NATURE

"To the solid ground
Of nature trusts the Mind that builds for aye."—Wordsworth

Vol. 146, No. 3702 SATURDAY, OCTOBER 12, 1940 ONE SHILLING

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Vol. 146 SATURDAY, OCTOBER 12, 1940 No. 3702

CONTENTS

PAGE

Science and the National War Effort 469

Social Rehabilitation 471

An Island Naturalist. By S. G. 474

Woodlands in Agriculture. By Dr. Winifred E. Brenchley 475

Colour and Music. By Dr. W. D. Wright 475

Musical Acoustics 476

A Great Swedish Astronomer. By Prof. H. C. Plummer, F.R.S. 477

Reconstruction and Town and Country Planning 479

The Progress of Camouflage. By J. S. H. 482

Obituaries:

Sir Harold Carpenter, F.R.S. By Dr. C. H. Desch, F.R.S. 483

Mr. F. Hutchinson. By H. Barraclough Fell 484

News and Views 485

Letters to the Editors:

Gonadotropic Hormones in the Urine of the Giraffe.—Dr. John F. Wilkinson and P. de Fremery 491

Volatile Aldehydes Liberated by Periodic Acid from Protein Hydrolysates.—A. J. P. Martin and R. L. M. Synge 491

Blind Seed Disease of Rye-Grass.—Dr. Malcolm Wilson, M. Noble and E. G. Gray 492

Non-parallelism of Lattice Planes in Tin Coatings on Steel.—Dr. Bruce Chalmers . 493

Submarine Canyons.—Dr. E. B. Bailey, F.R.S. 493

Research Items 494

Drugs and War-time Alternatives 496

Progress in Seismology 496

Wheat Diet and Leprosy 497

Scientific and Industrial Research in New Zealand 497

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SCIENCE AND THE NATIONAL WAR EFFORT

THE recent changes in the membership of the Cabinet, coming as they did on the same day as the announcement of the appointment of a Scientific Advisory Committee responsible to the Lord President of the Council (see page 485 of this issue), will probably have overshadowed in the public mind the significance of this Committee. A scrutiny of the terms of reference, and consideration of the qualifications and standing of its members, however, will bring the realization that in this Committee we have a means of putting science into direct contact with the innermost councils of the Empire. How much this may mean for the outcome of the present conflict, and beyond that, will depend on the speed with which the Committee pursues its inquiries, the vigour with which it urges its conclusions on the Government, and a receptive mind on the part of the leaders of the country.

During the past twelve months, there has been a feeling among scientific workers, both as organized bodies and as individuals, that insufficient use was being made of their knowledge and special qualifications. Reference has frequently been made in these columns to the dissatisfaction and sense of frustration, for which the only answer hitherto has been a certain amount of lip-service to science from responsible politicians. We have been told time and time again that this is a scientific war, and that the German use of scientific developments must be met by ever more intensive application of science ; but little came of it, apart from extensive development of the scientific departments within the ministries. There seemed no realization of the need for a major step in the improvement of the organization, for the provision of a focus through which the increasing activities of scientific departments could be linked together. Sir William Bragg hinted at the prevalent anxiety in his presidential address to the Royal Society last November ; and he made a definite suggestion for the constitution of a consultant panel of eminent scientific workers, that would give advice and also be kept informed of the progress of events, so that "it might foresee occasions and needs". In other words, Sir William was suggesting more than the usual committee, pursuing its investigations and making recommendations which would be forwarded to the Government through the usual departmental channels and thereby subjected to delay and, alas, often ill-informed and destructive criticism. He asked for a body with access to, and authority with, those who lay down policy.

Such a committee would, of course, have been a new departure in the system of government in which we have grown up. But evolution rather than revolution has ever been a characteristic of political history in Great Britain, and Sir William Bragg's suggestion, elaborated no doubt in association with the officers and Council of the Royal Society, was, we presume, rejected by the Government on other grounds than novelty. The scheme now adopted, although superficially it may resemble the older one, has an important difference. The members of the Committee, apart from the chairman, are indeed all fellows of the Royal Society, but three of them are in the public service, namely, the secretaries of the Department of Scientific and Industrial Research, the Medical Research Council and the Agricultural Research Council, and the other three are the president and secretaries of the Royal Society. By this means a judicious mixture of the official and unofficial is provided, and the members should be in intimate contact

with scientific and technical developments wherever they occur.

