VOL. 148
No. 3744

NATURE

SATURDAY
AUG. 2, 1941

AN INTERNATIONAL INTELLIGENCE FRONT

FOLLOWING on the establishment last November by the Ministry of Labour of an International Labour Branch as a central agency for making the best possible use of the services and labour of Allied and other friendly foreigners in Great Britain, the industrial registration of friendly aliens which the Ministry commenced on June 9 is a belated step to enlist many valuable heads and hands in our war effort, with the success of which they are as much concerned as ourselves. The man-power position may indeed well make us anxious to secure the very important contribution to our war effort which should be possible from the quarter of a million of these refugees, many of whom could make expert contributions in particular fields.

While, however, the Government has now realized the damage to our national war effort which was done by the policy of internment, which although an urgent necessity at the time of the fall of France has long outlived the emergency, there are few signs that either the Government or the nation realizes the moral consequences or the psychological opportunities which were open to us in this field as soon as the migration from Germany under Nazi persecution commenced. These consequences and opportunities have been well portrayed by Sebastian Haffner in a penetrating survey of the German nation and its leaders and of the possibilities and objectives of Allied propaganda which appeared last year under the title "Germany : Jekyll and Hyde"*. This book is a damning indictment of the policy pursued in the democracies, including the United States, towards such refugees, even before the outbreak of war.

This arresting picture of the deplorable effect of the failure of the democracies to realize before the War the significance of this migration from Germany and, by adopting a generous policy, to establish an anti-Nazi stronghold beyond the reach of the Gestapo is not, however, solely one of opportunities irretrievably lost. It gains fresh interest as the growing stress of the conflict compels us to explore more thoroughly and exhaustively all our moral and material resources. We can no longer, it is true, confront the German Reich with not merely one hundred thousand but a couple of million from among its best, most intelligent and most educated citizens, with all the repercussions on German moral and material reserves which a migration on that scale involves. The Evian conference closed the door on that prospect, which the Nazis were astute enough to fear and to exploit when the danger passed.

* "Germany : Jekyll and Hyde." By Sebastian Haffner. Trans. by Wilfred David. Pp. 320. (London : Secker and Warburg, Ltd., 1940.) 8s. 6d. net.

For all the tragedy of Evian, however, Nazi propaganda is taxed to the utmost to conceal the fact that Germany entered the War as a thoroughly disunited nation and that large sections of her people fear victory more than defeat. This is still our great psychological opportunity. It can be seized only with the help of the *émigrés*, and that is the greatest contribution they can offer to our war effort.

It is still possible, however, to use this German anti-Nazi movement both in the fight against Nazism as well as in the subsequent necessary reconstruction of Germany. Far more significant than the formation from them of a German Freedom Legion would be, as Haffner suggests, the formation of a German Academy. The blow to Nazi prestige which such a step could deal is not to be underrated, and might be decisive in winning the War and in preparing the peace. Even more effective might be the utilization of the experience of internal German politics, the knowledge of German political psychology, and the underground ties with Germany which are represented by these *émigrés*.

Such an organization might well go farther. By supervising the refugees and their military, cultural and political organizations, it would serve as a link with the Allied Governments. It might elaborate plans for Germany's reconstruction and future constitution and establish semi-diplomatic relations with the opposition groups within Germany, through the neutral countries.

If these opportunities are to be seized and such possibilities realized, however, there must be a profound change in the attitude and policy of the Government and indeed of many of the ordinary citizens. The first step in a positive and constructive policy towards Germany is a constructive and positive policy to the German *émigré*. The great opportunity presented by the offer of co-operation of large numbers of German political intelligentsia, men of science and others, now living outside Germany, and of the many who, mortal foes of the Nazis, are numerous enough to form at least a symbolic kernel of a German army to fight by the side of the Allies, must be grasped. The refugees must not simply be treated with humanity; they must be harnessed to the common cause.

Important as is this political contribution, there is also the question of learning and scholarship represented by these *émigrés*, among whom is a high proportion of outstanding workers in science, medicine and literature. To this question and its implications Dr. Raymond B. Fosdick, president of the Rockefeller Foundation, once again makes striking reference in his review of the Foundation's work in 1940. Many of the brilliant men with whose work the Foundation was associated are now driven from the posts for which they were trained, debarred from their laboratories, some of them fugitives, some in concentration camps, many of them separated from their families or lost in foreign countries where they sought haven.

The sombre picture of the breakdown in international solidarity, which in the realm of scholarship, at least, had become a vital factor in progress, contained in Dr. Fosdick's review affords a background against which this question of the refugee or *émigré* must be viewed if we are to keep a true perspective. The conception of knowledge as an international responsibility has vanished from Europe. The free flow of ideas across boundary lines between laboratories and universities has dried up.

The condition of university life and standards on the Continent, Dr. Fosdick asserts, is now little short of appalling. Due to flight, imprisonment or disappearance, the number of professors in institutions has been reduced by at least 50 per cent. Over all the Continental universities hangs the pall of uncertainty and fear. The contact with contemporary life has been abruptly broken. Even when fundamental research is being continued, publication has largely been abandoned or postponed. In the social sciences such research as is carried on is confined to innocuous projects which have no relevancy to the present scene. Even neutral countries are under pressure to permit a totalitarian interpretation in teaching such subjects as economics, political science and sociology.

In such surroundings, as Dr. Fosdick reminds us, scholarship withers; nothing short of heroic struggle can keep it alive. It is only free men who dare to think, and it is only through free thought that the soul of a people can be kept alive.

Considerations such as these give pertinence to the suggestion of an *émigré* academy thrown out by Haffner, particularly if this is not limited to one nationality. The Rockefeller Foundation itself is indeed nobly striving to salvage some proportion of the productive scholarship of the refugees from the conquered countries. Two of its programmes, a placement programme from 1933 to 1939, and an emergency rescue programme in 1940, have endeavoured to protect the careers of scholars unable to continue work in their native lands. During the seven years ending in 1939, 775,000 dollars were appropriated by the Foundation on the first of these, about 500,000 dollars being allocated to American institutions where 122 individual scholars found places, 99 of whom were established in permanent positions by the end of 1939.

In 1940 the second rescue programme was instituted with the assistance of the New School for Social Research and, in the task of permanent

placement, by the Emergency Committee in Aid of Displaced Foreign Scholars. During 1940, on behalf of the refugee scholars endangered by the invasion of Scandinavia, the Low Countries and France, the Rockefeller Foundation made fifty-six grants totalling 266,350 dollars. The fifty-six scholars assisted included nineteen Germans, eleven French, seven Poles, five Russians, five Austrians, three Norwegians, two Spaniards, one Belgian, one Czech, one Italian and one Swiss. Among them were physiologists, biochemists, mathematicians, neurologists, statisticians, economists, historians, philosophers and philologists. One was a Nobel prize-winner and nearly all had international reputations.

Hopelessly inadequate as efforts of this kind may seem through the restrictions imposed on the occupied territories of Europe, they are not without value. At least they reveal the mockery of science and learning which parades in the vaunted New Order of Hitler, and how truly it would sound the death knell of culture and intellectual life. By themselves they are quite inadequate.

To accord to all aliens in sympathy with the ideals for which Britain is fighting the full status of allies with freedom of employment, domicile and movement is only the first step. Utilization of the services of the engineers, chemists, doctors and nurses at present waiting employment would demonstrate the solidarity of an international front against Nazism. The relief it would bring to our war effort is indeed the least of the consequences of such a step—every layman knows well how overburdened are medical men in general practice in almost every part of Great Britain.

What is above all required is a policy towards the *émigrés* which will enlist as fellow-workers and partners all in sympathy with the ideas and ideals for which we are striving and afford them full opportunity of making their own contribution to that end. That policy must be inspired by a large vision of the psychological possibilities, of the opportunities of a psychological war on Germany which could be carried on with such assistance, thus not merely shortening the war but assisting also to build a stable and better European order after hostilities have ceased.

To see in the presence of these foreigners, bitterly opposed to the Nazi regime and eager to fight with us to secure its overthrow, not dangers and hindrances to our war effort, real as some of the difficulties which attend an enlightened policy may be, to realize the counterpart to the Allied Governments already present in Great Britain which they represent, demands both courage and imagination. Without these and without magnanimity, such a war as this of ideas and of irreconcilable conceptions, of human values, of justice and of society cannot be won nor an enduring peace achieved. Given, however, the statesmanship alive to the human and moral issues involved, resolute to explore all the possibilities which the position of so many Allied Governments and political leaders from enemy or occupied countries offers us, and no less keen in its scrutiny of the dangers of treachery or abuse of privilege, decisive action greatly accelerating victory might well be taken. Bold and imaginative steps like the organization of some suitable institution where the great gifts and international reputations of many of these scholars could find ample employ might well set the stream of thought flowing across international frontiers once more, and shatter the pretensions of Hitler and the Nazis to stand even for a united Germany, let alone a wretched regime of slavery and tyranny imposed on one broken country after another. It would, moreover, add to our own effort all the inspiration which comes from a policy conceived in a spirit worthy of the great cause which we are pledged so deeply to defend and the ideals to which the free nations do homage.

THE CHURCHES CHALLENGED

A Challenge to the Churches

Religion and Democracy. By John Macmurray. (The Democratic Order, No. 9.) Pp. 63. (London: Kegan Paul and Co., Ltd., 1941.) 1*s*. net.

THE Churches have had so many "challenges" presented to them that they are becoming accustomed to take them as read, and this indifference is often justified by the ignorance of the challengers, but it is to be hoped that Prof. Macmurray's little book will have serious attention, for it is the cry from the heart of one who knows what Christianity has been and passionately believes in its creative power. In this pamphlet the author is conducting an argument on two fronts ; he is pleading with his left-wing associates to realize that without Christianity there cannot be a socialist order which is also free, and he is trying to convince his fellow-Christians that the Church needs a new and drastic reformation.

The first of these theses rests upon an interesting and, as I think, convincing analysis of the tendency

of social evolution. The coming of large-scale State socialism is probably inevitable and, with it, the control by the State of the finances which in times past have been largely within the power of individual citizens. The religious sphere is the only one which can maintain itself independent of State control. The very possibility of democracy depends on the existence of a vigorous and almost universally accepted religion. If this condition be absent the State may profess the most extreme democratic aspirations but will be, in effect, a dictatorship. It appears to be Prof. Macmurray's opinion that this is what has happened in Russia. In an epigram which has perhaps prophetic truth he sums up his view by remarking: "Religion seeks to draw men into unity by love. Government seeks to compel them into co-operation by fear."

Bergson in his last great book, "Les Deux Sources", draws a distinction between static and creative religion, and though Prof. Macmurray does not refer to him, the fundamental idea on which the second of the theses rests is very much that of the French philosopher. The essential challenge to the Churches is that they have become the spiritual support of the old order, whereas if they had been true to the original gospel they would have been creating the new order. There is much salutary truth in the reproach, and I have no quarrel with the main contention; but it seems to me that some of Prof. Macmurray's statements in working out the idea are open to question. He suggests that Christian doctrine is the product of Greek philosophy to a much greater degree than history would warrant. It is strange that an eminent philosopher should object to the attempt to find a philosophical basis and formulation for a spiritual message. Most of all, it might be objected that he allows too little weight to the "other-worldly" elements in the New Testament. Christianity would be false to its deepest convictions if it came to hold that "in this life only we have hope in Christ Jesus". This is a small book which contains more matter for reflexion than most large ones; may it be widely read—and not only by members of the challenged Churches!

W. R. MATTHEWS.

ABORIGINAL TRIBES OF TRAVANCORE

The Travancore Tribes and Castes

Vol. 3: The Aborigines of Travancore. By L. A. Krishna Iyer. Pp. xxiii+176+54 plates. (Trivandrum: Government Press, 1941.)

THE late Dewan Bahadur L. K. Ananthakrishna Iyer will long be remembered as one of the pioneers of Indian ethnography, and his son, Mr. L. A. Krishna Iyer, of the Travancore Forests Department and at present in charge of the Ethnographic Survey of that State, is commendably following in his father's footsteps. His third volume of "The Travancore Tribes and Castes" has just been published. The first volume gave individual accounts of seven of the Travancore hill tribes, the second volume dealt with another eight tribes, and the present volume deals with all the fifteen comparatively and generally instead of severally.

Inevitably, no doubt, much of the previous information given is reiterated, and there are perhaps unnecessary duplications of tables and charts showing stature, cephalic index, etc., while the illustrations are in many cases repeated from one or other of the previous volumes. Ten pages are taken up with extracts from reviews in the Press and complimentary letters from individuals with regard to the contents of the first two volumes. There is, however, new material as well in the volume under review, apart from the comparative treatment. Thus there are a couple of pages on the blood-groups of Travancore tribes, in so far as figures are available. The results are interesting as suggesting three different strains among the South Indian aborigines, one in which group *O* constitutes about 50 per cent and *A* about 30 per cent, such as the Kadar, suggesting comparison with the Bushmen and Australians, another in which *O* is comparatively low, 20 per cent, while *A* stands at 60 per cent, the Paniyan, and a third, the Kanikkar, in whom the *O* group stands at about 50 per cent again, while *A* is less than 20 per cent and *B* is nearly 30 per cent. This is not a high percentage for *B* as figures for India in general run, but it is in marked contrast to both of the former groups.

A short chapter is also given to megalithic monuments, of which there are some good photographs. The author apparently inclines to Perry's view that megalithic monuments are everywhere to be associated with the search for gold on the part of "the archaic civilization". He quotes Newbigin to the effect that the uniformity of structure of megalithic monuments in India and Europe is accompanied by a corresponding uniformity of the skeletons contained therein, as all are dolichocephalic. The words used, however, do not seem to be actually Miss Newbigin's (her name,

too, is misspelled) and go farther than her actual text seems to warrant.

