. (at position angle 116° from the north point) and the reappearance at 2h. 49·8m. at position angle 267°. Jupiter and Saturn, still close together, rise before 18h. in mid-October. These two planets are in conjunction with one another on October 11 at 23h., but their closest approach (1·2°) occurs on October 19. Close groupings of Jupiter's four inner satellites can be seen at 0h. 15m. on October 3, 4, 11, 12 and 19 (all to the eastward side), 21, 28 and 29. Examples of wide separation occur on October 6, 8, 15 and 31. Venus, the brilliant planet rising about four hours before the sun, is close to Regulus on October 6 and near β Virginis on October 29. Conjunction with Neptune is on October 29 at 21h. The Orionid meteors reach their maximum frequency about October 19, the radiant point being north, following α Orionis (Betelgeuse).

The new moon on October 1 is associated with a total eclipse of the sun, the path of totality, some 120 miles wide, crossing Brazil, the South Atlantic to South Africa. The duration on the Brazilian coast will be 5 minutes; north-east of East London, South Africa, the duration is 3 min. 24 sec. A general article referring to arrangements for observing the eclipse appears on p. 422 of this issue.

Announcements

AMONG the changes in the Schedule of Reserved Occupations recently announced is the statement that scientific and research workers may now volunteer for general service in the armed forces irrespective of age, provided that consent is obtained from the Committee for Scientific Research of the Central Register Advisory Council.

DURING the continuance of the present disturbed conditions, the library of the Chemical Society at Burlington House, London, will be closed on Saturdays. So far as circumstances permit, it will be open on other weekdays from 10 a.m. until 5 p.m.

THE Rockefeller Foundation has given £1,000 to the Royal Society of Medicine for the preservation of its library. It is proposed to evacuate to a suitable house a number of the older and irreplaceable periodicals. A member of the library staff will accompany them and will be in telephonic communication with the library in London.

THE fourth Pan-American Congress of the Red Cross will be held at Santiago, Chile, during December 5–14 under the direction of General L. Brieba, president of the Central Committee of the Red Cross in Chile.

MANY valuable zoological collections recently gathered in Central America for the British Museum are being housed in the Field Museum of Natural History, Chicago. After an expedition headed by Ivan T. Sanderson, of Belize, British Honduras, had completed its work of collecting mammals, reptiles and various invertebrate animals in Central America, the War made it unsafe to ship them to England. The Field Museum, therefore, offered its hospitality, and the first large instalment of Mr. Sanderson's material has recently arrived there. Some of it is to be classified there, at his request, and ultimately some division of the collections will be made between the Field Museum and the British Museum.

THE International Commission on Zoological Nomenclature has commenced the publication of the Opinions rendered by the Commission, vol. 2, Opinions 134–136. Copies may be obtained from the Commission, c/o Royal Entomological Society of London, 41 Queen's Gate, South Kensington, London, S.W.7.

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.

Camouflage in Modern Warfare

RECENT articles and correspondence in NATURE[1] have painted a gloomy and even alarming picture of the inefficiency of the departments in Great Britain responsible for camouflage. We are led to suppose that the work is mainly entrusted to artists who cannot be expected to understand what they are doing, instead of being under the control of properly qualified scientific men who are familiar with the "fundamental biological principles" involved. We are left with the impression that the work is being carried out with a degree of incompetence which can only lead to disaster, and although it is not specifically stated, there is a strong suggestion that since modern camouflage was brought into being a quarter of a century ago by an eminent zoologist, and since biologists have made an intensive study of the methods by which animals conceal themselves, it follows that camouflage is a special province of the biologist to whom alone the ultimate control can safely be entrusted.

Whilst I am sure that the authorities are fully aware of the debt that they owe to biologists in the past and would welcome their further help and co-operation, I do not believe that the most urgent problems which are still awaiting solution are of a biological character at all, but are rather questions for the engineer, the chemist and the physicist. The "fundamental biological principles" seem to me to be neither profound nor difficult to understand; in fact they are so fundamental that the average artist or physicist can grasp them without any great intellectual effort. It remains to discover how to apply these "principles" to the practical problems of camouflage and to put accumulated experience to the best possible use—and this is where the artist comes in. Whether he stands back from his easel to view his work or whether he goes up in his aeroplane, the successful application of the "fundamental principles" is ultimately a matter of experience and of trial and error, for the simple reason that one objective is as different from the last as one man's face is different from another's.

I am in close contact with the work of the Civil Defence Camouflage Establishment and it may perhaps be a surprise to readers of the articles in NATURE to learn that this Establishment is under the control of a distinguished physicist and that biology, engineering, physics, and chemistry are all represented on the Camouflage Committee; it is my own belief that progress can only be made by the co-operation of workers in every field and that it would be absurd to stake a claim for the paramount importance of any particular branch of science. Camouflage to-day is practised by all and sundry, and it is not surprising that we find many examples which look absurd; and often are absurd. It does not seem to matter much what the omnibus companies do to the tops of their buses; it gives us something to laugh at or to grumble about. Of course, what really matters is what important camouflaged objectives look like *from the air*; and this is quite a different story.

There has been no civil aviation in Great Britain since the outbreak of War and members of the Fighting Services and Civil Servants are precluded from any public expression of opinion. If I were an expert in these matters (and I make no such claim) I would not venture to praise or to censure the work of the camouflage departments for one simple reason—that as I have not seen it from the air my opinion would be of little value.

T. R. MERTON.

Winforton House,
Hereford.
August 17.

[1] NATURE, **145**, 949 (1940); **146**, 112 (1940); **146**, 168 (1940).

SINCE the appearance on June 22 of a leading article entitled "Camouflage in Modern Warfare" in NATURE, the War has entered upon a new phase, in which the enemy has repeatedly sent large formations of bombers in search of targets over Great Britain. Now more than ever before in our history has camouflage become a matter of national importance. Prof. Merton complains that the above article presented "a gloomy and even alarming picture of the inefficiency of the departments in Great Britain responsible for camouflage". Complacency and mutual congratulation will not help to remedy matters in these stirring times.

Biologists do not claim that camouflage is their exclusive province, and they are well aware that a satisfactory solution to problems of visual concealment and deception on a gigantic scale can only be achieved by their co-operation with experts in other fields—architects, structural engineers, chemists, physicists, psychologists. But the fact remains that the most effective camouflage yet devised is that displayed in the coloration of various wild animals; that in this field man has lagged far behind the inventiveness of Nature; and that while the biologist knows how these results have been achieved in Nature and how they could be applied to war purposes, the non-scientific camoufleur frequently does not and to that extent he is groping in the dark.

Prof. Merton remarks that the "fundamental biological principles" upon which visual concealment depends seem to him not difficult to understand. Nor are they: and no doubt there are authorities at the War Office who could understand them. Yet there is little indication at present that those responsible for the camouflage of heavy-calibre guns, and of tanks, transports, and other army vehicles are even making an attempt to do so. Moreover, it appears that they refrain from accepting advice on these matters.

For example, the principle of countershading is applicable to solid structures of all kinds; and indeed all camouflage by paint should be worked out on this basis. Countershading is particularly appropriate to cylindrical bodies such as guns, just as it is in Nature to the bodies of snakes and caterpillars. So recently as August 29, 1940, a well-known daily paper published a photograph of two 12-in. coastal defence guns, each bearing the conventional camouflage pattern which is a peculiarly senseless and ineffective thing, and which entirely fails either to break up surface continuity, to obliterate outline, or to nullify the appearance of solidity due to light and shade. In other words, the official scheme ignores or defies three of the fundamental optical principles which according to Prof. Merton are so fundamental that any artist can grasp them without any great intellectual effort.