The need for outside and independent criticism of the activities of scientific and technical departments under Government control will readily be conceded. This is no reflection on the integrity and capabilities of the many eminent men working in these departments ; it is one of the defects of the present system. Few of the political leaders of Great Britain have anything but a nodding acquaintance with science or technology, and they can get little help in this field from Civil Servants in the higher administrative posts. In consequence, the scientific and technical officers of departments become either the servants of the administrative side, with little possibility of taking a hand in the formulation of policy, or else—and more rarely—their advice is followed blindly. Neither result is likely to be productive of the critical yet flexible and responsive attitude of mind which is required under modern conditions. Coupled with the departmental scientific advisers there should be a source of independent opinion, to the recommendations of which the minister himself may be expected to give weighty consideration.

There are in existence several such advisory councils or committees, which have fully justified the hopes entertained of them. The three research departments of the Privy Council, namely, the Department of Scientific and Industrial Research, the Medical Research Council and the Agricultural Research Council, have all worked from their formation by means of councils or committees consisting mainly of independent scientific workers, which have largely defined policy as well as administered research projects. The scientific work of the National Physical Laboratory is controlled by a body appointed by the Royal Society. The Aeronautical Research Committee, which includes many independent members, has for many years been responsible for research and development in aeronautics in Great Britain, as its many publications have shown.

To come to appointments directly concerned with warfare, there is the Committee for the Scientific Survey of Air Warfare, set up in 1935, which came to an end in June last at about the time when the Ministry of Aircraft Production was formed ; this Committee was of much service to the Air Ministry, and many of the methods now used in air defence are due to its initiative. The Chemical Defence Committee, which continued for many years to advise the War Office and now the Ministry of Supply, has a number of independent members. The Civil Defence Research Committee has done valuable work for the Ministry of Home Security. The Ministry of Supply is well served by the Council for Scientific Research and Technical Development, formed early this year, the various committees of which have the right, and the duty, of inspecting and advising upon the scientific and technical work of the establishments of the Ministry.

The Department of Scientific and Industrial Research, the Medical Research Council and the Agricultural Research Council are, of course, closely connected with the work of the Ministries of Agriculture, Health and Food, but they are responsible to the Privy Council, and their scientific councils have no direct means of ensuring that the best means for the fuller utilization of scientific and technical advice are adopted in these departments. The Fighting Services and other ministries are for the most part even less well served, so far as outside and independent critical opinion is concerned.

It is in this matter of providing opportunity for the voice of scientific men outside Government service to be heard in the deliberations of the various ministries, although not strictly within its terms of reference, that the newly appointed Scientific Advisory Committee may be able to perform a vital service. It is not a question of appointing a number of committees, ringing the changes for the several departments on the names of a few senior men of science, but rather of finding talent among the younger men, that their fresh minds may leaven those of the elders, and that their shoulders may early learn to bear the burden of responsibility.

In the conflict in which we are engaged, nothing short of the mobilization of the whole of the intellectual and material resources of the Empire will suffice. The contribution of science to the war effort should be a major one, for which the Scientific Advisory Committee may well be largely responsible. Moreover, the work must not cease with the end of the War. It does not follow that an organization which is satisfactory under the stress of modern warfare will serve equally well in times of peace ; but the principle of the immediate concern of science in formulating policy and in other ways exerting a direct and sufficient influence on the course of government is one to which we must hold fast. Science must seize the opportunity to show that it can lead mankind onward to a better form of society.

SOCIAL REHABILITATION

ONE of the consequences of the social disturbance and distress which have accompanied the widespread destruction of private property in the indiscriminate bombing attacks on London and other areas has been the realization that problems of social reconstruction have to be faced now and cannot be deferred until the end of hostilities is in sight. Whatever evacuation or shelter policy may now be adopted must be part of a long-term policy, keeping in mind the possibility of a long war, and designed to conserve morale and resources as effectively as possible. Short-sighted temporizing and timid palliatives are a public danger, and can no more be tolerated than the administrative incompetency from which they spring.