A chapter on racial affinities compares the views of various authorities. As elsewhere, the author modestly refrains from committing himself to any particular view, being content to sum up what others have stated. Other chapters deal with traditions, domestic life, exogamy, marriage, taboo, inheritance, etc., disposal of the dead, religion, and occupation and the clash of culture. The data set out have in many cases been given in the previous volumes when dealing with the tribes individually, but are here treated as a whole. The author occasionally leaves us in doubt as to his real meaning. Thus when he says that "the nephew of the Pulaya inherits the mortar and pestle and the youngest wife of his uncle" and takes his aunt to wife, presumably he means that the man marries his mother's brother's widow, as the system of the Garo tribe of Assam is adduced in comparison ; but it is nowhere made clear that he does not marry his father's brother's youngest widow, and we learn from vol. 1 that a Malapulaya may marry the daughter of his mother's brother or of his father's sister. A detailed note on the question would be worth publishing.

The issue of this volume completes the three volumes on the Travancore tribes, but the castes proper have not been touched in them, and it is much to be desired that the author should now proceed and deal with the castes. Most of the castes to be found in Travancore have been dealt with individually by Thurston and Rangachari in "The Castes and Tribes of Southern India", or by Mr. Iyer's own father in his "Cochin Tribes and Castes", so that a general approach on the lines of the present volume would be the most useful. Indeed a treatment of castes in this manner has possibly not yet been tried. Here is an admirable opportunity, and it is to be hoped that the Travancore State will not fail to make use of Mr. Iyer to complete a valuable series.

MOSQUITOES OF AFRICA

Mosquitoes of the Ethiopian Region
3 : Culicine Adults and Pupæ. By Dr. F. W. Edwards. Pp. viii+499+4 plates. (London : British Museum (Natural History), 1941.)

THE present is the third and final volume of a general monograph of the mosquitoes of tropical and subtropical Africa. The first volume (1936) by Hopkins dealt with the larvæ of the Culicine mosquitoes and covered both their biology and external anatomy. The second volume (1938) by the late Dr. Alwen Evans, gave a very detailed account of the Anopheline mosquitoes from all points of view. The present volume includes the adult and pupal characters of the African Culicines, together with the late author's judgment about the affinities of this difficult group. It may readily be understood that it has not been easy to secure coherence between the first and third volumes, which divide the account of the Culicines, and have come out at a five-year interval : none the less they are not seriously discrepant.

The greater part of the present book is descriptive and systematic : it deals with some 290 species of Culicine mosquitoes. The descriptions have been freshly drawn up for the present book, which also contains keys and lists of localities. It is illustrated by many hundred line drawings.

It is sometimes thought that a systematic work must be so specialized as to appear dull to the ordinary reader, but there are a number of points of very general interest in the volume before us. Owing to the need to recognize early stages in the field (in order to control mosquito breeding in the particular spots where harmful species breed) much attention has been given to the larvæ of these insects : indeed one might say that there are few groups of insects in which the early stages of so large a proportion have been collected, figured and considered. We have therefore what is still unusual, a systematic work which takes into account the early stages as well as the adult. The late Dr. Edwards had an encyclopædic knowledge of everything pertaining to these insects and could certainly use larval and pupal characters with as much mastery as he could those of the adult. It is therefore interesting to observe that, in his opinion, precedence should be given to the characters shown by adults, in those cases where there appears to be a conflict between the evidence derived from the adults and from the early stages.

The very close study to which African mosquitoes have been subjected has revealed information of general interest about the characters which sometimes separate species. There are, for example, several little groups in which there are sharp characters in the male genitalia, but no others, either in the external anatomy of the mosquitoes themselves or of their larvæ : but one is not entitled, from this, to conclude that specific differences will invariably be found in the genitalia,

for in other groups there are 'good species' with evident differences in pattern and colour but no points of distinction in the genitalia. There are also several instances of insects which are more readily distinguished in the immature stages than in the adult.

The book includes an excellent, well-illustrated introduction to the external anatomy of Culicine mosquitoes (adults and pupæ) with special reference to the characters used in systematics. This part of the book has considerable general value.

Dr. Edwards has given a large amount of space to discussing the zoogeography of his subject, and the provinces and subprovinces which may be based on these considerations. On the whole, he is able to accept the regions already proposed by Chapin for African birds.

The volume is a very scholarly addition to knowledge. In this, which was perhaps his last major work, the late Dr. Edwards has left something which will be of value not only in Africa but also in all other parts of the world. P. A. BUXTON.

RECENT ADVANCES IN PHYSICS

Reports on Progress in Physics
Vol. 7 (1940). General Editor: J. H. Awbery. Pp. iii+362. (London: Physical Society, 1941.) 22*s*. 6*d*. net.

IN spite of 'blitzes' and 'black-outs', of paper shortages and general war tension, vol. 7 of the Physical Society's "Reports on Progress in Physics" for the year 1940 has duly made its appearance, as well printed, well produced and not notably slimmer than usual. Physicists have come to rely on these annual volumes to keep themselves alive to developments in parts of their vast subject not peculiarly their own pet province, and the Society may be congratulated on the courage and foresight which have enabled it to continue the series through at least the first two years of the greatest war in history.

What hair-breadth escapes the volume may have suffered during production, and what may have been the editorial difficulties we are left to guess. The editor offers no apologies, for none are needed; and if he feels, as well he may, a quiet glow of satisfaction at a job well done under trying conditions, he allows no sign to escape him. Only here and there a modest footnote indicates that the times have not been quite normal. Future generations of readers—for these volumes are of more than ephemeral interest—will no doubt learn with surprise that "Dr. Eirich was engaged on this article when he was interned, and it has therefore been necessary to print it without bibliographical references". For the rest, the substitution of one author for another in one of the articles, and the inability of two others to follow up their very interesting article on the "Electrical Discharges in Gases" with a second part dealing with the practical applications of the subject are the only other *contretemps* recorded.

One of the anticipated joys of skimming through the latest volume of "Progress Reports" is the realization of how many branches of physics there are of which one knows next to nothing; and further, how many others, which one thought to have been worked out and safely interred in the pages of some standard text-book, have suddenly taken on a new lease of life. Dr. E. G. Richardson has collected more than ninety references to papers on sound published within the last two years (we wish he could have worked them into a rather more connected story) and Dr. Beattie and Dr. Stockmeyer, of the Massachusetts Institute of Technology, have found something fresh to say on the subject of "Equations of State". "Infra-red spectra," one knows, is a serial story which is likely to run through many volumes, but Dr. Harald Nielson's instalment in the present volume (again a contribution from the United States) is very welcome. One might have thought, however, that "Surface Tension" had been definitely cleared up. Dr. R. C. Brown in his article on the subject convinces us to the contrary.

What is generally known as "Modern Physics" is, of course, represented, though the editor, as usual, has wisely confined it within reasonable bounds. Dr. Feather writes on "The Gamma Radiations emitted in Nuclear Processes" and Dr. Peierls contributes an excellent article on "The Bohr Theory of Nuclear Reactions". Though it may seem a little invidious to distinguish a particular author when all are so good, one must say that Dr. Peierls's article is a model of the way in which such things should be done. With a minimum of mathematical symbols he succeeds in conveying to the average physicist, who has neither the time nor (to be quite frank) the mathematical ability to follow the original papers, a clear picture of the physical principles involved in the argument, and in convincing him of their plausibility.

Astronomy is represented by articles on solar physics, by Dr. Thackeray, and on the absorption of light in interstellar space, by Dr. Hunter. Dr.

Roberts gives an interesting account of interactions of gases with metals and crystals. Technical physics provides material for articles on photo-electric photometry, electron microscopes and new lenses ; and, in different vein, Dr. Allan Ferguson provides a charming little postscript on the development of the teaching of experimental physics in British universities.

It is an interesting and well-chosen menu which the editor has provided for his readers this year, and, on the whole, it is admirably served up. The authors have kept in mind the fact that, however much we may deplore it, the average physicist professionally engaged in cultivating his own little section of the field is no longer an expert in other parts of the subject, and looks to "Progress Reports" to keep him *au fait* with developments there. He will not be disappointed with the present volume. In the dark days through which we are passing, though money is being lavished on research on a scale unthinkable in the days when physicists were merely engaged on the advancement of learning and the betterment of mankind, it is unlikely that the results of their work will be available for publication in the near future ; though we may hope that something of permanent value in science will result from so much strenuous activity. World war must call a halt to progress in physics, as to so many other civilized activities. We trust, however, that the ingenious editor will still be able to find some progress to report, and that he will find ways and means of reporting it.

J. A. CROWTHER.

ZOOLOGICAL LITERATURE

The Zoological Record

Vol. 76 : Being Records of Zoological Literature relating chiefly to the Year 1939. Compiled for the Zoological Society of London by A. G. Brighton, M. Burton, A. B. Hastings, C. A. Hoare, W. Nicoll, A. E. Salisbury, J. K. S. St. Joseph, W. L. Sclater, M. A. Smith, C. J. Stubblefield, E. Trewavas, E. I. White, R. J. Whittick, and the Imperial Institute of Entomology. Edited by Malcolm A. Smith. Pp. 1420. (London : Zoological Society of London, 1940.) £3 ; also in 19 Sections, issued separately.

THE seventy-sixth volume of the "Zoological Record", dealing with the literature published in 1939, appears a good deal later than usual (although some of the sections were issued separately many months ago), which, in the circumstances, is less surprising than that it should appear at all. Its compilation under war conditions must have involved much additional labour and great determination on the part of the editor and his contributors, and they are to be warmly congratulated on the completion of their task.

The arrangements for the cataloguing and indexing of scientific literature are among the problems of reconstruction that will have to be considered when the scientific world can again turn its attention to such things. It may not be inopportune, therefore, to inquire how far the "Record" meets the needs of present-day zoologists, and whether any improvements can be suggested to meet the needs of the future, so far as these can now be foreseen.

The "Zoological Record" is, by a long way, the senior of the current bibliographies that serve the congeries of sciences grouped under the name 'zoology'. To have maintained a continuous existence for more than three-quarters of a century is sufficient evidence of usefulness. Nevertheless, it is matter of common knowledge that its financial position is far from secure. For many years the Zoological Society itself sustained the very heavy loss involved in the publication of each annual volume. Some fifteen years ago, in response to an appeal sent out by Sir Sidney Harmer, a number of scientific societies and institutions in Great Britain and the United States and a few generous individuals came to the help of the Society, and enabled the "Record" to be carried on. A financial statement prefixed to the present volume shows that this help continues. In the year 1939, £450 was contributed by the trustees of the British Museum, £250 by the Zoological Society, and smaller sums amounting to £172 came from other sources. These contributions, however, failed by £114 to bridge the gap between the cost of production and the amount received from subscriptions and sales. Clearly, an increased circulation must be aimed at if the "Record" is to have an assured future.

The "Zoological Record" was originally founded by systematists for systematists, and the arrangement of its subject-matter has always been predominantly systematic. It will be generally agreed that in this respect it has been, on the whole, remarkably successful. It is still the only publication to which the zoologist can turn with the

certainty of finding (within the limits of human fallibility) references to all new genera and species, and all important additions to the systematic knowledge of species already named and described. There can be very few serious workers in any branch of descriptive zoology, in any part of the world, who find it possible to carry on without at least occasional reference to its pages. There are, indeed, some minor blemishes and a few major ones apparent in the present volume that might be remedied without increasing its bulk, but there is no need to dwell on them here.

But if the "Systematic Index" sections of the "Record" do meet, more or less adequately, the needs of systematists, other zoologists are likely to find themselves bewildered if they look for guidance to the "Subject Index". In this index a uniform classification of the subject-matter in each of the divisions of the "Record" allotted to the major groups of the animal kingdom is obviously desirable. Yet in the present volume no such uniformity exists. Each recorder makes his own choice of categories under which the data are classified and the headings used for them. This haphazard arrangement of the Subject Index makes it of little use to zoologists engaged in branches of research other than systematics.

W. T. CALMAN.

THE SCIENCE OF CANNING

Canning Practice and Control

By Osman Jones and T. W. Jones. Second edition, revised and enlarged. Pp. xiv+311+107 plates. (London : Chapman and Hall, Ltd., 1941.) 32*s.* net.

THAT a second edition of this book has been found necessary in such a short time proves that it has fulfilled a definite purpose. There are not many authoritative books on canning—a section of the food industry which, although not new (for certain of Napoleon's armies were supplied with canned foods), has nevertheless only developed to its present huge proportions during the last forty years or so—and therefore a compilation by the two authors, both of whom have had considerable (practical and theoretical) experience, was received with pleasure by those interested in the application of science to the industry. There are many new features in the second edition, but one might have expected that certain aspects of the first edition would have been altered—as they could have been with profit to the book. The difficulty, as the reviewer sees it, was to do justice in some three hundred pages to the whole of the ground which the authors attempted to cover ; a difficulty which has been experienced by many authors seeking to stress the scientific aspect of an industry whilst endeavouring to convey to the reader an appreciation of the 'practice' of the industry.

What, in effect, have the authors attempted to achieve ? They have endeavoured to bring before their readers a practical treatise on canning and an authoritative text-book on the chemistry and bacteriology of canning, and, in the reviewer's opinion have only succeeded in drawing together from a scattered technical literature and from purely scientific papers, certainly reinforced by their own practical experience, a number of facts which are largely commonplace. If the experienced packer were faced by some out-of-the-ordinary problem, reference to this book would scarcely yield an answer. The whole trouble is that limitation of space results in a superficial treatment of the subject. The best practical chapter is that concerned with packing in glass, for the information on this aspect of 'canning' is notably meagre.

The same restriction has reduced the value of the scientific sections of the volume. The reader would naturally expect authoritative statements on tests to be carried out on the products being canned. The authors have chosen to detail, as an example, some thirty-five different methods of analysis in approximately twenty pages, with the obvious result that the instructions are sometimes incomplete, sometimes ambiguous and sometimes carelessly presented.

The bacteriological sections also suffer. The authors have considered it advisable to treat with some of the fundamentals of bacteriology, but they have also practical hints to give, methods of testing to describe, with the result that both theory and practice suffer. The chapter on the staining of micro-organisms is a good one and full of useful information.

Unfortunately the book reminds the reviewer of publications where the work of the authors has been marred by a too ambitious interpretation of their object.

This is the opinion of the reviewer, but he may be the only person in step in the battalion—a second edition has been found necessary.