Week by week since the outbreak of war we have seen in the Press similar illustrations of incompetence and ignorance. Again, in the painting of Army and R.A.F. transports, we look in vain for any evidence that these principles of countershading and of disruptive and coincident coloration have really been grasped, or for any signs of radical improvement in the systems of patterning adopted.

The futility of attempting to camouflage an object by daubing its surface with patches of grey, brown or green paint of nearly equal brightness has been repeatedly stressed in these pages and elsewhere. Yet so consistently has this method been adopted by the authorities that for many people the term 'camouflage' has come to mean parti-colouring with drab colours. The danger of this misconception of camouflage lies in the belief that any object so coloured will be camouflaged!

The importance of knowing what camouflaged objectives look like from the air is rightly stressed by Prof. Merton. So long as camouflage is directed against aerial reconnaissance and aerial bombardment, the view from above is the significant view. Prof. Merton states that he has not seen the work of the camouflage departments from the air. On the other hand, it is in the light of flying experience and as a result of observation both from the air and from the ground that these criticisms are made by

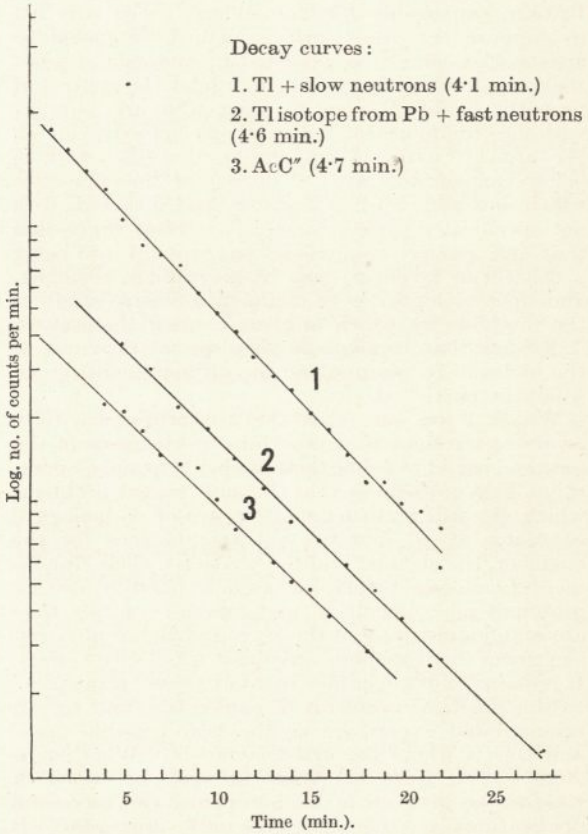
THE WRITER OF THE ARTICLE.

Production of Actinium C″ from Lead

THE production of members of the natural radioactive series from stable nuclei is a result of considerable interest. Hitherto, radium E and polonium[1] have been obtained by bombarding bismuth with deuterons, and uranium Y has been reported[2] as arising from the interaction of fast neutrons with thorium. We have been able to obtain actinium C″ from lead by bombardment with neutrons. From the accompanying table of isotopes, it will be seen that the reaction Pb^{207} $(n,H)Tl^{207}$ would lead to this result, whilst similar processes with Pb^{208} and Pb^{206} would give rise to ThC″ and Tl^{206} respectively.

	Z \ M	203	204	205	206	207	208	209
Tl	81	30 p.c.	4·1 min.	70 p.c.	—	4·7 min. AcC″	3·2 min. ThC″	—
Pb	82	—	1·5 p.c.	—	28·3 p.c.	20·1 p.c.	50·1 p.c.	—
Bi	83	—	—	—	—	—	—	100

On the other hand, the large nuclear charge of lead makes the reaction rather improbable, as the high potential barrier will tend to prevent the escape of the proton. In order to increase the sensitivity of the method, we therefore irradiated 500 gm. samples of lead nitrate for periods of 10 minutes and then separated chemically a few milligrams of thallium added as carrier for the actinium C″. It is of course desirable to use large amounts of lead only if the thallium formed is separated sufficiently rapidly, before the short-lived actinium C″ has time to decay. When lead nitrate was employed, the necessary operations consisted in dissolving the nitrate in hot water, removing the lead as sulphate, isolating the thallium as the sulphide Tl_2S from the filtrate, drying the precipitate, and mounting it on our standard holders for counting. After some practice we succeeded in carrying through all these operations regularly in about 5 minutes, which meant a loss of little more than half the actinium C″ actually formed during bombardment. The decay of the active body isolated in this way was followed over six half-lives, and a final value of 4·6 min. was obtained for the half-value period.



Numerous decay curves were then taken with actinium C″ obtained by recoil from the active deposit, and also of the 4-min. activity which is obtained when thallium is exposed to slow neutron bombardment. The mean value for the period of the recoil preparations was 4·7 min. and that of the thallium isotope obtained by slow neutron irradiation was 4·1 min.

Taking these results together, it may be concluded with considerable assurance that the product of fast neutron bombardment of lead is in fact actinium C″, and that very probably neither in this bombardment nor in the slow neutron bombardment of thallium is any evidence for the production of Tl^{206} forthcoming. This last conclusion is in agreement with the previous assignment[3] of the 4·1 min. activity to Tl^{204}. If the difference between the half-life of actinium C″ (4·7 min.) and that of thallium (4·6 min.) is real, it is consistent with the simultaneous formation of thorium C″ and actinium C″.

The neutrons used for preliminary irradiation were obtained from lithium bombarded with 100 μ amp. of 0·9 Mv. deuterons in the Cavendish High Voltage Laboratory, with the exception that for the final bombardment of the large quantities of lead nitrate, the cyclotron supplied the neutrons ($Li + H^2$ of 9 Mv., 5–10 μ amp., 10 min. exposure).

It was originally planned to supplement the experiments described above with absorption measurements, but the present emergency prevented us from doing so.

We are much obliged to Mr. D. C. Hurst and Mr. R. Latham for operating the cyclotron for us.

E. BRETSCHER.
L. G. COOK.

Cavendish High Tension Laboratory,
Cambridge.
August 28.

[1] Livinggood, *Phys. Rev.*, **50**, 425 (1936); Hurst, D. G., Latham, R., and Lewis, W. B., *Proc. Roy. Soc.*, A, **174**, 126 (1940).
[2] Nishina, Y., Yasaki, T., Kimura, K., and Ikawa, M., NATURE, **142**, 874 (1938).
[3] Heyn, F. A., NATURE, **139**, 842 (1937); Fajans, K., and Voigt, A. F., *Phys. Rev.*, **58**, 177 (1940).

Dependence of Thermal Diffusion on the Concentration Ratio

IN the design of experiments to separate isotopes by means of thermal diffusion, as for example by the highly successful continuously convective method devised by Clusius and Dickel[1], much depends on the value of α, defined by $\alpha = k_T/c_1c_2$, where c_1 and c_2 are the volume-fractions of the constituents 1 and 2 (so that $c_1 + c_2 = 1$), and k_T is the thermal diffusion ratio; α, which may be called the thermal diffusion *factor*, determines the magnitude, and its sign determines the direction, of the thermal diffusion.