Recent events have made it plain beyond question that planning for social reconstruction must be undertaken in the midst of the War and as part of its effort with a vigour, a vision and a courage worthy alike of the gallant few on whom the main brunt of defence has fallen, the heroism of the civil defence services and the patient fortitude of those who have seen their homes and families shattered and scattered. The relief of distress in the stricken areas, evacuation of non-essential classes from the more dangerous districts no less than the restoration of public services which have been interrupted or dislocated, and other measures of social rehabilitation are tasks calling for immediate attention. None the less they should be handled not merely in respect of immediate and urgent needs but also in relation to the long-range problems of social rehabilitation and reconstruction which will confront us after the War.

The relief of distress and social reconstruction in the heavily bombed areas represent only one aspect of the question of social rehabilitation. The nation is equally committed to the care of its fighting men ; to see that when the War is over they may secure their places in civil life or find new places in which their energies can be employed. The care of the disabled soldier and of those suffering from cardiac, nervous and other afflictions is a particular aspect of such rehabilitation, and as to the value of this work the experience of the War of 1914–18 leaves no room for doubt. Equally that experience warns us of the danger of allowing what promised to become the foundation of a great national effort to dwindle to meagre or insignificant proportions. If justice is to be done to our fighting men, our gratitude to them to find adequate expression and even our pledges honoured, now is the time to look forward, to plan on an adequate scale and take such immediate steps as will prevent us again missing our goal.

If this is one of the main reasons for giving attention to such problems of social reconstruction at this hour, to ensure that the lines of an adequate policy and necessary measures and resources are available when the need for action arrives, so as to avoid the confusion and mistakes that are inevitable if we wait until such problems urgently arise, there is another equally as important. Our immediate problems and needs are related in a remarkable way to our long-range problems in this field, and attention to the latter requirements in dealing with the former may well assist to conserve our resources as well as facilitate reconstruction after the War. What is even more important is the contribution which such vision and long-range planning may make to public morale.

It is impossible to take a cross-section of opinion in Great Britain to-day without realizing the extent to which social reconstruction looms in the minds and thoughts of almost all sections of the community. The realization that the struggle is fundamentally between two entirely different social orders, between one in which the State is supreme and the individual is without rights and exists merely to serve the State, and one in which the State exists to serve those needs of individuals which must be met collectively in an ordered society, is widespread. Many indeed are coming to look for a new social order from which the grosser inequalities of wealth and opportunity have been eliminated and in which a finer tradition of public service is shared by all. If into such planning and reconstruction as are demanded now we could get something of this spirit and vision we might well give to those on whom have fallen the severest blows and heaviest strain just that inspiration and hope which count for most in maintaining morale and endurance under the War's sternest trials.

Such a possibility cannot be dismissed as impracticable or Utopian. We are apt, as Prof. J. H. Jones has pointed out, to exaggerate the real and enduring suffering caused by war and to assume the inevitability of poverty for long years after the War has come to an end. Such poverty is not inevitable if the resources of Nature, of technical skill and energy which will remain, with most of our capital resources are used with imagination and effectively organized. We have already indicated how reconstruction in the stricken areas, whether undertaken now or after the War, might be carried out in accordance with an adequate national plan and not marred again by limitations imposed by departmentalism, parochialism or vested interests. Similarly in the field of rehabilitation of the fighting men, as Dame Agnes Hunt has pointed out, there is real need for co-ordination in view of the many organizations concerned. Co-ordination, if it is to be effective, must stand above medical and vocational treatment and re-employment, with its corollary of a scale of pensions. Some rearrangement of existing responsibilities is necessary.

If the Ministry of Health, for example, acting through its Emergency Medical Service, assumed some of the duties now being discharged by the Ministry of Pensions and by the Board of Education, the ideal of a National Medical Service would be appreciably nearer realization. The Ministry of Health would thus become the sole authority of State on medical and surgical questions and would be in a position to lay down broad principles of procedure for the guidance of the secular ministries. Moreover, the work it is at present doing for disabled soldiers would thus become the basis not only of re-education but also of re-employment, and a beginning would have been made with the task of dealing with persons unable to perform heavy work or to work continuously.

The importance of this to industry is obvious, and equally its special value at the present time when our War effort demands the maximum utilization of man- and woman-power. The development of a National Medical Service in this way might well enable us to restore to industry without danger, not only many of the victims of tuberculosis as the work of the Papworth Village Settlement has shown, but also those of some cardiac and nervous and other chronic diseases if adequate steps were taken to secure their welfare. Even if such additions to our industrial resources were not effected in this way during the present War, we have here yet another striking example of the way in which far-sighted, long-range action is of benefit to our immediate purposes.