L. H. LAMPITT.

LOWLAND TROPICAL PODSOLS AND THEIR VEGETATION

By Dr. P. W. Richards,
Botany School, Cambridge

PODSOLS are soils characteristic of cool temperate regions with a damp climate, and until recently they were generally thought to be absent in the zone between about 40° N. and 40° S. Some years ago, however, Senstius[1] showed that podsolization occurred at high altitudes in the mountains of Java and the Philippines, though he did not find any mature podsols. Hardon[2] afterwards described well-developed podsols at about 2,000 m. in the Arfak Mountains in New Guinea (latitude 1° 10′ S.). In these observations there was nothing surprising, because, except for the smaller seasonal range of temperature, the climate at high altitudes in the equatorial zone may be very like that of cool temperate lowlands. It is the object of this article to point out that podsols (or soils similar to podsols in most of their characteristics) occur in the tropical lowlands down to sea-level, a fact which is not generally recognized and which does not accord with the climatic theory of soil development—at least in the form in which it is often stated.

These podsols of the tropical lowlands are not found sporadically, but have a wide distribution in the tropical rain-forest region of both hemispheres. They occur side by side with tropical red earths, the prevailing soil type of the equatorial zone, and are developed under the same climate. Where the rainfall permits, the natural climax vegetation of both tropical red earths and of lowland tropical podsols is usually rain-forest; but the rain-forest of the podsols has marked characteristics of its own and may be regarded as an edaphic climax. Under certain conditions (not yet understood) the podsols of the rain-forest belt may bear locally a type of evergreen scrub which is apparently also a climax type of vegetation.

These facts have been established by a series of steps which have been more or less as follows. The existence of bleached sands ('white sand') in the Tropics has been known for a long time. The botanical traveller Richard Spruce[3] met with large areas of white sand in the Rio Negro region of the Amazon and noted that the rain-forest on this soil—called by the natives *caatinga* forest—was different in composition from the forest elsewhere. The 'bleached earths' of the tropics are mentioned by Ramann, who in his "Evolution and Classification of Soils"[4] refers to the fact, well known to travellers in the South American jungle, that streams rising in the bleached soils are coloured brown by highly dispersed humus ('blackwater'), while streams from the red earth soils are colourless ('whitewater').

Bleached sands are widely distributed in the Guiana peneplain. At Moraballi Creek in the Essequibo basin, for example, a deep, porous and completely bleached sand forms a capping to low ridges and plateaux. This sand bears a highly characteristic type of rain-forest, dominated by the leguminous tree, *Eperua falcata* Aubl. (Soft Wallaba). This 'wallaba forest' is strictly confined to the bleached sand, and where it adjoins other soils the vegetation changes abruptly. In some parts of British Guiana the bleached sand bears other peculiar types of rain-forest which replace 'wallaba forest'. In 1934 a few analytical data from a soil profile in the 'wallaba forest' were published[5]. The significance of the data was not fully appreciated at the time, but it was noted as remarkable that the samples, though acid (*p*H about 4·8), gave a negative result with Comber's test, showing that they were deficient in iron as well as in bases (as would indeed be expected from their appearance).

In the Malayan region, bleached sands, similar to those of South America, were seen by Beccari[6] and probably by other travellers, but they seem largely to have escaped the notice of soil scientists and botanists. In 1932 I met with bleached sands in several localities in Sarawak (Borneo)[7], for example near sea-level at Marudi on the Baram River and at an altitude of about 750 m. on Mount Dulit. These sands were very similar to the 'white sand' of British Guiana, except that the texture was somewhat coarser. The vegetation was a type of evergreen rain-forest without a single dominant species, but strikingly different from the typical mixed dipterocarp forest which is the climatic climax of the region. This type of forest had previously been described from South Borneo by Winkler[8], who had called it *Heidewald* or 'heath forest'. The 'heath forest' of Marudi and Mount Dulit strikingly resembled the Guiana 'wallaba forest', in structure and physiognomy, though there was of course no species common to the two. Very significantly the Sarawak 'heath forest' differed from the local type of mixed rain-forest in precisely those characteristics in which the Guiana

'wallaba forest' differed from the Guiana mixed forest. The common factor between the two must clearly be a similarity of soil as well as climate.

Several soil profiles were examined in the bleached sand of the Sarawak 'heath forest'. The analyses showed the same feature which characterized the 'wallaba forest' soils—all the samples gave a negative or feeble reaction with Comber's test, though all of them were acid. In a brief discussion of these data I pointed out that the 'heath forest' soil strongly resembled a European podsol; unfortunately the analyses were not carried far enough to establish this conclusively.

The fact that the bleached sands of the Malayan lowlands are actually podsols was finally demonstrated by Hardon[9] in a paper published in 1937. from the *A* and deposited in the *B* horizon, while silica remains behind. All horizons are extremely poor in bases, even compared with other tropical soils. A striking feature is the excessively high carbon/nitrogen ratio of the humus layer (in one sample as high as 57), indicating very incomplete humification. The humus of these soils would thus appear to be of a *mor* rather than of a *mull* character.

There can be little doubt that Hardon is right in considering these soils to be podsols. Though in the Sarawak profiles no *B* horizon was found, probably because the sample pits were not deep enough, it seems certain that they belong to the same soil type. Hackenberg's[10] account of the South Bornean 'heath forest' mentions a blackened,

PROFILES OF LOWLAND TROPICAL PODSOLS.
After Hardon (1937).

Locality	Horizon	Depth cm.	Description	Percentage of sand (0·05–2mm.)	Percentage of clay (0·0005–0·005 mm.)	Organic Matter (%)	Molecular ratio $\frac{SiO_2}{Al_2O_3+Fe_2O_3}$ (for clay fraction)	*p*H	CaO (%)
Padang Locwai, E. Borneo	A_0	0–20	Brownish-black half-decomposed organic material	—	—	—	—	2·8	—
	A_2	10–120	Loose white quartz sand	97·3	0·5	0·1	—	6·1	0·008
	B	120–170	Yellowish-brown quartz sand	93·9	2·8	1·2	—	5·4	0·002
Bangka	A_0	0–10	Half-decomposed black organic material mixed with coarse sand	—	—	—	3·62	2·7	—
	A_1	10–25	Loose greyish-black hulme quartz sand	95·6	1·6	—	7·17	3·9	0·022
	A_2	25–40	Loose greyish-white quartz sand	94·0	0·6	—	8·64	6·1	0·032
	B_1	40–70	Hard pan. Dark brown, very compact quartz sand	86·9	7·2	5·2	0·42	3·9	0·029
	B_2	70–100	Loose light brown quartz sand	92·1	4·6	—	0·31	4·6	0·035

In this, soil profiles were described from the island of Bangka and from a locality in East Borneo: the vegetation in both places was *padang*, a type of heath-like scrub or poor woodland, which occurs in areas with a rain-forest climate, and which is ecologically and floristically related to 'heath forest'. Both types of vegetation are found on bleached sands, and transitions from one to the other have been recorded. Some of Hardon's data are given in the accompanying table.

Both Hardon's profiles have a surface layer of blackish humus followed by a typical bleached horizon. Below this is a coloured horizon, which in the Bangka profile takes the form of a hard pan: clearly this is a *B* horizon. The percentage of clay is less than 1 per cent in the bleached layer and even in the coloured layer it is less than 10 per cent. The silica/sesquioxide ratios are typical for podsols—high in the *A* horizon, low in the *B*—indicating that sesquioxides are being removed consolidated soil layer at a depth of 1·5 m., which is doubtless the *B* horizon. That the South American bleached sands are also to be regarded as podsols seems extremely probable, though a full series of analyses for a deep profile is still needed. A profile at Moraballi Creek showed pure white sand extending down to 6 ft.; possibly a *B* horizon would have been found at a still greater depth. Unpublished notes by Mr. T. A. W. Davis on a white sand profile at another locality in British Guiana indicate a yellow layer at 77 in., which is possibly the *B* horizon.

The occurrence in the tropical lowlands of what appear to be podsols raises some interesting pedological questions. Under a tropical rain-forest climate, owing to the excess of precipitation over evaporation, movement of the water in the soil is predominantly downwards. Owing to the constantly high temperature, which accelerates the activities of micro-organisms, humus usually does

not accumulate. Now at high temperatures in water containing little organic matter, silica is relatively soluble and the sesquioxides of iron and aluminium relatively insoluble; thus silica tends to be removed preferentially from the upper soil horizons and sesquioxides to remain behind. The chief soil-forming process in the tropical rain-forest region is thus normally laterization, resulting in the development of a tropical red earth. The opposite process to laterization is podsolization, which is the removal of sesquioxides from the upper horizons, leaving silica behind. This usually takes place at temperatures low enough to favour humus accumulation, because in water containing dissolved organic matter sesquioxides are more soluble than silica.

Now the *padang* and 'heath forest' soils of the Malay islands and the white sands of British Guiana occur in what is a typical rain-forest climate both in respect of temperature and of rainfall. Indeed these soils are found side by side with typical red earths bearing normal mixed rain-forest. Why should podsolization sometimes take place instead of laterization? Hardon gives no complete answer, nor can one be offered here; but it is at least clear that the nature of the soil-forming process must be ultimately determined by the properties of the parent rock. The bleached sands of Borneo are derived from coarse-grained Miocene sandstones which are probably initially poor in bases and in materials which would readily weather to a clay fraction. The Guiana podsols probably arise directly from white sands ultimately derived from the breakdown of granite, but afterwards sorted and deposited in a shallow sea during the Tertiary. Here again the parent material was probably deficient in bases and clay-forming materials from the beginning. In these extremely base-deficient soils there seems to be a tendency for raw humus to accumulate, even under tropical conditions. This raw humus leads to the preferential removal of sesquioxides rather than silica. Thus the nature of the parent rock locally outweighs the effects of climate and deflects the course of soil development from the start. If this is so, it strikingly confirms the view that vegetation, animals, soil and climate are all parts of one very complex interacting system (the "ecosystem" of Tansley): to regard one component of this system as determined by any other single component has little meaning.

Though all the factors controlling their development are not yet clear, it may be accepted that podsols occur in the tropical lowlands. These *lowland tropical podsols*, as they may be called, to distinguish them from the podsols of tropical mountains and temperate regions, have a wide distribution in both hemispheres. As well as occurring in Asia and America, there are indications, though no definite evidence, that they are found in tropical Africa. They are derived from sands or sandstones poor in bases, and bear a vegetation markedly different from the mixed rain-forest of the tropical red earths, which is the climatic climax of the region. In Borneo, in habitats with unimpeded drainage, the natural vegetation of the podsols is either 'heath forest' (perhaps better termed 'primary lowland rain-forest of bleached sands') or *padang* (evergreen scrub). The factors determining the latter are not climatic; if not due to felling, burning or some other biotic factor—as seems to be the case—it must depend on some soil factor, possibly a high degree of podsolization. In swampy habitats on soils of the podsol type, wood-moors (*Waldmoore*) develop. These are extensive lens-shaped masses of peat bearing a peculiar forest vegetation. They are found in the low-lying coastal plains of Borneo and Sumatra, and as shown by Polak[11], are closely comparable with the raised bogs of temperate regions, though the peat is formed chiefly of wood, not of the remains of herbaceous plants. In ordinary tropical swamps there is little tendency to accumulate raw humus; the peat-formation in these wood-moors cannot be due only to water-logging and consequent poor aeration. Possibly the very low concentration of bases in the ground-water inhibits the activities of micro-organisms.

In South America there are analogues to 'heath forest', *padang* and wood-moors. The 'wallaba forest' of Guiana, and other types of white sand forest, are the counterparts of the Bornean 'heath forest'. A corresponding type to *padang* in South America is the so-called '*muri* bush' of British Guiana, a low evergreen scrub dominated by *Houmiri floribunda* Mart. This occurs on white sand, chiefly as islands in 'wallaba forest'. Finally there are the 'pegass swamps' of the Guiana coastal plain, which though little investigated, are certainly very similar to the Malayan wood-moors.

The main reason why tropical podsols have been neglected is no doubt their low agricultural value. Attempts at farming on the white sands of Guiana show that they are unsuited to any kind of permanent cultivation (see Milne[12]).

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TWO THOUSAND YEARS OF HOME LIFE IN NORTHERN SCOTLAND*

BY DR. A. O. CURLE, C.V.O.

AT the extreme southern end of the mainland of Shetland there towers up the massive headland of Sumburgh Ness. Sheltered behind the Ness, and flanked by a long promontory which springs from the mainland on the west, is the Sumburgh Voe, a peaceful stretch of water running inland for about a mile. From the west side of the Voe, a low grassy headland rises above the general level of the coastline, affording a site for the various buildings which, now in ruins, bear the name of Jarlshof.

Some forty years ago, a violent storm swept the sand from the front of the shore bank on the side of the Sumburgh Voe and exposed some buildings. Here, adjacent, more extensive excavation in recent years has brought to light a group of dwellings, dating from the pre-Bronze Age of Shetland down to the Viking period in the eleventh–twelfth century.

The first dwelling to be described belonged to a pre-metal period in Shetland, for not a trace of metal or of any metallurgical process was found within it. It was a house built of drystone with flat-sided boulders selected from the adjacent beach, the walls of which still stood to a height of 2–3 ft. On plan it was elliptical, with the entrance in the centre of one end, and consisted of a small central courtyard, measuring some 10 ft. in diameter, with, on one side, two small cells rounded at the back, and, on the other side, two less deeply formed recesses, with a long chamber placed transversely at the back and measuring some 10 ft. by 6 ft. 6 in. There was ample evidence that the house was arranged to accommodate the cows as well as the family. Beside one of the lateral chambers lay the quernstone, *in situ*, a long trough-like contrivance, open at one end, on which the inhabitants had ground their grain, with the rubbing-stone lying nearby. Against the inner side of the front wall of the house lay four small four-sided pots of steatite or soap-stone, evidently drinking-vessels, three of them as fresh as on the day on which they had left the maker's hand, and the fourth, a bottomless specimen which, inverted, had been used for the support of one of the others. The house must have been hurriedly vacated, and the drifting sand had dropped its mantle over everything before any marauder had come to disturb the contents. Sherds of pot represented the food vessels and cooking-pots. At a height of about 2 ft. above floor-level there projected from the side wall, opposite to where the quern lay, a small vertebra of a whale, placed in such a way that the side of the canal down which passed the spinal column protruded from the wall-face, thus providing a loop to which a cow or a calf could have been tethered.