Though the main features of the dependence of α on the molecular mass-ratio and (where the masses are equal) the diameter ratio have long been known, no systematic examination of the characteristics of α has hitherto been made. I have recently made such an examination of $[\alpha]_1$, the first approximation to α according to the Chapman-Enskog theory; this first approximation is correct within a few per cent, so that the results of the examination (which will shortly be published) are likely to be valid, to a high degree of approximation, for α itself. Some unexpected possibilities have thus been discovered.

One factor in α depends solely on the law of interaction between the unlike molecules. This factor, and therefore α itself, vanishes when the interaction is according to the inverse fifth-power law; for inverse-power laws of index higher than 5 (including rigid elastic spheres) the factor is positive, and for a lower index it is negative. The sign of the remaining factor in α has hitherto been tacitly supposed independent of the concentration-ratio c_1/c_2, and all the experiments so far made on thermal diffusion have supported this view. It now appears, however, that this is not necessarily true, and that α may change sign (once) as the proportion of either constituent increases from 0 to 1.

Moreover, it appears that in certain cases $[\alpha]_1$ may vanish for all concentration-ratios, although the mutual interaction is not according to the fifth power law, and the molecular masses and diameters are not equal.

If the method of Clusius and Dickel were applied to mixtures of gases for which α changes in sign as the concentration-ratio varies, the concentration-ratio c_1/c_2 would not tend to 0 at one end of the tube and ∞ at the other (corresponding to the pure gases), but at one end of the tube the ratio would tend to the value for which α changes sign. Though this will not occur for isotopic gas-mixtures, the phenomenon is of much theoretical interest, and worthy of experimental investigation.

S. CHAPMAN.

Imperial College of Science and Technology,
London, S.W.7.
September 6.

[1] Clusius, K., and Dickel, G., *Z. phys. Chem.*, **44**, 397 (1939).

Submarine Geology and Geophysics

THE brief article by Dr. Bullard entitled "Geophysical Study of Submarine Geology" which appeared in NATURE of May 18, p. 764, was gratifying in that it directed attention to some of the developments in the newest field of geological research. On the other hand, this article showed a pardonable lack of familiarity with many developments, particularly with work along the California coast carried on with the facilities of the Scripps Institution. Since the tentative conclusions suggested by Dr. Bullard are in no way confirmed by these investigations, a brief summary of the work and its implications might prove of interest to the readers of NATURE. To date only brief summaries of this work have been published, but forthcoming publications by the Geological Society of America can be consulted for amplification.

Dr. Bullard referred to the excellent charts which have been prepared by the U.S. Coast and Geodetic Survey showing the submarine canyons which cut the submarine slopes off the American coasts. These charts have been used as a basis for oceanographic investigation of the submarine canyons on the auxiliary ketch *Atlantis* off the east coast and on the auxiliary schooner *E. W. Scripps* off the California coast. Since 1933, I have devoted a large amount of time to making minutely accurate charts of the canyon heads off California and in collecting samples of sediment and rock from the canyons and vicinity. Also accurate range lines have been established and checked many times to look for changing depths within the canyons. During 1938 approximately six months of cruises on the *E. W. Scripps* were devoted to this work.

The *E. W. Scripps* is equipped with a gravity coring device designed by K. O. Emery and R. S. Dietz, which obtains cores up to 10 ft. in length, equalling those obtained by the Piggot gun, which, contrary to the impression given by Dr. Bullard, has not obtained 10-ft. cores in rock but in oceanic ooze. Hundreds of cores have been obtained with this

gravity device. Hundreds of dredgings of rock also have been taken with large geological dredges. Currents have been measured in a score of different places on the ocean bottom both in and out of submarine canyons. The echo-sounding device on the *E. W. Scripps* has also been employed particularly to find out about the nature of the outer termination of the canyons off southern California. Parallel investigations of the east coast canyons have been undertaken by H. C. Stetson on the *Atlantis*.

Dr. Bullard states that the hypothesis that the submarine canyons are due to river cutting must be abandoned because the canyons extend to too great depths. However, it should be remembered that sea shells are found at high elevations in most mountain ranges. Before abandoning the river erosion hypothesis, would it not be better to look at some of the evidence from the canyon investigations? This evidence will, I think, prove disconcerting to those who wish to rule out the subaerial cutting. Thus we have found well-rounded gravel in cores and dredgings along the axis of many of the canyons and extending out to depths of so much as 5,000 ft. In places this gravel is mixed with shells which are certainly not of a deep-water variety. We have also found the water-worn gravel and even rounded cobbles on the banks off the California coast out to depths of 3,000 ft. At the head of the great Monterey submarine valley the deep fill shown by well cores gives unmistakable evidence of submergence great enough to account for at least a thousand feet of the submergence implied by the canyons.

The detailed surveys of the California submarine canyons reveal their close resemblance to the river canyons of the adjacent lands. These canyons are cut for the most part in rock. They have V-shaped cross-sections, winding courses, a river-like pattern of tributaries, and as continuous an outward slope as is typical of river canyons. While submarine processes are undoubtedly important in preventing the canyons from becoming filled, as is shown, for example, by the finding of submarine landslides, no process either of landslides or of submarine currents has as yet been detected which would appear to account for the canyon characteristics as well as that of subaerial origin. Our investigations show that the currents are not concentrated in the canyons nor do they attain proportions which could be expected to produce these great sea-floor gashes in the relatively short periods available for their excavation through the late Tertiary rocks found on their walls. These investigations cannot be said to have completely solved the mystery of the canyons, but they should at least show that one should not lightly dismiss the idea of subaerial excavation as has Dr. Bullard and as have various American writers in recent articles.

Dr. Bullard refers to the continental shelf as a mass of sediments built out on a gently sloping surface of rock. Possibly this interpretation may apply to some continental shelves, but again the evidence is largely in the opposite direction. Most of the dredging operations both on the outer portion of the continental shelf and on the walls of submarine canyons which cut into the shelf margin have revealed the presence of rock. This is not only true off the California coast, where the evidence is incontrovertible, but also is the case off the New England coast where Stetson found well-consolidated Cretaceous rock at a depth of a few hundred fathoms near the shelf edge. When Dr. Bullard refers to the 8,000 ft. of sediments overlying the rock on the continental shelves off both sides of the Atlantic, he should qualify the statement by noting that it is not easy to distinguish between soft sedimentary rock and recent sediments in geophysical determinations. Also Ewing's work off eastern United States is only thought by that writer to imply a thick section of sediments and sedimentary rocks overlying the granite basement.

The statement that the edge of the shelf does not represent a fault scarp but is simply the outer edge of the sediment pile is also one that is subject to debate. The continental slopes show a close topographical resemblance to the fault scarps of the lands. Judging from deltas, they are distinctly too steep for normal sedimentary accumulations. The finding of rock in many places on the slopes is also significant in this connexion. Their straightness further implies fault origin. The deep water at the base of these slopes, despite the evidence that sediments are accumulating much faster at the slope base than on the slopes, indicates that diastrophism must be keeping the base depressed. Finally, the common presence of troughs in the ocean floor adjacent to the continental slopes and the seismicity of these zones lend support to the idea that the continental slopes are tectonic. Here again, however, it is best to reserve judgment until more evidence is available. Submarine geology is still too much in its infancy to make positive statements advisable.

FRANCIS P. SHEPARD.

Scripps Institution and
University of Illinois.
August 13.