What must be kept particularly in mind is the importance of undertaking the requisite study of such problems now as a prelude to planning. For this reason alone the publication of Mr. D. M. Goodfellow's study of Tyneside (see p. 485 of this issue) is opportune. The social and industrial disturbances of war inevitably leave a legacy of problems. Areas of intense industrial activity in war-time are practically depressed areas in peace-time. Migration, whether of workers into centres of industry to increase production, or of workers and factories to less vulnerable and non-industrial parts of the country, are apt to involve distortion of development, lack of balance in productive capacity and of variety of occupation. The consequent problems to which attention in war-time is imperative even on the bare ground of production become even more acute when redistribution has to be faced after the War.

The Royal Commission on the Geographical Distribution of the Industrial Population in its recent report frankly faced a number of the problems of industrial dislocation at the end of the War, which indeed its recommendations are designed to mitigate. Mr. Goodfellow's report is concerned much more with social and welfare conditions, but equally emphatically he emphasizes the need for preparing plans for the transition well in advance and ready for application. Like the Barlow Commission, he stresses the need for co-ordination and for relating the measures of the Government, the local authorities and industry.

Social preparations must be planned and re-adjustments can no longer be left to chance. On that the investigations of Mr. Goodfellow and the members of his tutorial class organized by the Workers' Educational Association leave no room for doubt. They also trace the lowered vitality on Tyneside to-day back to a false prosperity which reached its apex during 1914–18 and weakened resistance in the long depression which followed. The scarcity of essential foods, and overcrowding and deficiencies in cleanliness and the normal care of children, partly through the absence of mothers working in the factories, played their part, and it needs little imagination to realize how serious a situation might well arise during the present War, let alone after it, even leaving out of account the disturbance and dislocation which heavy air attack may cause.

To some of these dangers the Government are already clearly alive, but one of the most significant features of the report is the fresh support it brings to the recommendations of the Royal Commission of Local Government in the Tyneside area. This acute piece of analysis emphasizes the erratic character of the Tyneside social services. They in no way correspond to the needs of the whole area. In many important services only Newcastle-upon-Tyne reaches the national standard. In others, some Tyneside towns make special efforts and rise far above that standard, while others fall far below it.

This inordinate disparity in the health and other social services on Tyneside is not always determined by poverty. Some of the poorest Tyneside towns make the best efforts to improve the conditions of their citizens, but do so only by taxing these citizens and so intensifying poverty. It is for this reason that Mr. Goodfellow sees danger in the formation of a region consisting of industrial Tyneside and Northumberland County as likely to lead to an over-emphasis of agricultural interests and continued disparities of social services. He recommends that Durham should be included from the first, if only because of Durham's excellent achievements in the development of social services, which indicate an attitude likely to be beneficial if not essential to the development of Tyneside.

Mr. Goodfellow suggests, however, that the division of local services into two types, regional and local, requires more consideration. In his view a regional authority for all purposes, controlling all services and strengthened by ownership of public utilities, would stand the best chance, without any danger of friction from minor authorities within its own boundary, of satisfying the conditions of the reports of the Barlow Commission. Such a regional authority would be able to speak with one voice as regards the industrial development and planning of the north-eastern region, its equitable treatment by the national exchequer, and the uniform development of its social services on the lines required by both industrial and agricultural districts. It might well also encourage the local development of the potential resources in leadership.

The value of this survey at the present time is unmistakable. It is a timely reminder that social welfare, the quality of the health and social services, cannot be let down at any time, even amid the desperate need of war, without the exaction of a heavy penalty later. Industrial and social policy must be brought together in a comprehensive welfare policy. Scientific workers will recognize Mr. Goodfellow's investigations as a sample of what might well be attempted elsewhere as a prelude to planning for social reconstruction. They should be grateful also for the stimulus it gives to the scientific consideration of the larger issues involved in regionalism. War-time developments have already opened up wider possibilities which might be utilized in the development of our plans for reconstruction after the War.