Numerous relics were found in the dwelling, including a number of rude stone tools, among them objects of slate fashioned with serrated or sharp cutting edges, probably used in the preparation of skins, and closely resembling relics found in Norway belonging to the Arctic culture, and referable to a post-Magdalenian period. As neither whorls for spinning nor combs to be used in weaving were found we may presume that clothing was entirely formed of hides, carefully prepared with the help of the many slate and bone objects found in the course of the excavation. The pottery was rudely fashioned by hand, and without ornamentation, and the cooking for which it was used was effected by sinking the pot in the peat fire up to the shoulder. From the encrustation on the inner face of the potsherds, the diet appeared to have consisted largely of stews.

From the entrance to this house a stone-paved passage of secondary construction, led by a rude stair of two or three steps, to a corridor. At the end of this corridor, on the right, a doorway opened into a small chamber. Here was a vivid picture of the life that had been lived within. At the entrance lay a quern, and, set up against it, ready to hand, was the rubbing stone to be used upon it. There was no trace of grain near it, so, presumably, the quern had been used for working up the clay which was found nearby, as a film of that substance was found on the surface of more than one of these querns in the course of the excavations, indicating that the grinding of grain was not the only purpose for which they were used. On the opposite side of the doorway from that on which lay the quern, was a heap of clay, carefully levigated, and still in a perfectly plastic condition suitable for making pots. Behind the quern were the remains of the fire on which the pots were, no doubt, fired; while in the wall behind the quern was a small ambry.

A doorway on the other side of the passage gave access to another house.

* Substance of a lecture entitled "Glimpses of 2,000 Years of Home Life as revealed by Excavations in the North of Scotland" delivered at the Royal Institution on May 15.

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DR. E. D. HUGHES and PROFESSOR C. K. INGOLD
"Mechanism and Kinetics of Elimination Reactions."

DR. J. N. E. DAY
"Mechanism and Kinetics of Esterification and Ester Hydrolysis."

DR. J. W. BAKER
"Mechanism and Kinetics of Aromatic Side-chain Substitution."

DR. A. E. BRADFIELD and DR. BRYNMOR JONES
"Mechanism and Kinetics of Aromatic Substitutions and Rearrangements."

DR. H. B. WATSON
"Mechanism and Kinetics of Prototropic Change."

DR. R. P. BELL
"Mechanism and Kinetics of Additions to Carbonyl Compounds."

DR. GWYN WILLIAMS
"Mechanism and Kinetics of Additions to Olefinic Compounds."

DR. F. FAIRBROTHER
"Mechanism and Kinetics of the Fridel-Craft Reaction."

DR. J. KENYON
"Mechanism and Kinetics of Anionotropic Change."

PROFESSOR G. M. BENNETT
"Mechanism and Kinetics of Ring Closures."

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"Mechanism and Kinetics of Reactions involving Free Radicals."

The papers will as usual be available in advance proof so that the time of the meeting may be devoted to discussion.

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

The plan of the courtyard house is as ancient as the time of the Minoan culture of Crete[1], reckoned to have belonged to a period between the second and third millennium B.C., and, as there is an absence among the relics from Jarlshof associated with the houses of this type, which would connect its introduction with any folk immigration, it may well have been traditional there from the advent of the Neolithic inhabitants to the island.

To the right of the entrance, on coming into the house, was a cell somewhat smaller than the rest. The front had been purposely blocked by large stones laid across it, and the cell itself had been converted into a rubbish pit in which were found some remarkable relics. Among them were numerous fragments of clay moulds which had been used for casting bronze swords; pieces of more than one mould for casting a bronze axe; a piece of the matrix of a mould for a pin of the sunflower type; and several other fragments of moulds for indeterminate objects.

Clay moulds of the Bronze Age are exceedingly rare in Great Britain, and, not many years previous to this, the first recognized fragment of a sword-mould had been found on Traprain Law, near Haddington. It had previously been doubted, moreover, whether bronze had ever reached Shetland, and the appearance of a bronze sword on the island, far less the existence of a factory of them, had never been dreamed of.

On a secondary hearth was found a number of grains of bear, a species of coarse barley, showing that the inhabitants had been cultivators of the soil, as the numerous bones of sheep and oxen in their middens and elsewhere showed that they had owned flocks and herds. The complete absence of fish bones, as well as of fish hooks and spears, seemed to indicate that they did not seek their living on the sea, though the masses of limpet shells in the middens, and, to a lesser extent on the floors of the dwellings, showed that shell-fish formed one of their main sources of food.

On the paving of the court there was visible the site of the fire on which the smith had smelted his bronze. But a more interesting discovery was to follow. On clearing the floor nearby there was found a small pit in the vicinity of the hearth, measuring across the surface some 16 in. by 9 in., and in depth 11 in., with the sides converging until they were 6 in. apart, obviously the casting-pit into which the moulds had been thrust preparatory to the reception of the molten bronze.

But, besides the technical interest in these moulds and the casting, there is an even greater interest in the evidence they afford of a fresh contact with the outer world which Shetland had acquired.

The advent of the sword-smith did not synchronize with any apparent change in the character of the inhabitants of the Jarlshof settlement. Their houses continued, during the occupation in which the moulds were found, to be of the primitive courtyard type, and their tools and implements were little, if at all, affected. True, they had acquired new and formidable weapons of war, presuming the axe to be also a weapon, for, except for use on driftwood, bronze tools could here only be of limited application, the islands being treeless. Accordingly, the moulds supply no evidence for the advent of a fresh influx of people but rather of the coming of a single sword-smith, perhaps with his family, from across the ocean, bringing with him the implements of his craft. The type of the leaf-shaped sword, the sunflower pin, and other products, show that, from whatever land he had sailed, he had been trained in the Britannico-Irish traditions[2]. As Orkney, owing to the general difference of its archæological culture, may be ruled out as the land of his origin, we must look even farther afield, to the Western Isles, or even to Ireland itself, for the source from which he ventured on the perilous seas, in what would seem to us a very inadequate vessel for so long a voyage.

Besides the moulds, relics very similar to those found in the house previously described were recovered here; but also chisel-shaped objects of bone, having the socket at one end, a type which corresponds closely with one from Denmark dating from a very remote antiquity. The presence of the Danish *Maglemös* type of chisel and of the peculiar slate tools suggests that Shetland had, perhaps for centuries, remained practically unknown to the outside world, lost in the wastes of ocean, and still preserving cultural evidence of a remote contact with northern Europe.

Adjacent to this house, but not in direct communication with it, was another and larger dwelling, which had been constructed on the ruins of a still earlier building. It also was a courtyard house. Here, too, the sword-smith had left evidence of his work, for numerous fragments of clay moulds were scattered about. In all, it was reckoned that as many as thirty swords were represented by the numerous fragments found in the settlement.

Until a few years ago, although the Viking occupation of parts of the north of Scotland and of the northern and western isles had left an indelible record in the place-names as well as in the surnames and physical characteristics of the people, yet no trace of the remains of a Viking dwelling had ever been exposed, or such a discovery recorded. By good fortune, such a house, and an associated homestead, were found at Jarlshof, which led afterwards to the discovery of another at Freswick on the Caithness coast, some five miles south of John o' Groats.

The earliest Viking houses were oblong on plan, with rounded ends. The walls were about 1½ m. thick and the same in height, and on the top of them rested the edge of the roof of timber and turf, supported by a row of wooden posts along each side of the interior. The ordinary rooms were three in number: the dining- and living-room known as the *stofa*; the sleeping-room or *skali*; the kitchen or *eldhus*. The Shetland example was a typical long house measuring, in its original state, 95 ft. in length by 12 ft. at either end, and 18 ft. at the centre.

At Freshwick a bath house was discovered. It was a small chamber, forming a somewhat irregular square of about 5 ft., with an entrance by a step in one side. The floor was carefully paved, except for a small area, in one corner where the fireplace had been, and which was filled with burnt broken stones and peat ash. From the floor a well-fashioned drain led through the wall of the chamber, and, continuing beneath covers along the floor of the main building, eventually discharged by way of an offset into a sump.

This was a typical vapour-bath, such as had been used in Scandinavian countries since early times, and which may still be met with there in country districts.

[1] Childe, "Prehistoric Communities", p. 183.
[2] Childe, *ibid.*

OBITUARIES

Dr. R. Bracher

DR. ROSE BRACHER, who died after a short illness on July 15, was born in 1894, the elder daughter of Reuben Bracher, a well-known teacher in Salisbury. She was educated in Salisbury and at the University of Bristol, where she graduated with first-class honours in botany in 1917. A year later she took her M.Sc. and then spent two years as demonstrator in the London School of Medicine for Women. The award of the Rose-Sidgwick fellowship allowed her to spend a year at Wisconsin, after which she returned to London as lecturer at East London College. In 1924 she came to Bristol to undertake research work; in 1926 she became assistant lecturer in the Department of Botany and in 1929 lecturer. In 1940 she was appointed senior lecturer—a title reserved for those who have given distinguished service to the University. A month ago she was elected a member of the Senate.

Dr. Bracher's principal scientific work was a study of the ecology of the great tidal mud-banks of the Bristol Avon and especially of the species of Euglena, which is the most conspicuous feature of its vegetation. Euglena appears on the surface and sinks into the mud with a rhythm which is largely caused by variations in illumination, and Dr. Bracher succeeded in working out in detail the part played by light and other factors in this striking phenomenon. The results were published in three distinguished papers in the *Annals of Botany* (1919), the *Journal of Ecology* (1929) and the *Proceedings of the Linnean Society* (1937). During the last ten years she was constantly engaged, along with her students, in work on the ecology of the Bristol district; the results have appeared in a series of papers of the greatest use to students of the vegetation of Somerset. As another consequence of this work she published two books, "Field Studies in Ecology" and "Ecology in Town and Classroom", which have been of especial use to teachers, showing, as they do, how interesting work can be carried on even in very unfavourable conditions.

Dr. Bracher was an admirable teacher and her services were much in demand for extra-mural work. She had notable success in rousing to an interest in biology members of W.E.A. classes and of others of that kind. In the University she had an unrivalled knowledge of the students, their problems and difficulties, and for some years she had been warden of the Women Home Students' Society. The tragedy of her early death is felt by a wide circle of colleagues and friends.

M. SKENE.

Sir Francis Anderson

THE death is announced of Sir Francis Anderson, emeritus professor of philosophy in the University of Sydney.

Sir Francis, who was eighty-two years of age, must have been almost the last survivor of that remarkable succession of pupils of Edward Caird (professor of moral philosophy in the University of Glasgow during 1866–1894) who themselves attained eminence as professors of philosophy. After an outstanding undergraduate career, crowned in 1893 by the award of first-class honours and the Clark fellowship in mental philosophy, Anderson spent two years as Caird's assistant, two years as assistant minister of the Australian Church in Melbourne, and then started upon his long and fruitful career as a teacher of philosophy in the University of Sydney—first as lecturer, and later, from 1890 until 1922, as professor in the newly founded chair of logic and mental philosophy.

Among the distinctions which marked this period were the presidency of the Mental Science Section of the Australasian Society for the Advancement of Science in 1897, and the presidency of the Social Science Section in 1907. Retirement from academic duties brought no abatement in his philo-

sophic interests, and from 1923 until 1927 he acted as editor of the *Australasian Journal of Psychology and Philosophy*. In 1927 his Alma Mater recognized his notable services to learning by conferring upon him the degree of doctor of laws. In his later years the cause of the League of Nations claimed much of his time and energy, and he was, from 1931 until 1936, president of the League of Nations Union (New South Wales). In 1936 he was created a knight.

Sir Francis's contribution to the literature of his subject was chiefly in the form of papers; but although he produced no major philosophical work, his influence upon the development of philosophical studies in the land of his adoption was powerful and widespread. The sphere of his academic influence and interests, however, extended far beyond the narrowly philosophical. The social sciences in general found in him an enthusiastic and untiring champion. Indeed the successive establishment in the University of Sydney of chairs in education (1910), economics (1912) and psychology (1920) was in no small measure due to his energetic advocacy. C. A. CAMPBELL.

We regret to announce the following deaths:

Dr. C. S. Fisher, acting director of the American School of Oriental Research in Jerusalem, on July 20, aged sixty-five.

Prof. O. L. Shinn, professor of applied chemistry in the University of Pennsylvania, on June 10, aged sixty-nine.

Dr. L. A. Strong, chief of the U.S. Bureau of Entomology and Plant Quarantine, on June 2, aged fifty-four.

NEWS AND VIEWS

Sir Prafulla Chandra Rây, C.I.E.

On August 7 the distinguished Indian chemist, Sir P. C. Rây, will celebrate his eightieth birthday. As a young student, Sir Prafulla was fortunate in coming under the influence of the late Sir Alexander Pedler, then professor of chemistry at the Presidency College, Calcutta, and on his recommendation Sir Prafulla proceeded to work under the late Prof. Crum Brown at Edinburgh, where in due course he graduated with the degree of D.Sc. Returning to India he became professor of chemistry at the Presidency College, Calcutta, and he remained in this post until his retirement under the age limit in 1916. He was then appointed Palit professor of chemistry at the University College of Science, retiring owing to failing eyesight in 1937. Valuable as have been Sir Prafulla's personal investigations, mainly in the field of nitrite chemistry, his outstanding contribution has been the foundation of an Indian school of chemistry. A true 'guru', devoting much of his income to the support of poor students, he sent forth from his laboratories a constant stream of young chemists fired with a zeal for original research. These young chemists now occupy most of the chairs of chemistry in Indian universities.

Sir Prafulla's interests have not been confined solely to academic research; his historical sense is shown in his "History of Hindu Chemistry", and he was responsible also for the foundation of the Bengal Chemical and Pharmaceutical Works. Naturally, Sir Prafulla's important work for India has received general recognition. He was appointed C.I.E. in 1912 and was knighted in 1916. He is a fellow of the Royal Asiatic Society of Bengal and of other Indian academies, and an honorary graduate of the Universities of Durham and Calcutta. He was president of the Indian Science Congress in 1920 and the first president of the Indian Chemical Society (1924). We trust that he may long be spared to inspire Indian youth.

Great Britain and the U.S.S.R.