IN Prof. Shepard's interesting communication he differs from me on two main points. First, he thinks that the "canyons" were probably formed by subaerial erosion, whereas I do not know how they were formed; but I feel fairly certain that at any rate on the east coast of the United States the land has not recently stood thousands of feet higher than at present. To me it is inconceivable that the flat-lying sediments of the coastal plain can have been raised and lowered without leaving a trace in their structure and without affecting the physiography except near the outer edge. In California, broadly speaking, anything may happen. Large changes have occurred recently and are presumably still in progress, and there is nothing inherently impossible in assuming large relative movements of sea and land. It is the extension of the movements to practically the whole length of the shores of all the oceans that raises such great difficulties.

The second difference is that I suggested that the form of the continental shelf might be due to sedimentation whilst Prof. Shepard regards it as probably tectonic. This is not a matter on which I would wish to be dogmatic and it is a question which can be settled by mapping some discontinuity past the edge. The most promising horizon for this purpose seems to me to be the Palæozoic or Pre-Cambrian floor underlying the sediments under the continental shelf of the eastern United States and western Europe.

I agree that most of the shelf consists of well-consolidated sediments. Last year it was found that the velocities of seismic waves on the shelf south of Ireland were as great as 10,000 ft./sec. at a depth of a few thousand feet.

E. C. BULLARD.

Department of Geodesy and Geophysics,
Cambridge.

RESEARCH ITEMS

Trephining in New Britain

AN account of trephining methods employed by the natives of New Britain during tribal wars is contributed by J. L. Meacher, of Frankston, Victoria, Australia, to the *Brit. Med. J.* (No. 4156 ; Aug. 31, 1940). The observations were made and communicated to him by Mrs. Parkinson, who settled there sixty years ago. Skulls showing healed trephine wounds have been deposited by her in the Australian Museum of Anatomy. The operator first washes the wound with coconut milk and cuts the skin in the middle of the wound with a bamboo knife, dividing the skin into two halves. The wound is then scraped round with a black stone which "falls down from lightning", that is, a meteorite. The operator then blows into the wound through a bamboo pipe fourteen inches long to discover if there are any small pieces of bone there. A strip of coconut shell four or five inches long is used to extract pieces of bone. Coconut milk is used to wash the wound while bone is being extracted. The scalp flaps are then replaced and sewn up with a needle made from the wing-bone of a flying-fox and banana fibre thread. The wound is covered with a banana leaf, and over that the skin of the banana flower. To prevent air from getting into the wound, a paste of chewed pepper, lime and soft betel-nut is placed over the leaves. The whole head is covered with *taro* leaf and big round leaves of a bush called *paba*. A frame worked like a net protects the head. The patient is kept on a soft diet to obviate moving the jaws, while he must lie quiet for three days after which the doctor removes the frame to examine the wound. In case of malaise the wound is opened up, blown upon and scraped to remove fragments of bone previously overlooked. When a week has passed without pain the cure is tested by the eating of an old hard piece of coconut. Absence of pain indicates that no more pieces of bone are left, and the relatives are bidden to prepare a feast as the operator is about to remove the frame. Injury to the brain is treated by scraping the injured part and the insertion of a pad of *mal* (pounded wood of a small tree) which is left permanently in the wound. A pad of *mal* is also wrapped over the wound until it heals. [A description of trephining in New Britain was communicated to the Anthropological Institute in 1901 by W. Crum and Sir Victor Horsley, see *J. Anthrop. Inst.*, **32** ; 1902.]

Celtic Ornament from Elmswell, Yorks

A PANEL of Celtic ornament, described and analysed by Philip Corder and C. F. C. Hawkes (*Antiq. J.*, **20** ; July 1940), was found in the excavations at Elmswell, East Riding, Yorks, in 1938 on a native site of the Parisii occupied from Flavian times to the end of the Roman period, and then in subsequent pagan Saxon times. The site as a whole shows the persistence through Roman times of an Iron Age mode of life. The panel found, unstratified and unassociated, is a thin sheet of bronze covered with an embossed design of flowing curves garnished with rosettes. On the upper edge is fitted a strip of bronze ornamented with champlevé enamel of a bright orange-red (now green). Beneath is an iron plate bent at right-angles to form a flange. It appears to be a panel which ornamented the side of a box. It measures 9·5 inches by 3·1 inches. Such ornamented boxes it is known were made and prized in Britain in the period. Discussing the panel, Mr. Hawkes compares it with a bronze strip from the Santon Downham hoard. Its Belgic technique (especially the enamelling and repoussé) suits the state of affairs among the Parisii in East Yorks. The style, however, rules out the suggestion that it was imported Belgic work. It shows the northern tradition of the Torrs champfrein, but with a debt to the south. In the rosettes it may be thought is an element of the Romanizing convention which can be seen in the Elmswell style. Actually the rosette has a longer history in British art. The occurrence and distribution of the rosette, the relation of the Elmswell panel to the Aesica brooch and other considerations suggest that the panel is the work of an artist on the edge of the Roman world but not yet in it, most probably about A.D. 60, when the Parisii were included in the territory of the pro-Roman Cartimandua, Queen of the Brigantes.

Coral Reefs

FOR long enough coral reefs have furnished food for speculation and interest to naturalists and other men of science. Much has been written on the formation of reefs and atolls but not so much on the living activities of the animals themselves, and yet it is just these activities that determine the nature of the reefs. This aspect of the "biology of reef-building corals" has been dealt with by C. M. Yonge (Great Barrier Reef Exped. Sci. Rep., **1**, 1940) in a publication which synthesizes previous work and the author's own observations and experiments. Coral polyps are adapted for feeding upon zooplankton, and the zooxanthellæ they contain play no part in their nutrition ; for while the zooxanthellæ are dependent on the corals and do not occur free in the sea the converse is not true and individual coral colonies are not dependent upon the zooxanthellæ. Reef-building corals exhibit a marked phototropism and so light plays an important part in their growth and is indeed responsible for their vertical distribution. Their horizontal distribution is limited mainly by temperature, but other factors incident upon local conditions also play their part. Reef corals are able to get rid of sediment by the action of their cilia, and unattached corals can uncover themselves when buried under sand. The diversity of the adaptional possibilities exhibited by different species of corals determines their position in the reef. The photographs by T. A. Stephenson of the same colony during daylight and at night (taken by flashlight) are illuminating.

Meiosis

FROM the general accounts of meiosis given in text-books a simple and in some respects a misleading picture is obtained. While the final result is the reduction of the chromosome number so that upon fertilization the normal somatic number is restored, the details by which the reduction is brought about vary within wide limits. A review of these variations provided by C. D. Darlington is a useful

antidote to the simplicity of the text-books (*Biol. Rev.*, July 1940). There are three main sources of the variations: (1) the place where the pairing chromosomes touch; (2) the time that is available for pairing; (3) the amount of twisting that can be undergone by the portions of the chromosomes which are paired. The material upon which the review is based is from the plant kingdom.

Combined Fertilization and Apomixis

G. Gentcheff and A. Gustafsson (*Bot. Not.*, 1940) have shown that a biotype of *Potentilla collina* forms embryos by parthenogenesis, but that the further development of the embryo cannot take place unless fusion of the central fusion nucleus with a nucleus from another source has occurred to provide an endosperm. In these apomicts the number of chromosomes in the mother, embryo and endosperm does not affect the setting of seed. Treatment with heteroauxin did not influence seed production but did induce parthenocarpy.