These possibilities cannot, even in the stress of war, be left purely to chance. Even now we must turn all available scientific energies to studying the causes of our difficulties. We cannot clearly prophesy to-day what form the society of the future will take, but as Mannheim has pointed out we need a new kind of foresight, a new technique for managing conflicts, together with a psychology, morality and plan of action in many ways completely different from those which have obtained in the past. It is only by re-making man himself that the reconstruction of society is possible. A conscious attack on the sources of maladjustment in the social order in this way, based on a thorough knowledge of the whole mechanism of society and the way in which it works, an attack on the strategic points and not the treatment of symptoms, might well yield results far beyond expectation and make some of the sacrifices of the War well worth while.

Scientific workers carry an inescapable responsibility for helping their fellow citizens to see and face these possibilities and responsibilities. They might well lend their support to such a central body as the Reconstruction Commission advocated by Prof. Jones, or sectional groups concerned with particular problems like the Architects National Council, which are attempting to study, collate and co-ordinate the changes that are occurring and the problems which emerge. Certain it is that if we are to see the health of the nation adequately safeguarded during and after the War and those whose lives have been disrupted, whether physically, mentally or spiritually by the impact of War, rehabilitated and established in a new social order, the planning and action must be based on fearless scientific investigation and courageous and far-sighted administration, untrammelled by departmentalism or prejudice.

AN ISLAND NATURALIST

Island Years

By Dr. F. Fraser Darling. Pp. xii + 306 + 23 plates. (London : G. Bell and Sons, Ltd., 1940.) 12*s*. net.

IN "Island Years" we have an account, written most attractively, of a life which the author, along with his wife and his growing son, has lived (and still lives) on lonely Hebridean islands, uninhabited except by this little family.

The first island which Dr. Fraser Darling and his wife chose for their home was Eilean a' Chleirich, one of the Summer Isles, which lie off the coast of Wester Ross. Thence they migrated to Lunga, one of the Treshnish Isles, where they made a late autumn camp in order to study the habits of the Atlantic seal—and all the time the idea was taking shape of a more daring stay on Rona, a very lonely, storm-beset island lying 47 miles out to sea north-east of the Butt of Lewis. No one had hitherto thought of camping on Rona in the stormy late autumn season when the Atlantic seals in their thousands come ashore to drop their pups, but the Fraser Darlings braved a part of a winter there and faced gales so tremendous that those strong birds the greater black-backed gulls became quite exhausted and permitted themselves to be caught and lifted by human hands. Although the author does not say so, the photograph (illustrating p. 227) of Rona under snow to the water's edge depicts a very rare scene. I well remember the week in December in which the photograph was taken and never either before, or since, had I seen from my home in Skye the lesser isles of ocean snow-clad so completely.

Dr. Fraser Darling is a trained and observant naturalist. In his observations on the Atlantic seal he gives us much new and valuable data concerning the habits of these animals : his notes on that rare nocturnal bird, Leach's forked petrel, are also noteworthy. He mentions that he obtained a midnight flashlight photograph of this bird in flight : one could wish that it had been included in the illustrations, all of them excellent, of this book.

One learns with interest that the rock dove, numerous in Skye, does not nest on Rona ; also that barnacle geese, which winter on almost all suitable Hebridean islands which are uninhabited, are absent from Rona.

There are so many interesting and delightful passages in the book that it is difficult to pick out the most attractive, but the account (p. 255) of the joy of the Atlantic seals as they battle with enormous seas is outstanding. Fraser Darling describes in restrained yet vivid language the occurrence (p. 262) of the 'green ray' at the moment of sunset at 10.10 p.m. after a day of restful beauty. I like, too, his description of Loch Fada (p. 50), and I am glad to see that he appreciates the aroma of the crowberry. This, to my mind, is one of the most fragrant and characteristic scents of the hills and moors, yet no other author I have read appears to have noticed it. On p. 48 Dr. Fraser Darling gives an interesting account of a peregrine falcon preying on little auks, and on p. 106, of barnacle geese alighting on the sea. I once saw this, from the same island group from which the author records it.