In NATURE of July 19, p. 79, brief reference was made to a broadcast from Moscow by Prof. P. Kapitza, which was addressed particularly to scientific workers in Great Britain. Prof. Vladimir Vernadsky, a veteran mineralogist and member of the Academy of Sciences of the U.S.S.R., also broadcast a message. These friendly gestures brought a reply from Prof. A. V. Hill, one of the secretaries of the Royal Society, who broadcast greetings to Russian colleagues and a reply to Prof. Kapitza in the European News sent out by the B.B.C. at midnight on July 14. Since then the Royal Society has dispatched the following cable: "President and Council of Royal Society London send greetings of Royal Society to National Academy of Sciences of U.S.S.R. Moscow. Our countries stand firm as partners in struggle against wanton aggression and our united efforts will ensure that the future of science is not endangered by destruction of those freedoms in which has thrived the work of the great scientists of both our countries enshrined in records of past and achievements of present. In the struggle science has already made and will continue to make essential contributions to victory."

Other bodies and individuals have joined in expressing their satisfaction that the U.S.S.R. can now be numbered among the Allies fighting against Nazi domination. The committee of the Division for the Social and International Relations of Science of the British Association has sent to the Academy of Sciences at Moscow a cable welcoming the alliance of British and Russian science, and expressing the hope that they "may in the near future be united in application to the establishment of a new and happier ordering of the affairs of mankind". The Cambridge branch of the Society for Cultural Relations with the U.S.S.R. sent a cable signed by the vice-chancellor and other members of the University

of Cambridge to the Academy of Sciences, to which Eugene Chudakov, vice-president of the Academy, has replied; and a group of biochemists at Cambridge, headed by Sir Frederick Gowland Hopkins and Dr. Joseph Needham, have sent "greetings and assurances of utmost support" to Russian biochemists through Profs. Bach and Engelhardt, of the Academy of Sciences, and the latter has replied, expressing his conviction that "the cause of progressive humanity will triumph over Hitlerism". Prof. Kapitza and Prof. P. A. M. Dirac, Lucasian professor of mathematics in the University of Cambridge, have also exchanged cables of greeting affirming their belief in victory for freedom of scientific thought.

"Fantasia"

THE new film, "Fantasia", shortly to be generally released, will appeal not only to lovers of music, but also, from several points of view, especially to men of science. The basic theme of the film is the interpretation by artists of several well-chosen musical works. The fact that artists were chosen to interpret the music is a new departure for the screen; but of equal interest are the evidences of new technique adopted. The stereoscopic effect produced at the beginning of each half of the programme gives an almost complete impression of reality—in fact, for a moment it seemsal most impossible not to believe that the Philadelphia Philharmonic Orchestra and its conductor, Stokowski, are on the stage of the cinema. The first presentation—one of Bach's toccatas and fugues, so difficult to interpret as anything other than pure music that even the composer could not find a name for it—is here interpreted in a series of colour and wave forms that should delight and intrigue the physicist. He, too, will be amused by the introduction to the audience of the sound track as a "screen personality". Coyly comes the sound track on the screen where he is induced to demonstrate how he reacts to the sounds of various wind and string instruments. Though his reactions are impressionist to a degree, they are obviously based on the actual scientific facts.

Tschaikovsky's "Casse-noisette" is interpreted in a beautifully coloured floral ballet of a type familiar to regular cinema-goers; but susceptible lovers of Beethoven might be irritated by the interpretation of his "Pastoral" symphony-life on Mount Olympus. It is said that Beethoven claimed to compose always according to a "picture" he had in mind. Several years ago, the Russian Ballet based his wonderful seventh symphony on a religious theme, and it still remained Beethoven. But in "Fantasia", Beethoven appears as someone quite different, and not to our liking. The unusual continuity of the whole piece, without the slightest break between movements, might have contributed to our irritation. But Beethoven was a musician; to disarm such criticism "Fantasia" can definitely claim to be an artistic appreciation and interpretation of music.

There was one exception—and this number was an exposition of the origin and evolution of life by a group of men of science, and accompanied by Stravinsky's music. At any rate, the item claimed to be the origin of life; actually it represented the origin of the earth and was followed up by the origin of life and its evolution up to the arrival, and comparatively sudden extinction, of the giant reptiles of the Mesozoic. It is obvious that Mr. Disney carefully consulted authoritative astronomers and biologists before embarking on this unique production. The film lost its cartoon qualities and became almost real—Amœba engulfing its prey, Hydra somersaulting, other aquatic life, Pterodactyls, the small-brained herbivorous Brontosaurus and the fierce, carnivorous Tyrannosaurus, all coming to life in their true perspective so far as science is able to visualize it. This number will probably appeal most of all to men of science; despite certain detailed faults, it hus much more than entertainment value, as indeed has the whole film.

The Profession of Chemistry

IN his presidential address to the Society of Chemical Industry (*Chemistry and Industry*, July 12, 1941), Prof. J. C. Philip outlined the history of recent efforts made by chemists to bring order and co-operation into their ranks by the formation of some kind of federal union. These efforts began at the close of the War of 1914–18, at the instigation of the late Lord Moulton, and are still continuing. So far they have had little result, and their recapitulation would have little interest except to chemists and possibly to other professional men who desire to substitute co-operation for extreme individualism and *laisser-faire*. Sectionalism, as Prof. Philip says, has undoubtedly been a determining factor in the want of success, but another, not mentioned by him, has been inability to choose the right type of leader, a defect which seems to be common in many democratic organizations. A learned professor, however brilliant in his own special field, will fail unless he possesses the power of influencing other men's minds, and his failure may lead to the emergence of the self-appointed type of leader who has a gift for oratory, that harlot of the arts, *et præterea nihil*.

At the present time, the movement towards union is in charge of a Chemical Council, which was set up in July 1935, under a deed of agreement between the Chemical Society, the Institute of Chemistry, and the Society of Chemical Industry. Each of these societies is represented by three delegates, and there are also three co-opted representatives of industry, nominated by the Association of British Chemical Manufacturers. The Council undertakes the general administration of the funds available for the educational and scientific publications of the constituent bodies. The library of the Chemical Society, which has long outgrown the narrow confines of its rooms in Burlington House, is to remain the property of that Society but to be administered by a joint committee of the various bodies contributing to its maintenance. The Council disposes of funds that for the present seem adequate, but these would have to be largely supplemented were the old idea of a Chemistry House to materialize. A year ago a supplementary agreement was signed

extending the validity of the original agreement until 1947. Progress in collaboration has recently been effected by instituting a scheme which facilitates joint membership of two or three of the societies under payment of a reduced total fee ; and by giving members a wide choice of publications up to a specified limiting value. The provisions of the deed aim primarily at 'roping in' as many as possible of the 14,000 (?) scientific chemists now practising their profession, with the view of promoting the progress and status of chemistry in its threefold aspect of science, profession and technical applications. Nothing appears to be said about the obligations of the profession to the community, but there is little doubt that these could be and would be far better met by a united profession than by what has been called "a disunited rabble".

Rockefeller Foundation's Gifts to the National Central Library

AT a time when the Trustees of the National Central Library are faced with difficulties beyond the normal, as a result of the loss by enemy action of about half its books and the greater part of its London building, the emergency grant of £2,200 which has recently been made by the Rockefeller Foundation comes as a most welcome gift. Some of the books lost will be irreplaceable, but, fortunately, many of them can be bought as the demand for them arises. The timely aid of the Rockefeller Foundation will be appreciated by many thousands of persons who will benefit by the valuable additional service thus placed at their disposal. The grant is also another illustration of the practical sympathy of the United States with the difficulties which have to be dealt with by those responsible for the work of cultural institutions in the British Isles. By helping the National Central Library, the Rockefeller Foundation is indirectly helping all other libraries which make use of the national service. The Rockefeller Foundation is also continuing to provide money for the upkeep of the Bureau of American Bibliography at the National Central Library.

Physical Society: Annual General Meeting

THE sixty-seventh annual general meeting of the Physical Society was held on July 25 in the lecture theatre of the Science Museum, with Prof. Allan Ferguson in the chair. The reports of the Council and of the treasurer were adopted and the following officers for 1941–42 elected. *President :* Dr. C. G. Darwin ; *Hon. Treasurer :* Dr. C. C. Paterson ; *Hon. Secretary (Business) :* Dr. W. Jevons ; *Hon. Secretary (Papers) :* Mr. J. H. Awbery ; *Hon. Librarian :* Dr. L. C. Martin ; *New Members of Council :* Prof. E. N. da C. Andrade and Dr. H. Shaw. Prof. Ferguson will undertake the duty of acting-president until Dr. Darwin is able to take office. The Council has to record a very successful year's work in difficult circumstances. Despite exceptionally heavy losses by death, the membership of the Society is scarcely affected, standing at 1,070 members at the end of 1940, as compared with 1,084 members twelve months earlier.

For the science meetings of the Society, the Council has adopted a new policy which has been justified by its complete success, the majority of the meetings having been devoted to discussions and to lecture-surveys. Discussions have been held on colour, the liquid state, the electrical and general physical properties of plastics, and the teaching of the fundamentals of electric and magnetic theory. Lecture-surveys have been given on contact-angles (Prof. Allan Ferguson), anemometry (Prof. P. A. Sheppard), gravity meters (Dr. J. McG. Bruckshaw), the magnetic hysteresis cycle and its interpretation (Prof. L. F. Bates), and some mechanical properties of glass (Prof. W. E. S. Turner). An outstanding event was the formation, within the ambit of the Society, of a Group for the discussion of scientific and technical problems relating to colour. The Group has already held three very profitable meetings, and its success encourages the initiation of similarly constituted groups for the discussion of problems of special interest to experts on the subjects to which the groups are devoted.

A Clouded Yellow Butterfly Invasion

ONE of the most interesting entomological features of the summer of 1941 is the invasion of clouded yellow butterflies (*Colias croceus* or *Edusa*) from the Continent which, since the first week of July, have been seen in Lancashire and Cheshire and various other parts of the north of England. This immigration has nothing to do with the War ; it is one of the more spasmodic immigrations of insects which occur from time to time, the classic example being the 'great *Edusa* year' of 1877, when flights ranged from the Orkneys to Land's End and Ireland. Several were seen in 1933, 1926, 1913, 1872, 1864, 1862 and 1859 and odd specimens in the north in other years like 1930. The greenish-white variety *helice* Hubn. has also been seen; while the rarer pale clouded yellow (*C. Hyale*) was observed in 1860, 1872, 1891, 1900–1, and at least one specimen has been noted at Ness, west Cheshire, during the present immigration of clouded yellows. A few clouded yellows from south Europe reach the south of England almost every year, arriving during May or June ; third brood larvæ are sometimes found in autumn on trefoil, lucerne or clover, and attempts at hibernation have been noted, but there is no record of surviving the winter here. Excepting in 1892, the common and pale clouded yellows are seldom abundant immigrants together.

Mineral Composition of Crops

IT is generally recognized that the mineral composition of crops has an important bearing on human and animal health, and increasing attention is being paid to the interrelationships between such fields of investigation as soils, fertilizers, plant composition and the nutritive value of food. Although it is true that several nutritional diseases can be directly traced to the deficiency or excess of particular minerals, as yet the data are usually quite insufficient for the laying down of direct recommendations for agricultural practice. A valuable review and com-

pilation of this subject has been made by K. C. Beeson entitled "The Mineral Composition of Crops with Particular Reference to the Soils in which they were grown" (U.S. Dept. Agric. Misc. Pub. No. 369). The question is approached from two main aspects, namely, the soil characteristics associated with nutritional diseases in man and animals, and the various factors which affect the mineral composition of plants. In the first case, bone diseases, anæmias, goitre and selenium poisoning are among the instances discussed, while as regards the crops, fertilizers, climate, irrigation, age and part of the plant are shown to have an important influence on its chemical composition. More than six hundred references are quoted, which cover work carried out in various parts of the world. The publication concludes with extremely useful tables giving the chemical composition of a large number of crops, figures for many of the minor elements being included.

Rediffusion of Broadcasting over Electric Mains

IN the report of the council of the Incorporated Municipal Electrical Association presented at the annual general meeting at York on June 12, one of the topics raised was broadcasting over the electric mains. In the last annual report it was intimated that in the event of legislation being promoted in this matter, the Association would press for the inclusion of a clause which would authorize electricity undertakers themselves to operate the rediffusion of broadcast programmes over their distributing mains if they so desired. Before the War, the business of rediffusion of broadcast programmes was a growing one and was, for some reason or other, outside the field covered by the electrical industry ; but the Post Office was taking a special interest in the various rediffusion companies. The *Electrician* of June 13 says that it is probable that the Post Office holds the right to take over such wireless relays if it wishes, and that the further development of broadcasting over the mains might, without adequate protection, become a Government monopoly, with the added privilege of using, without cost to the Post Office, the already existing supply mains, which were put into the roads, etc., after long research and considerable expense, by the electrical industry.

Earthquake of April 15 in Mexico

FURTHER details are now available concerning the great earthquake which took place on April 15, 1941, in Mexico (see NATURE, April 26, 1941, 507). It is stated in the news-magazine *Time* that at the tropical city of Colima, with a population of 20,000, the first shock caused the dam guarding the water supply to collapse, that it disrupted power lines and caused half the buildings in the town to collapse. The cathedral, rebuilt after the earthquake of 1932, was again destroyed, and during the night forest fires blazed round the town due to the scattering of the charcoal burning dumps by the earthquake. At least 36 people in Colima lost their lives. The shock was felt from Jalisco in the north to Oaxaca in the south, while in Mexico City just as lunch time was beginning, towers and signs swayed, church bells tinkled gently, windows rattled and pavements cracked. Mexico's tallest skyscraper, a seventeen-story office building at the corner of the Paseo de la Reforma and the Avenida del Ejido, shook and cracked and a five-story section of glass and facing stone collapsed. Fires broke out, one destroying the El Monte lumberyard after firemen had fought the blaze for six hours. No one was killed in Mexico City though 800,000 dollars worth of damage was done to property. Altogether the earthquake caused near 2,000,000 dollars worth of damage to property and at least 84 people were killed, including 27 at Tuxpan in the State of Jalisco.