Tubercularia Fungi

A VERY detailed paper by T. Petch (*Trans. Brit. Mycol. Soc.*, **24**, Part 1, 33–58, June 1940) gives a critical account of the genus Tubercularia as accepted at present. From a bewildering number of species of the genus recorded for Great Britain the author finds only two valid namings—*T. vulgaris* and *T. versicolor*. The former is known to be a stage of *Nectria cinnabarina*, and the latter frequently occurs in company with various species of Nectria, though it is possible that it merely seeks the company of any fungus, having even been found on the stalk of *Polyporus squamosus*. One curious form, previously named *T. granulata*, is shown to be really modified *T. vulgaris*, and *T. nigricans* is parasitized *T. vulgaris*. The question of parasitization of Tubercularias is treated at some length, and forms a useful addendum to the critical part of the paper.

Copper-deficient Australian Soils

THE study of these interesting soils has been continued and a report by D. S. Riceman, C. M. Donald and S. T. Evans (from the Animal Nutrition Laboratory and the Waite Research Institute, Adelaide) is issued as Pamphlet No. 96 by the Commonwealth D.S.I.R. (by the photo-lithographic process as a war-time economy). The main objective is the establishment of superior perennial pasture, but the cereals, particularly oats, have proved the most satisfactory plants in their indication of copper deficiency. Maximum yield of oats and wheat was obtained with application of 14–56 lb. copper sulphate per acre. Further work will show how long the effect of these dressings will last. Analysis of the copper content of the plants in the dressed soils, suggests that other complicating factors are numerous, possibly in some cases the interplay of iron and manganese, but the influence of organic manure may be more effective than liberal applications of copper. It is clear that the heavier crop yields obtained after copper application may reveal further deficiencies in available elements, and in this connexion the supplies of iron and manganese are being closely scrutinized. The two grasses naturally prominent in the copper-deficient soils are *Bromus madritensis* and *Lagurus ovatus*. Apart from an improvement with nitrogen supplied in the spring these species have shown no response to copper or any other fertilizer treatment.

Forest Soils in the Adirondack Section, New York State

IN a paper on "Cation Exchange Properties of Certain Forest Soils in the Adirondack Section", R. F. Chandler, jun. (*J. Agric. Res.*, **59**, No. 7; 1939) states that the selection of methods for the determination of exchangeable cations in forest soils required special attention because of the high content of organic matter in certain horizons. The cation as well as the anion in the leaching salt markedly affects the solubility of the organic matter. The ammonium ion is particularly active in this respect, and hence methods should be avoided which involve the treatment of soils with any ammonium salt previous to the determination of total exchange capacity. The research work described has been undertaken in virgin forest soils. This fact may be stressed, for a considerable amount of ecological work in connexion with forest botany and forest soils has been carried out in forest areas the character of which has often been entirely changed, and not unusually degraded, by the action of man himself; misleading inferences leading to harmful economic action having been too often the result. The locality here dealt with appears to offer an excellent opportunity for studying the properties of virgin soils; the object of Mr. Chandler. There are, he says, localities where the climax forest types have not been appreciably disturbed by man or fire; the two most misleading factors when studying the remnants of the natural or pseudo-natural forests about the globe. The paper presents data on the cation-exchange capacity, exchangeable bases, percentage base saturation, percentage loss on ignition, and hydrogenation concentration for soils of similar geological origin but occurring beneath three distinct forest types, namely, red spruce, red spruce – sugar maple – beech, and sugar maple – beech – yellow birch.

Perchlorides of Hydrogen

AN investigation of the freezing point curves of mixtures of chlorine and hydrogen chloride by J. A. Wheat and A. W. Browne (*J. Amer. Chem. Soc.*, **62**, 1577; 1940) shows that two compounds separate: HCl,Cl_2, m.pt. $-115°$ and $2HCl,Cl_2$, m.pt. $-121°$. It is suggested that chlorine attached to hydrogen donates a pair of electrons to the chlorine of the chlorine molecule, and the formulæ of the compounds are thus written as: H—Cl→Cl—Cl and H—Cl→Cl—Cl←Cl—H.

Chemical Separation of Isotopes

A PAPER was read on this subject by H. C. Urey, of Columbia University, at the annual meeting of the U.S. National Academy of Sciences held during April 22–23. The chemical separation of the isotopes of nitrogen and carbon gives the most rapid separation of these isotopes which has so far been devised. Experiments have been made in which three fourths of a gram of C^{13} have been transported per 24-hour period. The simple process fractionation factor for the exchange reaction between ammonium ion and ammonia is 0·967, favouring the concentration of N^{15} in the ammonium ion, while the simple process factor for the exchange reaction between hydrogen cyanide and cyanide ion is 1·025, favouring the concentration of C^{13} in the gas. These rates of production are for laboratory production. There seems to be no reason why the method cannot be extended to plant size apparatus with the production on as large a scale as is required.

WINDOWS AND BOMB 'BLAST'

THE Research and Experiments Department of the Ministry of Home Security has issued two memoranda dealing with the protection of plate glass windows and other large sheets of glass from the effects of bombing. The following points have been extracted from the bulletins.

Effects of Blast

Bulletin No. C.9 is concerned with vertical windows, fixed or made to open, fitted with plate glass $\frac{3}{16}$ in. thick or more. Such windows are common in shop fronts, restaurants and hotels, in internal display cabinets inside or outside buildings. The protection of the interior lit by the window is also considered.

Shop windows are prone to damage by blast because of their large areas. Small panes of plate glass are relatively strong but may fail by the frame breaking. When a bomb explodes the direct blast pressure may force in the window, or the suction following the pressure pulse may pull it outwards. At greater distances reflections of the shock-wave may start strong vibrations in a window which happens to have the same natural frequency. Such a window may break when others close by are unharmed.

The minimum distance from an explosion at which plate glass will escape damage cannot be predicted, but within 200 ft. its chance of survival is small. Beyond that distance the chance depends on factors which include size and thickness of pane, frame fixing, size of bomb and method of detonation and, in particular, the reflection of the blast wave from adjacent buildings. The last factor is chiefly responsible for the apparently freakish fracture of windows. Panes facing the ends of streets leading towards the explosion often break while adjacent windows escape. Where blast travels along a street, the side panes (at shop entrances, etc.) may be broken and the larger front panes escape ; elsewhere the reverse may happen.

When a pane breaks under severe blast, pieces may be scattered violently. It is not possible to foretell whether the pieces will fly inwards or outwards. When a pane breaks under distant blast, pieces generally fall inside and outside within a few feet.

Plate glass in internal partitions, show cases, etc., is almost as liable to fracture and to dangerous scattering as glass in external windows. Plate glass in doors, and in sliding or hinged windows, is somewhat less vulnerable. It is desirable to fasten doors wide open during air raids and generally to open windows.

There is no method of preventing the fracture of glass under blast, nor has any method yet been discovered of materially increasing the resistance of glass to blast while retaining its transparency.

Various forms of bracing and damping devices have been investigated but none has been found which can be relied on to strengthen the resistance of the glass. In certain circumstances a bracing device may increase the liability of the pane to fracture. The behaviour of braced windows in air raids has confirmed the investigations. An important objection to such devices is that it may give the occupier of the building a false sense of security, blinding him to the need for providing against the danger of flying glass.

The possibility of increasing the resistance of large sheets of plate glass is being investigated. Research, however, does not at present indicate more than that it is useful to provide a flexible setting for the glass.

Minimizing the Results of Fracture

Since it is not practicable to prevent the fracture of plate glass windows, while retaining their transparency, efforts should be directed towards minimizing the results of breakage. Such results include injury from flying glass, damage to stock or other contents of the building from flying glass and from exposure to weather and, in shops, pilfering of stock and loss of trade.