The U.S. Coast and Geodetic Survey, in co-operation with Science Service and the Jesuit Seismological Association, has determined the epic ntre of this earthquake and its aftershocks from instrumental reports from twenty-one seismographic stations. The epicentre of the first earthquake at 19h. 9m. 53s. G.M.T. on April 15 was at lat. 18·8° N., long. 103·0° W., which is some 70 miles south-east of Colima, and the depth of focus normal. Strong aftershocks on April 15 at 23h. 42.6m. G.M.T. and on April 16 at 1h. 37·9m. G.M.T. had their epicentres slightly north of that of the main shock.

Beit Memorial Fellowships for Medical Research

AT a meeting of the Trustees of the Beit Memorial Fellowships for Medical Research held on July 23 it was noted that out of the thirty present fellows thirteen have already been seconded at their own request for more direct service during the War, and that six others have undertaken research work for Government departments on problems arising out of the War.

The following elections of new fellows were made, all with permission for each fellow to be seconded at any time for war duties : *Senior Fellowship* (£700 a year) to Dr. T. R. R. Mann, to continue his work on intracellular metallo-protein compounds, expecially of red blood cells, at the Molteno Institute of Biology, University of Cambridge. *Fourth Year Fellowships* (£500 a year) to Dr. J. F. Danielli, to continue his work on the permeability of muscle fibres and of capillaries, at the Biochemical Laboratory, University of Cambridge ; Dr. C. O. Hebb, to continue her studies of physiological problems in relation to high altitudes, at the Department of Physiology, University of Edinburgh ; Dr. H. Lehmann, to continue his work on the influence of shock and of the suprarenal glands on glycogen synthesis, at the Biochemical Laboratory, University of Cambridge. *Junior Fellowships* (normal value £400 a year) to Dr. E. F. Gale, to study bacterial amine production as a cause of non-specific infantile diarrhœa, at the Biochemical Laboratory, University of Cambridge ; Mr. W. Holmes, to study the regeneration of nerve fibres after injury, at the Department of Zoology, University of Oxford ; Dr. M. F. Lockett, to identify renal pressor substances responsible for experimental high blood pressure, at the Pharmacological Laboratory, University of Cambridge.

Public Health in Venezuela

THE outstanding developments in Venezuelan public health since the establishment of the autonomous Ministry of Public Health and Social Welfare in February 1936 include the building up of a well-trained full-time staff, a tuberculosis control division with child and adult dispensaries in the capital and seventeen other cities, a school hygiene X-ray division, a national institute of puericulture, a malaria control division, a yellow fever preventive service, division of sanitary engineering and ankylostomiasis, and cancer and leprosy institutes. Among the more recent developments have been the creation of a Social Service Division in 1938, the opening of its school in 1940 and the increase in the number of beds in hospitals.

Institute of Fuel

MR. W. M. SELVEY has been elected president of the Institute of Fuel in succession to Sir John Greenly, as from October next. Mr. Selvey has been very closely identified for many years with the development of fuel economy in all forms, but more particularly in connexion with the electric power stations in Great Britain and abroad.

The Melchett Medal for 1941 has been awarded to Dr. Clarence A. Seyler, of Swansea, as some recognition of his work on coal and its constitution.

Sir David Milne-Watson, Bart., has been nominated president of the Fuel Luncheon Club for the coming session in succession to Lieut.-Colonel W. A. Bristow, who has occupied the chair for the past two years.

College of the Pharmaceutical Society

IT is good news that although the College of the Pharmaceutical Society has obtained temporary accommodation in Cardiff and the Departments of Nutrition and Pharmacology have been housed at the National Institute for Research in Dairying, Reading, research work is still going on. This is evidenced by the annual report for 1940 of the research departments of the College of the Pharmaceutical Society (pp. 30, Heffer and Sons). Items of interest are: the influence of cooking on the vitamin content of foods; the components of acriflavine; the structure of γ-sugars; the quantitative determination of cinnamon and cassia and methods of assay of prolactin, heparin and suprarenal cortical hormone.

The Marine Biological Laboratory, Plymouth

WE learn from the Secretary of the Marine Biological Association that the Plymouth Laboratory, which a few months ago sustained heavy damage through enemy action (NATURE, 147, 411; 1941), has now been restored to working order. Extensive emergency repairs have been carried out, accommodation for research workers is once more available and there are limited opportunities for work at sea in the Association's motor boat. It has, however, been necessary to transfer the greater part of the library to other quarters, and only the recent volumes of current periodicals can now be consulted.

Comet van Gent (1941d)

A CABLEGRAM has been transmitted from Dr. W. H. van den Bos, Union Observatory, South Africa, announcing the discovery of a comet by Dr. H. van Gent, Bosscha Observatory, Lembang, on May 27.96965 U.T. At the time of discovery its position was, R.A. 18h. 01·9m., Dec., −40° 07′, and its daily motion was 5m. 15s. west, 41′ north. It was diffuse, with central condensation or nucleus, and the tail was less than 1° in length. The magnitude was 11. An orbit has been computed by Dr. F. J. Bobone, the elements of which, and also an ephemeris, are given below.

T	1941	September 3·362 U.T.		
ω	84°	13′	}	1941·0
Ω	256	42		
i	95	10		
q	0·8925			

Ephemeris computed by Mr. L. E. Cunningham.

1941 U.T.	1941·0 α	δ	ϱ	r	Mag.
Aug. 2·0	13h 09·7m	+31′ 20°	1·10	1·06	8·2
Sept. 3·0	12 24	41	1·4	0·9	7·5
Oct. 5·0	11 26	46	1·3	1·1	8·5
Nov. 6·0	9 25	50	0·9	1·4	9·5
Dec. 8·0	5 08	33	0·8	1·8	11·0
,, 24·0	4 06	19	1·1	2·0	12·5

The magnitudes have been computed from the sixth-power law.

Prof. Strömgren suggests that Comet Bernasconi-Zagar, discovered at Bologna on June 17, is probably Comet van Gent.

Announcements

THE Annual Congress of the Royal Sanitary Association of Scotland will be held in Glasgow on September 16–17.

A PAN-AMERICAN League against Cancer has been founded in New York under the presidency of Prof. Angelo H. Roffo, director of the Institute for Experimental Medicine at Buenos Aires.

THE subsidization of private growers of cinchona in India is being urged by the India Chemical Manufacturing Association, which points out that, if anti-malarial treatment is to be provided in India, at least 6 lakh lb. of quinine will be required annually. The present consumption is about 2 lakh lb., of which India produces about 70,000 lb., the remainder being imported from abroad.

A new national natural history society chiefly for scouts, guides and schoolboys under eighteen years of age, to be known as the Grey Owl Society, was recently formed at Haslemere, Surrey, by D. P. Faux, who is honorary secretary, the other officials being: *President*, Eric Hardy; *Editor*, P. Shaw Baker; *Hon. Treasurer*, Miss Watson. The society is to have a half-yearly journal called *Wild Life*, to publish instructive pamphlets, organize lectures, outdoor meetings, correspondence, an identification service and possibly nature study examinations. An explanatory booklet is now in the press. The secretary's address is 5 Lion Lane, Haslemere, and membership is also open to people over eighteen.

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.*

"The Philosophy of Physical Science"

I HAVE been re-reading Sir Arthur Eddington's recent book with great admiration, but also with grave doubts as to whether his philosophical position is not wholly unsound. I think he employs the word 'epistemological' in at least two different senses ('epistemological-in-form' and 'epistemological-in-substance'), and the resulting confusion of thought is disastrous to his proposed new philosophy of science.

His main contention (pp. 57, 58) is that all those laws of Nature that are usually classed as fundamental, as well as the values of the constants of Nature, can be foreseen "from epistemological considerations, so that we can have *a priori* knowledge of them". As examples of such laws he mentions (p. 39) special relativity, the uncertainty principle of Heisenberg and the modified mechanics of indistinguishable particles.

The relativity principle was not in the first instance founded on, or even suspected from, epistemological considerations; it was founded on the Michelson-Morley and other experiments. After these had resulted in a sufficient number of failures to detect absolute velocity, Einstein proposed a hypothesis which can be expressed in a great variety of ways, as for example:

(*a*) The laws of Nature involve only relative velocities.

(*b*) It is impossible to determine an absolute velocity in space.

(*c*) It is meaningless to talk of simultaneity at distant points.

While the mathematical contents of these three statements are practically identical, their forms are very different. There is nothing epistemological in (*a*) and not much in (*b*), but (*c*) is distinctly epistemological-in-form. Eddington considers that (*c*) could have been foreseen epistemologically even "if the result of the Michelson-Morley experiment had not instigated a scrutiny" (p. 39). If he is right, then (*c*) is not only epistemological-in-form, but also epistemological-in-substance. But surely he is wrong. The Michelson-Morley experiment did more than instigate a scrutiny; it disclosed one of the 'brute facts' of Nature, and it is on this fact that proposition (*c*) depends for its very existence; if the experiment had not turned out as it did, there would have been no proposition (*c*). Thus (*c*) is not *a priori* knowledge in the sense of the rationalist philosophers, or even in the sense of Eddington, who defines *a priori* knowledge as "knowledge which we have of the physical universe prior to actual observation of it" (p. 24). In its substance (*c*) is just as empirical as (*a*) and (*b*); indeed all three statements comprise virtually the same substance—an interpretation of the Michelson-Morley etc. experiments.

There is a shorter cut to the same conclusion. If light travelled with infinite velocity, it would clearly not be meaningless to speak of simultaneity at distant points. Hence (*c*) includes, as the greater includes the less, the proposition that light travels with finite velocity. Can Eddington seriously claim that this is "knowledge which we have of the physical universe prior to actual observation of it"?

It is the same with Eddington's other instances, which are taken from the quantum theory. They can all be enunciated so as to be epistemological-in-form, but no matter in what form they are enunciated, their substance is empirical; their content is knowledge extracted from observation—in this case from studies of the spectra of black bodies and of atoms.

Eddington seems to me not to trouble about the substance of laws, but to tie the label "epistemological" on to every law which can be so enunciated as to be epistemological-in-form (as so many empirical laws can be). He then claims for his labelled laws an "altogether different status from physical hypotheses" (p. 39), as well as certain special properties peculiar to epistemological laws. He tells us, for example, that such laws "have a security that is denied to those that can only be reached empirically" (p. 19), and that "whatever is accounted for epistemologically is *ipso facto* subjective; it is demolished as part of the objective world" (p. 59).

These properties, it seems to me, can only be claimed for laws which are wholly epistemological-in-substance; that is, which are entirely free from any empirical ties with the outer world, and so are *a priori* in the sense defined above. Not a single one of the laws which Eddington labels as epistemological seems to me to qualify for this category.

After Eddington's last step quoted above, there is a clear road open to his conclusion that "the purely objective sources of the objective element in our observational knowledge are *life, consciousness, spirit*. . . . The purely objective world is the spiritual world; and the material world is subjective in the sense of selective subjectivism" (p. 69). But is it not obvious that we cannot attain such far-reaching results merely by stating the results of experiment in such a way that they are epistemological-in-form?

J. H. JEANS.

Park House,
Wanstrow,
Somerset.
June 20.

IT is difficult to answer Sir James Jeans within the space of a letter; but I will begin with his statement (*c*). This is simply a statement of fact. Except in cosmological investigations, quantitative statements depending on distant simultaneity are meaningless because the reckoning has been left undefined. In the last thirty years distant simultaneity has been *by-passed*; and there is now no inducement to find a meaning for it even if we could. Among other consequences 'intrinsic similarity' of two systems necessarily means that they are related by a Lorentz transformation, that being the only criterion of similarity which does not presuppose a definition of distant simultaneity. The definition of similarity provides the norm from which are reckoned the strains which describe various kinds of dissimilarity.

In this way the Lorentz transformation has become an ingredient in the comprehensive scheme of formulation of knowledge, covering molar and microscopic physics, which comprises the equations and constants commonly classed as 'fundamental'.

Thus far I have been considering method, not observational facts. I agree with Sir James Jeans that the Michelson–Morley experiment discloses "one of the 'brute facts' of Nature". Let us try to express this 'brute fact' not in the terminology of 1887, or even of 1905, but as it appears in 1941. To say that the experiment will give a null result if strains are properly eliminated has become a tautology. The new fact is that, with the experimental precautions adopted, strains *are* eliminated.

Facts of this kind are of immense importance for progress; but they occur in other parts of physics, and we do not make a song about them. The pessimist may say: How can I keep an eye on all possible sources of disturbance, near and distant, visible and invisible? The optimist attends to a few major sources and trusts that the rest will balance out. Sometimes the optimist is right, sometimes the pessimist. In astronomy the optimist has assumed that the stars really are in the direction in which we see them—that their light rays take a straight course to the earth. The pessimist might reflect that, unless the light rays go a great deal straighter than they do in the gravitational field on the earth, they will tie themselves in knots in interstellar space. His fears are groundless, and it is of immense importance to discover that they are: but I do not know of any astronomical text-book which mentions this. The laying of bogies is an important side of progress; but it is not the practice to associate with the fundamental laws of physics an obituary of bogies.

If, following Jeans, we are to distinguish between the form and substance of a law, the substance is, I suppose, concerned with what obeys the law. In elementary cases we can indicate the substance by pointing—we point to certain objects in the sky and say that those are what Kepler's laws apply to. But as physics has grown more complex a change of method has occurred, which I think Jeans does not take into account. Description has been substituted for pointing. The change was scarcely avoidable, since we have to indicate not only an object but also the conditions in which the effects predicted by the law would occur undisturbed. The elements in the description can only be defined by their properties, that is, by the laws they obey; so that we find ourselves chasing our own tails in a purely formal system. Jeans's objection is that we know a great deal about the universe which is not mere tail-chasing. I answer: Yes; but that is not the knowledge epitomized in the existing scheme of fundamental laws and constants. Their function is to supply a system of formulating it.

I have been considering what the Michelson–Morley experiment discloses, not what it might have disclosed. Perhaps I should also consider the situation which would arise if the experimenters have let us down badly and the true result is that which Michelson originally expected. In the present terminology we should say that there is a strain depending systematically on the velocity. I think that (after gathering up the wreckage of present-day theory) we should find ourselves faced with a universe far more complicated than we have lately imagined; so that relatively we should be thrown back many centuries, and much further investigation would be necessary before we could see how the scheme of epistemological law applied. Another possibility is that it might be sufficient to introduce an extra law governing the strains and whatever was the cause of them. Presumably this would be a truly objective law—the first to be discovered. Whilst my scientific epistemology would be unaffected, the conclusions referred to in the last paragraph of Jeans's letter would be upset, since they are a commentary on the fact that no truly objective law has been found. However, so long as the effect is only imagined and not discovered, I need feel no apprehension.

A. S. EDDINGTON.

The Observatory,
Cambridge.

Reactivity of the Sulphur Linkage in Animal Fibres

MAKING use of a reaction discovered in this laboratory[1], Elöd, Nowotny and Zahn[2] claim to have shown that disulphide bond breakdown is neither an essential preliminary to the setting of strained animal fibres, nor a necessary cause of supercontraction. Wool fibres were heated with water in presence of mercury at 80° C., hydrogen sulphide being liberated and mercuric sulphide formed as a result of disulphide bond breakdown:

$$R.CH_2.S.S.CH_2.R + H_2O = R.CH_2SH + R.CHO + H_2S.$$

Although 45 per cent of the total sulphur was removed in 19 days, suggesting that 90 per cent of the disulphide bonds were hydrolysed, the fibres showed no tendency to contract in either boiling water or boiling hydrochloric acid at *p*H 2, and their setting power (in an unspecified medium) was unimpaired.

The failure of the mercury-treated fibres to show supercontraction might be due to the occurrence of setting reactions in the unstretched fibres during the prolonged heating in water at 80° C., especially as mercury compounds have been shown to be specially effective in promoting cross-linkage formation[4]. Elöd himself refers to the tanning action of the mercuric sulphide[2], but if cross-linkage formation is invoked to explain the absence of supercontraction, the difficulty of accounting for unimpaired setting properties becomes more acute. There can be no doubt, therefore, that if Elöd's observations are correct, the present theory of the chemical mechanism of permanent set[3] is invalidated. In consequence, it seemed justifiable to re-examine the properties of mercury-treated fibres.

Because of its higher sulphur content, human hair was used in preference to wool, in order to prolong the reaction with water and allow the course of disulphide bond attack to be followed more readily. After purification with alcohol, ether and distilled water, the fibres were heated for several days at 80° C. with distilled water and purified mercury in a quartz tube. Fibres were removed at intervals and their setting power determined in the usual way, each fibre being stretched 40 per cent in cold water and then set by immersion in boiling 2 per cent borax solution for 30 minutes. The set retained by the fibre after various times of release in boiling water was determined by measuring its air-dry length at intervals, drying being allowed to proceed in absence of tension. Typical data are given in the accompanying table, from which it is clear that the ability of

animal fibres to acquire a permanent set decreases with increasing time of heating with water and mercury at 80° C.

Time of treatment with water and mercury at 80° C.	Percentage set after release in boiling water for : 0 min.	2 min.	15 min.	30 min.	60 min.
Untreated	40·2	24·0	22·3	22·5	22·2
6 d. 2 hr. 15 min.	40·4	19·0	17·6	17·4	17·1
8 ,, 23 ,, 6 ,,	40·2	15·9	15·2	14·9	14·4
13 ,, 3 ,, 50 ,,	40·3	12·9	12·2	12·0	11·5
22 ,, 2 ,, 30 ,,	40·3	2·9	1·6	1·1	0·5

In accordance with setting theory, too, the treated fibres showed an increased power of supercontraction in boiling 2 per cent borax solution. For example, fibres which had been treated for 22 days contracted 42 per cent after 40 minutes boiling, whereas the length of untreated fibres remains unaltered under similar conditions. Contrary to Elöd's observations, therefore, supercontraction is promoted and set prevented when sulphur is removed from animal fibres by the combined action of water and mercury at 80° C. The present conception of the chemical mechanism of permanent set[3] remains valid, and the theoretical superstructure which Elöd has erected need not be discussed.

J. B. SPEAKMAN.

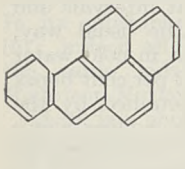
Textile Chemistry Laboratory,
University,
Leeds. June 30.

[1] Speakman, J. B., NATURE, **132**, 930 (1933); Speakman, J. B., and Cooper, C. A., *J. Text. Inst.*, **27**, T 191 (1936).
[2] Elöd, E., Nowotny, H., and Zahn, H., *Koll. Z.*, **93**, 50 (1940).
[3] Speakman, J. B., *J. Soc. Dyers and Colourists*, **52**, 335 (1936); Speakman, J. B., and Whewell, C. S., *ibid.*, **52**, 380 (1936); Speakman, J. B., and Stoves, J. L., *ibid.*, **53**, 236 (1937).
[4] Speakman, J. B., Stoves, J. L., and Bradbury, H., *J. Soc. Dyers and Colourists*, **57**, 73 (1941).

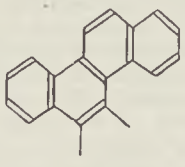
Carcinogenic Agent without the Condensed Carbon Ring Structure

IN an earlier publication[1] the formula of the highly active synthetic œstrogenic analogue, stilbœstrol, was contrasted with those of œstrone and chrysene. The figures in this earlier letter in NATURE indicated that by ring closure in the case of stilbœstrol a condensed carbon ring compound similar to œstrone on one hand and to chrysene on the other could be obtained. Since all the known carcinogenic hydrocarbons possess the condensed carbon ring structure, it was decided, by analogy with œstrone, to see if it were possible to break down the condensed ring structure of the carcinogenic hydrocarbons without losing all carcinogenic activity.

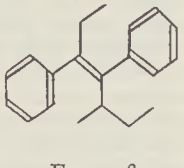
Two groups of twenty-five adult stock male mice, one group of coloured, the other of albino mice, have been painted twice weekly with a 0·3 per cent solution of α-ethyl-β-*sec*-butylstilbene in benzene. Fig. 1 indicates how this substance can be derived from either benzpyrene or dimethylchrysene by fissure of the rings.



BENZPYRENE



DIMETHYLCHRYSENE



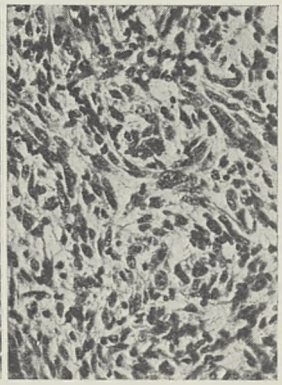
α-ETHYL-β-*sec*-BUTYLSTILBENE

Fig. 1.

Two tumours have developed in these groups. One of the seven coloured mice (*CM* 160/40) surviving after 12 months painting, had a tumour on the edge of the painted region at the back of the neck. It grew more rapidly than was expected, reaching a size of 2 cm. × 2 cm., and became necrotic. A second tumour was found in one of the thirteen albino mice (*CM* 44/40) surviving after 15 months painting. This was a slow-growing tumour situated subcutaneously on the rump 2 cm. distant from the painted area. At autopsy it was hard and 1·5 cm. × 0·5 cm. in size. In neither case were any metastases found.

Histologically, the two tumours were very similar (see Fig. 2), being spindle-celled and malignant. The first one was a spindle-celled carcinoma, the second a sarcoma. Attempts to transplant the first were unsuccessful, but fragments of the sarcoma were implanted in ten stock albino mice and, at the time of writing, two months after implantation, tumours have developed in five of the ten. The largest tumour (2 cm. × 1 cm.) has been sectioned and proved to be similar to the parent sarcoma.

CM 160/40 (×200)



CM 44/40 (×250)

Fig. 2.

A further group of fifty mice is now being painted with the same compound in an attempt to confirm the results, and other chemically related compounds are being investigated. If the results are confirmed, we believe that this is the first instance of carcinogenesis associated with painting a hydrocarbon without a condensed ring structure.

No positive results have been obtained by painting mice with diphenylhexane, diphenylhexadiene or diethylstilbene for shorter periods (6–9 months) in the same way; and no tumours were found on painting groups of twenty-five coloured mice twice weekly with 0·3 per cent acetone solution of 4 : 4′-dihydroxy-αβ-diethylstilbene (stilbœstrol), 4 : 4′-dihydroxydiphenylhexane (hexœstrol) or 4 : 4′-dihydroxystilbene for similar short periods. Stilbœstrol when given by this method was unexpectedly toxic, and none of the mice survived for more than three months.

E. C. DODDS.
W. LAWSON.
P. C. WILLIAMS*.

Courtauld Institute of Biochemistry,
Middlesex Hospital Medical School,
London, W.1.

* Beit Memorial Research Fellow.

[1] Dodds, E. C., Golberg, L., Lawson, W., and Robinson, R., NATURE, **141**, 247 (1938).

Stimulation of Neuron Proliferation by Means of Growth Hormone

IN further investigation of the theory I have already outlined[1,2] that by means of the growth hormone preparation it may be possible to stimulate artificially the proliferation of prospective cerebral neurons in mammals, I have used 385 albino rats in an attempt to improve the level of the psychical functions of the animal.

The rats were subjected in pregnancy to subcutaneous injections of growth hormone preparation 'Antuitrin G' and 'Phyone'. The offspring investigated at birth showed an increase of 18·7 per cent in body weight, 36 per cent in cerebral hemispheres weight, 21 per cent in thickness of the cerebral cortex, 70·4 per cent in volume of the cortex, 9·27 per cent in density of cells, and 86·5 per cent in number of cells per volume of cortex, as compared with the controls. All these increases are statistically significant.

A certain number of animals reached maturity, and proved to show an increase of 14·8–27·6 per cent in cell density, and 38–40·6 per cent in total number of cortical neurons, as compared with the controls. These increases are statistically significant.

It is concluded that in mammals the growth hormone preparation administrated in pregnancy does increase the number of cortical neurons in the offspring.

A full report on this work will be published elsewhere.

S. ZAMENHOF.

Work done in the Dept. of Animal Care,
School of Physicians and Surgeons,
Columbia University,
New York City.

[1] Zamenhof, S., "On Present Possibilities of Increasing the Higher Functions of the Cortex Through Artificial Changes in Its Architectonic, ", The Science Press Printing Co., Lancaster, 1940.
[2] Zamenhof, S., *Growth*, 5 (June, 1941).

The Hamburgh Parsley

THE Hamburgh parsley, known also as the large-rooted parsley, turnip-rooted parsley or parsnip-rooted parsley, has been developed on the Continent for its root instead of the usual leaves. It is a vegetable which deserves much wider use in Great Britain both for its pleasant flavour, which most nearly resembles celeriac, and as a particularly rich source of vitamin C during the winter months.

There are two varieties, the late, with long thin roots, and the early, which forms a compact root like a short thick parsnip. The latter is the more useful type and is the form on which these notes are based. At Cambridge stocks have been grown from Danish, French and German seed, the Danish producing the best-shaped roots. The roots are a very pale yellow colour, almost white, and they form an excellent vegetable either boiled, used in vegetable stew or soup, or grated and eaten raw.

Cultivation is the same as for parsnips, but the roots are easier to dig and remain free from canker. From a sowing made on April 18, usable roots were obtained in October and remained in good condition when stored until the end of the following April. The roots appear to be unaffected by frost and can be left in the ground and dug as required for use, or can be stored in a clamp. No figures for the rate of cropping have been obtained, but it should be reasonably high judging by the appearance of roots lifted from observation rows. The Hamburgh parsley will grow on poor soil, having thrived on the hot dry gravel at Cambridge.

The greatest merit of this vegetable as a war-time crop is its rich content of vitamin C which is available during the winter months. It has been found by a nutritional laboratory that roots which had been stored for 5 months still contained about 21 mgm. of vitamin C per 100 gm., a much higher value than is known in any root vegetable except swedes.

S. DARK.

Horticultural Research Station,
The University,
Cambridge.

Plankton as a Source of Food

MANY will have read with interest the recent proposals[1] concerning the possible use of plankton for human or livestock food. There is, however, an entirely different aspect of the subject which ought to be considered and would at least in one connexion be of far easier application. I refer to the possible use of plankton—especially freshwater phytoplankton—for *plant* nutrition, and the 'connexion' is the small vegetable gardener who has to water his plants. If he does this repeatedly or at least frequently in what is often the easiest way, namely, from open tanks or pans or from the A.R.P. buckets we are supposed to have outside our doors, he may be adding a very useful amount of nutrient matter to the soil, at least during periods of plankton 'maximum'. In hot sunny weather, just when watering is most necessary, great algal activity (which may turn water green in a day) may be maintained week after week and used almost nightly by merely leaving the green or brownish investment on the inside of the vessel intact when fresh water is added.

It seems probable that in these present times when farmyard manure is often impossible to obtain, such frequent planktonic additions, the component individuals of which often go on growing and dividing on or below the surface of the soil but ultimately will be washed down and decomposed, would go at least some way towards remedying the deficiency—without extra trouble or expense to the gardener. Only a sunny situation and wide open vessels are necessary, and sometimes the addition of a nitrogenous and phosphatogenous solution (for example, a very few drops of liquid manure).

It has been my intention for some months past to experiment along these lines and find out if the suggested benefit is really considerable, especially under other than optimal conditions; but as I have as yet had no opportunity to do this with proper controls, and am unlikely this year to have the time even to read all the pertinent literature[2], I record these ideas and intentions in the hope that they may be taken up and made use of by someone else. Other, connected possibilities which have come to mind, but about which I can find no published *ad hoc* research, I would gladly impart to or discuss with any responsible person who may be interested.

NICHOLAS POLUNIN.

The Herbarium,
Department of Botany,
University of Oxford.
July 23.

[1] *The Times*, May 6, 1941, and NATURE, 147, 695, 808 (1941).
[2] Useful bibliographies are given in *J. Ecology*, 19, 266 (1931) and 28, 491 (1940); see also *Ann. App. Biol.*, 26, 165 (1939).

SURFACE SOIL THICKNESS AND COTTON DEVELOPMENT

By Dr. A. Sreenivasan,
Institute of Plant Industry, Indore

In profile studies with the black cotton soil in Malwa, it has been observed that the thickness of the productive surface layer differed appreciably even between adjoining rich and poor fields. Often, the nature of the surface soil also varied, particularly in regard to openness, permeability and crumb structure. It therefore appeared probable that the friable loose surface soil in a field was closely associated with its fertility.