Shop windows may be covered externally with boarding on stout framing, securely fixed, and provided with hinged shutters over openings exhibiting the display space. Such boarding only gives a slight degree of protection. Rolling shutters of steel or wood give less protection than boarding. Under severe blast they may be dislodged from their guides. Internal damage can be much reduced if a solid brick wall or substantial panelling is built at the back of the window display space.

Wire netting of $\frac{1}{2}$ in. mesh will stop all but the smallest fragments of broken glass ; these, except under very severe blast, are not likely to fly far. There is no need to use two layers of netting. The netting should be as close to the glass as possible, preferably touching it. Netting of larger mesh than $\frac{1}{2}$ in. has much less effect in arresting flying glass fragments. A mesh larger than 1 in. may pass dangerous fragments of glass.

Blinds and curtains, particularly if heavy and thick, give a moderate degree of protection against flying glass fragments, except under intense blast.

An adhesive treatment does not make the breakage of glass less likely but, if appropriate to the weight and size of glass, it affords a useful measure of protection against the scattering of fragments. The following "anti-scatter" adhesive treatment is suitable for plate glass $\frac{3}{16}$ in. or $\frac{1}{4}$ in. thick, though it reduces the transparency. A full coat of varnish is brushed on the glass and when it has become tacky a sheet of fabric or strong textile netting is pressed into the varnish so that the whole glass area is covered. When the material is thoroughly set a full coat of varnish is brushed over the whole. Where considerable transparency is required (for example, in display windows) textile strips can be used. though this treatment is not so efficient as a close mesh netting all over the glass. Interspaces between strips should not be more than 6 in. each way. The stronger the textile and adhesive, the better the result. Transparent film of "Cellophane" type pressed into and afterwards coated with varnish is a useful alternative to the fabric or textile netting treatment. Liquid coatings and paper strip are not recommended for plate glass.

GLASS SUBSTITUTES

Bulletin No. C.10 deals with flexible substitutes for glass.

It is pointed out that glass damage from a bomb explosion is always much more widespread than its other effects. The breaking of glass and the violent scattering of its fragments under the blast of high-explosive bombs cause a fair proportion of air raid casualties, and serious inconvenience from exposure to weather. Several 'anti-scatter' treatments to prevent the flying of glass fragments have been recommended in Ministry of Home Security publications, but though such treatments may hold fractured panes together, they neither reduce the risk of breakage nor prevent the pane being wholly dislodged if the blast is violent enough. It appears unwise to replace broken glass with new glass, in view of the risk of repeated attack and because new glass would in turn require protective treatment. Further, supplies of materials for protective treatments can be expected to serve only a fraction of the glass at present in use. The utility of a flexible substitute for glass, that can be harmlessly dislodged by blast and readily replaced, is therefore obvious.

Flexible substitutes may be either translucent or, where permanent obscuration is required, opaque. Most translucent substitutes are at present made of synthetic resins or cellulose substances reinforced with metal or textile mesh. Alternatively, cotton or linen textiles may be used; these are not ordinarily windproof or rainproof, but may be obtained suitably treated with cellulose lacquer or with boiled linseed oil, or alternatively, may be treated in position at the window opening.

Only the stiffer materials, that is, those reinforced with metal mesh, are likely to be suitable for use in roof glazing bars. They should probably be supported below at 2 ft. intervals, as recommended for roof glass in R. and E. Department Bulletin C. 7. No tests have yet been carried out.

For vertical glazing, preliminary blast tests show that if flexible glass substitutes are fixed with nails or staples, the material when displaced is usually torn at the edges. Also where edge fixing is too strong the material may be burst in the centre. Fixing with a soft non-setting putty or mastic, fastening the edges with adhesive tape, fixing by ordinary wood glazing beads in the glass rebates, fixing on the face of the frame by plasterer's lath or similar wood strip, and holding the edges of the material in strip rubber channelling are being tested. It is important that the material should not be wrapped around beads or laths, and nails used to fix such beads should not perforate the edge of the material.

Where permanent obscuration is required galvanized flat sheet steel, composite sheets of asbestos and steel, hard wallboards are suggested for roof glazing. These will stand up to blast pressures considerably greater than those that fracture roof glass. When displaced they can usually be replaced undamaged. They can be fixed in the same way as roof glass. Thinner and more flexible opaque materials such as combinations of wire mesh and bituminous sheeting, soft wallboards, etc., will probably require support from beneath. Experiments have shown that flat asbestos-cement sheeting, including the newer 'flexible' type, is readily fractured by blast; there is, therefore, little to be gained by using it as a glass substitute in roof glazing bars, since it is likely to be fractured before it is displaced, though, when fractured, it is not so dangerous as glass. Wall-boards require painting or impregnation with preservative to give protection against weather.

For vertical glazing, the same materials can be used, and also bituminous sheeting, plywood and plasterboard can be used. The two latter should be painted on the face and on the edges to prevent the soaking in of moisture. A plasterboard faced with bituminous sheet is obtainable.

As with translucent materials, firm fixing, as by nailing, is undesirable.

There are many substitute materials on the market, and a list of twenty-six known to the Department, with names and addresses of manufacturers, is given. The inclusion of a name in the list neither gives nor implies any guarantee by the Ministry of Home Security of the reliability at any time of the price or quality or of the availability of the materials.

BRACING SYSTEMS

Bulletin No. B. 6, issued by the Research and Experiments Department of the Ministry of Home Security, discusses bracing systems for large sheets of glass. The static strength of a sheet of glass, assumed to be subjected to a uniformly distributed load over its whole surface, is increased if a brace is fitted which provides a single central rigid support having an area greater than $A_c = 1/16$ (length of the sheet $\times$ breadth of the sheet). If the area of the central rigid support is less than A_c, the strength of the pane is decreased, since the more concentrated forces at the support induce high stresses at that point. If the support is not rigid the strengthening effect is diminished, and so also is the concentration of stress.

If the brace restrains movement at the centre of the pane, the glass between the centre and the edges acquires a natural frequency of vibration higher than that of the pane without the brace. Consequently the equivalent static pressure exerted by the blast on the braced pane is increased. It has been calculated that if the natural frequency of the pane, without a brace, is 10 cycles per second, as with a sheet of plate glass $\frac{1}{4}$ in. thick and 9 ft. square, the effect of fitting a rigid central brace is to increase the equivalent static load exerted by the blast about $3\frac{1}{2}$ times.

In practice, the brace will not act as a rigid support but will always allow some movement of the pane, depending on the tension of the stay wires and their inclination to the pane. The fundamental frequency of the unbraced pane will thus not be entirely eliminated by the fitting of the brace, though vibration of the pane at this frequency will be greatly restrained.

It follows that fitting a more or less rigid support at the centre of a sheet of glass always increases the effective pressure and suction forces exerted by the blast wave, and may or may not increase the strength of the pane. Consequently the effective resistance which the glass can offer to the incident blast wave may or may not be increased. The two effects are opposing and either may predominate, but in no case is the effect likely to be great; in other words, the brace may make the conditions worse or better, but it is not likely to have much effect either way. A brace will not prevent flying splinters of glass after a break occurs.

OILFIELDS OF THE UNITED STATES*

By Dr. Hugh D. Miser,
U.S. Geological Survey

THE modern petroleum industry in the United States of America dates from the drilling of the first commercial oil well in 1859. Up to the present, about a million wells have been drilled for oil and gas, and the total production of petroleum has been 22,452,498,000 barrels, which has been contributed by twenty-three of the forty-eight States.

Statistics of the supply and demand of crude petroleum and refined products for the United States for 1939, as published by the Bureau of Mines, United States Department of the Interior, are :

	Thousands of barrels.
Domestic production (crude petroleum)	1,264,256
Imports (crude petroleum)	33,095
Imports (refined products)	25,804
Exports (crude petroleum)	72,073
Exports (refined products)	116,909
Domestic demand (refined products)	1,228,069
Total demand (crude petroleum and refined products)	1,417,051

Much is known concerning the geology of the oilfields of the United States, and additions to our geological knowledge of them are being made continually by the 3,000 or more petroleum geologists in the country. Data on the structure and stratigraphy of the oil-bearing rocks are supplied in large measure by the wells that are drilled for oil and gas and also by geophysical methods of exploration. Many of the wells exceed 10,000 ft. in depth and the deepest, which was completed in 1938 in California, reached 15,004 ft. The depths explored by geophysical methods exceed 30,000 ft.

The oil-bearing rocks of the United States are widely distributed and are of many different ages. They occur in all parts of the geological column from the Ordovician to the Pliocene. The common reservoir rocks are sand, sandstone, limestone, dolomite, and chert.

The relation of oil to geological structure was noted so early as 1860 in the United States, but oil companies did not employ great numbers of geologists before the present century, when the demand for petrol increased rapidly because of the growing number of motor-vehicles.

Anticlines were first sought as favourable structural features on which to locate drilling sites for oil ; but, with further drilling and the consequently increased knowledge of the occurrence of petroleum, it was learned that oil pools are associated with many other types of structural features, which include faults, salt domes, and buried hills. In addition, oil reservoirs like those of the east Texas field in Texas and the Coalinga and Midway-Sunset pools in California belong to a type recently designated as stratigraphic traps. Such reservoirs may be due to lensing, to unconformities, and to various lateral gradations in porosity and permeability of the reservoir rocks.

Estimates of the proved reserves of petroleum in the United States at the beginning of 1940 range from 18,500 to 19,700 million barrels. The estimates include the amount of petroleum recoverable by current methods of production from pools already proved by drilling. They do not include the as yet unknown amounts of petroleum that will be discovered in the future in new fields or in deeper zones or extensions of the present producing fields.

With the greatly increased depths to which wells have been drilled in recent years, the proportion of oil reserves found at the greater depths has increased. The first production below 10,000 ft. was obtained in 1935 at Binger, Oklahoma, where the output has averaged 30 barrels per day. During 1937–39 substantial amounts of oil between 10,000 ft. and 13,266 ft. have been discovered and developed in forty fields, of which eight are in California, five are in the Gulf Coast region of Texas, and twenty-seven are in the Gulf Coast region of Louisiana.

* Abstract of a paper presented, by permission of the Director of the Geological Survey, United States Department of the Interior, to Section III (Geological Sciences) of the Eighth American Scientific Congress.

EARTHQUAKES AND STRUCTURES

UNDER this title, there is published in the *Journal of the Royal Society of Arts* (August 23, 1940) the text of a paper read by Mr. D. Laugharne Thornton in which he gave an account of the salient features to be observed in the design of structures for regions subject to earthquakes. Mr. Thornton, an authority on vibration, has treated the behaviour of earth waves in his recent book "Mechanics Applied to Vibrations and Balancing". The subject of his paper was primarily of interest to engineers, to whom the problem set by earth phenomena is how to mitigate the great loss of life and property attendant on them. It concerns also those charged with public safety, to whom several of his inferences and conclusions are likely to be of moment, such, for example, as the care which must be taken to ensure that the form of structure, the choice of materials, and the nature of the loading permitted must be adapted to the local conditions.

On the engineering side, the matter is one of dealing with stresses of great intensity and with materials in which the seismic waves suffer so little damping that they may be felt hundreds of miles from the epicentre. In general, the information gathered by seismologists does not satisfy the needs of the engineer, who requires data regarding 'near' earthquakes, for it is in the vicinity of the disturbance that the destructive effects on buildings occur. To this end, instruments would require to be placed on the foundations as well as in the principal parts of

a structure during an earthquake so that their records would help in the interpretation of the results of experiments made on models attached to 'shaking tables'.

Mr. Thornton gave much detailed information about the nature and causes of the destruction which occurred in the earthquakes at Quetta, Anatolia, Antiqua and elsewhere, and discussed the effects produced on different buildings. The immediate consequences on foundations depend on the elastic properties of the subsoil, and the wide range of the values of these was shown in a table giving the velocity of compressional waves in typical strata. The effects of faulty distribution of loading were pointed out, the danger of heavy roofs, the general advantage of light rather than heavy construction, and the need for good material and workmanship and strictly appropriate design. In conclusion, he emphasized the need for more information regarding earthquakes, and suggested the collaboration of seismologists and engineers in examining the problems by means of records taken by instruments suitably designed for the purposes of both.

THE TRANS-CANADIAN HIGHWAY

THE last western link in the Trans-Canadian highway—the Big Bend section in the Revelstoke district of British Columbia—was opened officially by the Premier of British Columbia, Mr. T. D. Patullo, a few weeks ago. The road provides motorists for the first time with an all-Canadian direct route from the prairies to the Pacific coast. The ceremony took place at Boat Encampment, where David Thompson first saw the Columbia River and began its exploration in 1906.

Roads and Road Construction of September 22 states that the completion of a Trans-Canadian highway, long the dream of Canadians, who have to motor through the United States to get to Manitoba from Ontario, may await the end of the War, although only a small stretch now remains uncompleted. Two highways are proposed in north-western Ontario, either of which would, when completed, constitute the final link between British Columbia and Nova Scotia, but according to a statement made by Mr. R. M. Smith, Ontario Deputy Highways Minister, "it depends on the War when we can get back to heavy work on the projects". He added that War-time economics have cut down capital expenditures to almost nothing and stated that the date on which work can be resumed is indefinite.

The route most likely to be completed first is the far northern one, on which about two hundred prisoners housed in road camps are at present working between Long Lac and Hearst. The work involves about 135 miles, and from about a million to $1\frac{1}{2}$ million pounds will be necessary for the completion of the work after the prisoners have cleared the land and undertaken preparatory work.

The other route, on which constructional work was suspended in 1936, lies between Schreiber, on the north shore of Lake Superior, east to White River, and south-east to the Montreal River, in the Timiskaming district, a distance of approximately 250 miles. The Deputy Minister estimated that completion of the work will cost between five and six million pounds.