The normal drainage water from fields during rains removes with it a certain amount of the finer fractions of the upper soil layers, but beyond this, it is essential to conserve the surface soil from erosion losses. A knowledge of the depth of the surface soil which it is necessary to conserve will be of value in determining the efficiency of erosion control.

During the 1939 kharif season, a small plot (8 ft. × 8 ft.) experiment was carried out to ascertain what depth of the surface soil is optimum for cotton development, and whether it is enough to conserve the existing soil of a field or whether importation of surface soil from a rich field will be of any benefit to a poor field.

The test was carried out on the Institute fields, 12*D* and 27*S.E.* The former is a field of medium fertility and is well drained, while the latter is a badly drained field with very poor crop growth. The rich surface soil required for the experiment was taken from field 42*N*. Addition of average, loose, hand-gathered surface soil from the same field was made in thicknesses of 1, 2, 3, 4 and 5 in. respectively. Addition of surface soil from the rich field was made in thicknesses of 2 and 5 in. only.

There were five randomized blocks in each of the two fields with eight plots per block. Experimental plot size was 6 ft. × 6 ft. containing six rows of plants one foot apart, thus leaving a non-experimental margin of one row on each side and one foot at each end of the plot. There were 3-ft. paths between and all round the plots which were edged with bricks. The seeds (variety *Malvi* 9-20) were sown by dibbling.

The yields of seed cotton for the different treatments are given in Table I.

TABLE I.

	Control–untreated	Thickness in inches of surface soil added from						
		Same field					Rich field	
	(1)	One (2)	Two (3)	Three (4)	Four (5)	Five (6)	Two (7)	Five (8)
WELL-DRAINED FIELD (12*D*)								
Yield of seed cotton (in ounces)	34·8	55·3	63·3	58·0	57·0	58·0	44·3	77·8
		Critical difference ($P = 0·01$) = 4·6.						
		Order of merit: (8) (3) (2) (4) (5) (6) (7) (1)						
POORLY DRAINED FIELD (27 *S.E.*)								
Yield of seed cotton (in ounces)	9·5	16·8	16·0	17·0	24·5	28·3	15·6	24·0
		Critical difference ($P = 0·01$) = 2·5						
		Order of merit: (6) (5) (8) (2) (3) (4) (7) (1)						

Addition of loose surface soil from the same field increased the yield of cotton in both the fields, but while in the well-drained field the best result is obtained with the addition of a 2-in. layer of surface soil, the poorly drained field shows in general increasing differences in yield with increased additions of surface soil, a 5-in. layer giving the maximum yield. Lack of proper drainage naturally results in surface wash during periods of heavy rainfall and consequent loss in the fertility of the field (*cf.* the yield figures for the control plots of the two fields). Besides, the difference between the two fields in their response to treatments also shows the relative richness of their surface soils. This fact is further borne out by the results of laboratory examination of these surface soils (Table II).

TABLE II.

Loose surface soil from:	Carbon per cent	Nitrogen per cent	Available K_2O per cent	Available P_2O_5 per cent	Exchange capacity m.e. per cent	Pore space c.c. per cent	Structural coefficient	*p*H
Poorly drained field (27 *S.E.*)	0·407	0·064	0·0037	0·014	38·0	51·6	0·44	8·6
Well-drained field (12*D*)	0·436	0·076	0·0039	0·013	38·8	53·9	0·52	8·4
Rich field (42*N*)	0·604	0·077	0·0044	0·013	40·1	55·8	0·58	8·7

Addition of surface soil from the rich field also increased the yield significantly in both the fields, the response being better with the greater thickness. But, considering the cost of importation, this is not likely to be more profitable compared to addition of soil from the same field.

These results bear out the value of the conservation of surface soil that may be achieved by erosion control.

FORESTRY IN NYASALAND

FROM the annual report of the Forestry Department of the Nyasaland Protectorate for the year ending December 31, 1940 (Govt. Printer, Zomba, Nyasaland, 1941), it appears that a happy relationship has been established between that Department and the Agricultural Department. The Forestry Department has to some extent undertaken duties which bring it into direct relationship with the agricultural habits and practices of the local population. The Conservator reports that during the year the Provincial Agricultural Officer visited the southern course for special discussions, and the Director of Agriculture addressed the Foresters at the close of the course. These courses are annual ones given to the subordinate forest staff by divisional forest officers and lasting 10–14 days. The aims of the forestry policy in Nyasaland have been already discussed in NATURE.

The formation of village forests has proved a most important departure in the Protectorate, for they have caught the imagination. It is stated that the number of registered village forest areas has now reached 4,677 and that the majority are well cared for by the headman and villagers. In some of the earliest formed, systematic thinnings are now being undertaken with assistance from the district forestry staffs. It will be noted that this management is on the same lines as practised in the management of the communal forests in France. But a still closer connexion between the forest staff and the agricultural community exists through the participation of the former in land use problems and in activities to introduce simple reforms in the agricultural methods of the people. It is said that results have been excellent in parts of the Southern Province and that whole communities have changed over from mound planting (on hill-sides, productive of serious erosion) to ridge planting on the contour. Hill slope closure and stream bank protection are serious questions in parts of the Protectorate, and a plea for increased agricultural production has emphasized the need for much better control by native authorities over the opening up of new land for cultivation. For example, one of the commonest phases of these unchecked, ignorant cultivation practices it is stated is that "in some regions very steep hill slopes, of only ephemeral utility for agriculture, are still being cleared for planting maize".

It appears only fair to a forest staff to point out that, so long as dangerous activities of this kind are allowed by the administration to be practised unchecked, the danger to the Colony concerned as a whole may be so great as to render nugatory the efforts of a Department in obtaining sanction to the formation of forest reserves with a view to their professional management ; or even to the future success of the village forests, to the inauguration of which the Conservator of Forests in Nyasaland has devoted so much energy with such refreshing and creditable results.

OXFORD MEETING OF THE WORLD CONGRESS OF FAITHS

By Sir Francis Younghusband, K.C.S.I., K.C.I.E.

RECONSTRUCTION is in the air : the need for building a New World Order ; and the need for a sound spiritual basis on which to build it. This was the subject discussed at the meeting held at Oxford during June 27–July 2 of the World Congress of Faiths. The main idea of the Congress is to promote the spirit of fellowship and to promote it through religion ; not through one religion only, but through all religions working in collaboration and in concert, each retaining its own individuality, its own special forms and beliefs, but all willing to work with others in the great world-reconstruction now before us.

With this as its general aim, the World Congress of Faiths had for its special subject for discussion at this sixth annual meeting the interdependence of religion and the political, economic, social and educational aspects of the New World Order.

The Congress was officially welcomed to Oxford by the University. The inaugural meeting was addressed by the chairman of the Congress, Sir Francis Younghusband, by Señor Madariaga, Sir Hassan Suhrawardy (Muslim adviser to the Secretary of State for India) and the Rev. Canon Grensted. Others who spoke at the sessions of the Congress included Lord Samuel, Dr. Gilbert Murray, Mr. Yussuf Ali (translator of the Koran into English), Lord Davies, Diwan Runganadhan (another Indian adviser to the Secretary of State for India), Baron Palmstierna (formerly Swedish Minister to the Court of St. James's), the Warden of All Souls, Prof. W. Adams, and Miss Maude Petre, a well-known Roman Catholic writer.

Both the addresses and the discussion on them were on a high level. As a result of the meeting it was decided to invite the principal leaders in the Hindu, Buddhist, Jewish, Confucian and Muslim worlds to make pronouncements so far as possible on similar lines to that issued by the Pope and acceded to by the leaders of the Roman Catholic, Anglican and Free Churches in Britain. But the Congress also passed a resolution advocating the addition of a

clause favouring freedom of religious worship and expression.

It was evident to those who had attended previous Congresses, as well as the present, that distinct progress had been made. The Congress is now well established and able to draw support from the most influential persons in the country. Moreover, a growing cohesion among its members was noted, and it is safe to predict that some years hence a meeting of the Congress on a far greater scale might be held. There would necessarily be a meeting of the present belligerents to settle the terms of peace between them. After this limited conference, a more general conference would probably follow at which representatives from most of the peoples of the world would assemble to decide upon the future political structure of the New World Order, whether a reformed League of Nations or some type of federation. This would be an opportunity which should be seized. The World Congress of Faiths should organize a meeting of the most prominent representatives of all the great world religions to devise means by which the political New World Order may be given that spiritual drive and that steady and sustained spiritual support without which it can never endure. Annual meetings of the Congress will be held as heretofore; but the greater meeting some years hence will be the goal towards which they will deliberately be made to tend.

MATHEMATICAL PROBLEMS IN SEISMOLOGY

A. BLAKE has recently directed attention to many outstanding problems in mathematical seismology (*Trans. Amer. Geophys. Union*, 1940). The following problems are, more particularly, mentioned: (1) Problems in the theory of seismic waves due to inhomogeneities in the media and other causes, and to new methods available for the study of the interior of the earth. (2) Problems of instrumental seismology including the new strain meter and rotation seismograph. (3) Problems relating to the complexities encountered in determining the response of engineering structures to the motion of a strong near earthquake. (4) Problems of statistical seismology, especially the periodicity problem. In many cases Blake states that seismological calculations may be performed by machines such as the differential analyser and punched card machines.

Concerning strong-motion problems, Blake says that the analysis of the response of a structure into characteristic or normal components satisfying linear equations depends on the treatment of the strain-energy function as quadratic. But the purpose of investigating the response to destructive earthquake motions requires consideration of strains much exceeding the limits within which Hooke's Law remains valid. According to the author the linear theory can then only be used as a first approximation and the effects of the various components of ground motion cannot be treated separately. The Rayleigh dissipation function may be important, but the case of small damping including the existence of normal modes of oscillation has been encountered in the case of buildings, bridges and tank towers. The paper will act as a signpost towards further progress in mathematical seismology.

REPORTS AND OTHER PUBLICATIONS

(not included in the monthly Books Supplement)

Great Britain and Ireland

John Innes Horticultural Institution. Thirty-first Annual Report for the Year 1940. Pp. 20. (London: John Innes Horticultural Institution.) [217

The British Council. Report for 1940–1941. Pp. 176. (London: The British Council.) [217

Transactions of the Hertfordshire Natural History Society. Vol. 21, Part 3: Sawflies of the Berkhamsted District, with a List of the Sawflies of Hertfordshire and Buckinghamshire, and a Survey of the British Species (*Hymenoptera Symphyta*). By Robert B. Benson. Pp. 177–232. (Hertford: Stephen Austin and Sons, Ltd.) 5*s*. [217

Other Countries

Report and Accounts of the National Botanic Gardens of South Africa, Kirstenbosch, Newlands, Cape (and the Karoo Garden, Whitehill, near Matjesfontein) for the Year ending 31st December 1940. Pp. 20. (Kirstenbosch: National Botanic Gardens.) [147

Contributions from the Biological Laboratory of the Science Society of China, Zoological Series. Vol. 13, No. 9: Study of the Effect of Cerebral Cortical Lesion, on the Respiratory Exchange and its Associated Phenomena of the Albino Rat (*Mus norvegicus*). By Y. J. Wu, T.L. Chiu and C. Ping. Pp. 101–120. 40 cents. Vol. 13, No. 10: On the Digestive Enzymic Actions in the Gut of the Earthworm, *Pheretima*. By Y. Chiung Puh. Pp. 121–134. 80 cents. Vol. 14: Taxonomy and Faunal Relations of the Limnitic Oligochæta of China. By Y. Chen. Pp. 132. 13 dollars. Vol. 15, Part 1: Study of some Forest Insects of Nanking and its Vicinity, Part 4: Observations on the Pine Moth (*Dendrolimus punctata* Walker). By C. P. Miao. Pp. 16. 80 cents. Vol. 15, Part 2: Compounds related to the Natural Oestrogens: γ-Cyclopentyl-δ-(4-Hydroxyphenyl)-Δγ-Hexene, γ-(2-Methyl Cyclopentyl)-δ-(4-Hydroxyphenyl)-Δγ-Hexene. By Dr. Huang-Minlon. Pp. 17–28. (Shanghai: Science Society of China.) [177

Report of the Aeronautical Research Institute, Tōkyō Imperial University. No. 204: Numerical Calculation of Power Variation with Altitude in a Naturally Aspirated Engine by means of J.S. Diagrams. By Keikichi Tanaka, Osamu Tamura and Osamu Konisi. Pp. 32. 50 sen. No. 205: On the Subsonic Flow of a Compressible Fluid past a Symmetrical Joukowski Aerofoil. By Susumu Tomotika and Hazimu Umemoto. Pp. 33–126. 1.30 yen. (Tōkyō: Kōgyō Tosho Kabushiki Kaisha.) [177

Report of the Institute of Scientific Research, Manchoukuo. Vol. 4, Nos. 19–20: On the Fatty Oil of Awa (*Setaria italica*, Beauv.) Bran., by Mano Yoshikatsu; On the Vitamin Contents of Dried Mushrooms produced in Manchoukuo, by Kozo Kawakami and Hideo Miyayoshi. Pp. 393–404. (Hsinking: Institute of Scientific Research.) 25 sen. [177

Baltische Geodätische Kommission. Sonderveröffentlichungen, Nr. 8: Messung der Grundlinien Örebro und Värnamo in Schweden im Jahre 1938. Von U. Pesonen. Pp. 26. Sonderveröffentlichungen Nr. 9: Tafeln zur Übertragung geographischer Koordinaten auf dem Internationalen Erdellipsoide im Bereich 35° bis 71° Breite. Pp. 54. ((Helsinki: Baltische Geodätische Kommission.) [177

Editorial and Publishing Offices
MACMILLAN & CO., LTD.,
ST. MARTIN'S STREET, LONDON, W.C.2.
Telephone: Whitehall 8831 Telegraphic Address: Phusis Lesquare London

Advertisements should be addressed to
T. G. Scott & Son, Ltd., Three Gables, London Road, Merstham, Surrey
Telephone: Merstham 316

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