REPORTS AND OTHER PUBLICATIONS

(not included in the monthly Books Supplement)

Great Britain and Ireland

Scientific Proceedings of the Royal Dublin Society. Vol. 22, (N.S.), No. 31: Salmon of the Ballisodare River. 1: History of the Ballisodare Fishery. By Arthur E. J. Went. Pp. 289–306+plate 7. 2*s*. 6*d*. Vol. 22, (N.S.), No. 32: Soil and Fresh-Water Iodine-Content in Ireland in relation to Endemic Goitre Incidence. By James C. Shee. Pp. 307–314. 1*s*. (Dublin: Hodges, Figgis and Co., Ltd.; London: Williams and Norgate, Ltd.) [59

New Leadership. By Garth Lean and Morris Martin. Pp. 22. (London: William Heinemann, Ltd.) 3*d*. [109

King's College: Dove Marine Laboratory. Report for the Year ending July 31st, 1939. (Third Series, No. 7.) Pp. 32. (Cullercoats: Dove Marine Laboratory.) [109

Éire: Roinn Talmhaidheachta (Department of Agriculture): Brainse Iascaigh (Fisheries Branch). Report on the Sea and Inland Fisheries for the Year 1938. (P. No. 4055.) Pp. 36. (Dublin: Stationery Office.) 9*d*. [109

Tyneside: the Social Facts. By Dr. David M. Goodfellow. Pp. 80. (Newcastle-upon-Tyne: Co-operative Printing Society, Ltd. 1*s*. [179

Medical Research Council. War Memorandum No. 2: Notes on the Diagnosis and Treatment of Gangrene; with a Suggested Scheme for the Bacteriological Investigation of War Wounds. Pp. ii+14. (London: H.M. Stationery Office.) 3*d*. net. [179

Other Countries

Denkschriften der Schweizerischen Naturforschenden Gesellschaft. Band 74, Abh. 1: Geologie des Voirons. Par Dr. Augustin Lombard. Pp. vi+112+5 plates. (Zürich: Gebrüder Fretz A.G.) [29

Smithsonian Institution: United States National Museum. Bulletin 175: Variations and Relationships in the Snakes of the Genus Pituophis. By Olive Griffith Stull. Pp. vi+225. (Washington, D.C.: Government Printing Office.) [29

N.Z. Department of Scientific and Industrial Research: Christchurch Magnetic Observatory. Annual Reports for 1934, 1935, 1936. Pp. ix+132. (Christchurch: Magnetic Observatory.) 7*s*. 6*d*. [39

Commonwealth of Australia: Council for Scientific and Industrial Research. Pamphlet No. 97: The Shrinkage of Australian Timbers. 2: Shrinkage Data for 170 Timbers. By W. L. Greenhill. (Division of Forest Products: Technical Paper No. 35.) Pp. 48. Pamphlet No. 98: The Prevention and Treatment of Blowfly Strike in Sheep. Report No. 2 by the Joint Blowfly Committee. Pp. 48. (Melbourne: Government Printer.) [59

Ceylon. Paper 4: Education, Science and Art (F). Administration Report of the Acting Director of the Colombo Museum for 1939. By P. E. P. Deraniyagala. Pp. F16. (Colombo: Government Record Office.) 15 cents. [59

Ministério da Educacao e Saude. Anuário publicado pelo Observatório Nacional do Rio de Janeiro para o ano de 1940. (Ano 56.) Pp. xiii+460. (Rio de Janeiro: Observatório Nacional.) [59

N.Z. Department of Scientific and Industrial Research: Apia Observatory, Apia. Annual Report for 1936. Pp. iv+143. 6*s*. Annual Report for 1937. Pp. iv+131. 6*s*. (Wellington: Government Printer.) [109

U.S. Department of the Interior: Office of Education. Bulletin 1939, No. 9: Residential Schools for Handicapped Children. By Elise H. Martens. Pp. vi+103. (Washington, D.C.: Government Printing Office.) 15 cents. [109

South Australia: Department of Mines. Mining Review for the Half-Year ended 31st December 1939. (No. 71.) Pp. 125+5 plates. (Adelaide: Government Printer.) [109

Report on the Progress of Broadcasting in India up to the 31st March 1939. Pp. xiv+230+21 plates. (Delhi: Manager of Publications.) 3 rupees; 5*s*. [179

Ceylon. Part 4: Education, Science and Art (G.). Administration Report of the Acting Marine Biologist for the Year 1939. By P. E. P. Deraniyagala. Pp. G9. (Colombo: Government Record Office.) 10 cents. [179

Forest Research in India and Burma, 1938–39. Part 1: The Forest Research Institute, Dehra Dun. Pp. iii+111. (Delhi: Manager of Publications.) 2.14 rupees; 4*s*. 9*d*. [179

OFFICIAL ANNOUNCEMENTS

THE RECENT SOVIET CONFERENCE ON GENETICS

Lecture by Prof. J. B. S. Haldane, F.R.S., Saturday, October 5, 2.30, Caxton Hall. Tickets, 1/-, from S. C. R., 98, Gower Street, W.C.1 (Euston 2315).

VICTORIA UNIVERSITY COLLEGE, WELLINGTON, NEW ZEALAND

(UNIVERSITY OF NEW ZEALAND)

RESEARCH FELLOWSHIP IN SOCIAL RELATIONS IN INDUSTRY

Applications are invited for the above position: Salary, £1,000 (N.Z.) per annum. Appointment is for five years. Forms of application and additional information may be obtained from the Secretary, Universities Bureau of the British Empire, 88a, Gower Street, London, W.C.1, with whom applications close on October 12, 1940.

MARINE BIOLOGICAL ASSOCIATION OF THE UNITED KINGDOM

The Laboratory, Plymouth

The following animals can always be supplied, either living or preserved, by the best methods:

Sycon; Clava; Obelia; Sertularia; Actinia, Tealia, Caryophyllia, Alcyonium; Pleurobrachia (preserved); Leptoplana; Lineus, Amphiporus, Nereis, Aphrodite, Arenicola, Lanice, Terebella; Lepas, Balanus, Gammarus, Ligia Mysis, Nebalia, Carcinus; Patella, Buccinum, Eledone, Pectens, Bugula, Crisia, Pedicellina, Holothuria, Asterias, Echinus, Salpa (preserved), Scyllium, Raia, etc.

For prices and more detailed lists apply to:
Biological Laboratory, Plymouth. THE DIRECTOR.

For your

Information

The address of the Editorial and Publishing Offices of "NATURE" is

MACMILLAN & CO., LTD.,
St. Martin's Street, London, W.C.2.
Telephone Number: Whitehall 8831
Telegrams: Phusis, Lesquare, London.

The annual subscription rate, Inland or Abroad, is £3 0 0, payable in advance. Volumes begin in January and July of each year, but subscriptions may commence with any issue. Payment from abroad should be made by International Money Order or by Cheque payable at a London Bank, and Cheques, Money Orders and Postal Orders should be made payable to Macmillan & Co., Ltd.

All editorial communications, books for review, etc., should be sent to the above address.

Advertisements only should be addressed to T. G. Scott & Son, Ltd., 63 Ludgate Hill, London, E.C.4. Telephone Number: City 4211.

Free Copies of "NATURE".

Each of the signatories of a letter published in the Correspondence columns will be sent, free of charge, on publication, 1 copy of the issue of "NATURE" containing the letter.

If more than 1 copy is desired, written application must be made to the Manager of "NATURE", stating the number of copies that is required. Not more than 6 free copies in all can be presented in connexion with any letter published.

This offer of free copies does not refer to articles and similar contributions to "NATURE".

If any contribution includes illustrations, the blocks used for their reproduction may be obtained by the author, after publication, at half the cost price. Application for the blocks should be made to the Manager of "NATURE".

Proofs will not usually be sent to authors living outside Great Britain. Orders for reprints should, therefore, accompany MSS. All communications regarding reprints should be sent direct to the printers:

FISHER, KNIGHT & CO., LTD.,
Gainsborough Press, St. Albans, Herts.

Printed in Great Britain by FISHER, KNIGHT & Co., LTD., The Gainsborough Press, St. Albans, and published by MACMILLAN & Co., LIMITED, at St. Martin's Street, London, W.C.2, and THE MACMILLAN CO., 60-62 Fifth Avenue, New York—Saturday, September 28, 1940.