Writing of the eiders of the Summer Isles (p. 113), Dr. Fraser Darling mentions that their eggs hatch during the third and fourth weeks of June. Their laying must therefore be considerably later than the nesting season of the eiders of the mainland seaboard of the neighbouring county of Inverness where, on June 1 of the present year, I saw more than one brood of young eiders swimming actively in the shallow water of an ocean bay, accompanied by their parents. It is interesting, too, that the stormy petrels of the Summer Isles (p. 126) do not arrive at their nesting haunts until early June, whereas R. M. Lockley has chronicled that on the island of Skokholm (which lies off the coast of Wales) they first make their appearance as early as April. By the way, this species (p. 127) does not *always* "shuffle away on its hocks into its crevice" when disturbed, for I have on occasion seen them walk, upright and graceful. The statement that the legs "though of fair length, will not support the bird in the upright position of a robin or sparrow" is therefore not altogether accurate.

It is interesting to know that skylarks do not arrive at Dundonnell until April, because at my home in the north of Skye, where the species is abundant, they arrive with regularity in mid-February, regardless of the weather conditions then prevailing.

In this book unusual words are occasionally met with. "Cormorantry" as the name of a colony of nesting cormorants is new to me ; so also is "rinze" heather.

"Island Years" is one of the best books of its kind that has been published, for the author has done things no other man has done, seen sights no other man has seen, and is master of a style so vivid that these rare sights and sounds are conveyed faithfully and without effort to the reader.

S. G.

WOODLANDS IN AGRICULTURE

The Management of Farm Woodlands

By Cedric H. Guise. (American Forestry Series.) Pp. x+352. (New York and London: McGraw-Hill Book Co., Inc., 1939.) 20*s*.

AT the outset, farm woodlands are defined as areas of wooded growth that are integral parts of the lands used primarily for agriculture. As such they serve various useful purposes in affording protection to buildings and stock, in preventing undue soil erosion and, if skilfully managed, in providing profitable timber of various types. The problems of agriculture and forestry are inseparable in regions where the better soils are utilized for crop-growing and pastures, and woodland occupies the area of poorer quality. Detailed tables show how widespread these woodland areas are in the United States, the total value of the produce used and sold therefrom amounting to 190 million dollars per annum.

Good management of woodland entails the adherence to a definite policy based on sound technical forestry methods. Much improvement can be effected by judicious cutting, ranging from the provision of small wood for domestic purposes to the taking out of mature timber. In this, care is necessary to prevent injury to other trees from decreasing future profits. A management plan and simple book-keeping for each parcel of wood, combined with adequate selling arrangements form the basis of profitable woodland cultivation.

The volume under review is essentially a practical exposition of the knowledge and methods required to render the woodland a profitable section of the farm economy. The outline of woodland ecology describes the various types of growth, the light and temperature requirements of different species, and their susceptibility to diseases and pests, and provides lists of the most important trees associated with certain areas. A valuable section deals with methods of determining the volume, increment and yield of woodland products and the production of surveys and maps. Under the heading of protection the damage done to trees by grazing is emphasized, since usually a wood has little real value as a source of food for grazing animals, and both animals and woodland are likely to suffer.

Chapters on the utilization and marketing of woodland products, the durability and preservation treatment of wood and the general principles of management round off a book which should prove of great value to sylviculturists in all parts of the world. While the theme is woodlands in the United States, the text is of much wider application, and should be read with profit by all who are interested in the full utilization of all types of agricultural land. W. E. Brenchley.

COLOUR AND MUSIC

Colour Co-ordination

By M. Sargant-Florence. Pp. 352. (London: John Lane, The Bodley Head, Ltd., 1940.) 15*s*. net.

MANY years ago, McDougall suggested that much confusion of thought on the subject of perception would have been avoided if all philosophers had been born blind. To this we might add that it would have been well if all colourists had been born deaf; and we might even begin to wish that Newton had never been born at all.

To such heresies are we driven by this book on colour co-ordination, which is devoted to establishing a theory of colour harmony by analogy to the theory of harmony in music, an idea which originated in the main from Newton. In his day, practically nothing was known of the mechanism of colour perception, and in the nature of things his suggestion could have been little more than a guess. The truth is that, even at the present day, our knowledge of the colour processes is so imperfect that it is quite impossible to say why some colours harmonize and others clash.

No one will grudge artists their attempt to establish an arbitrary system of colour harmony, although some of us may wonder why they should need it, and we may suspect that the greatest artists have done quite well without it. We would, however, admit that in teaching the less gifted among us, a system is useful, although its limitations may be dangerous. If we can assume that those with artistic leanings are likely to be conversant with musical theory, there is even something to be said for choosing music as the analogy. The real grievance of the man of science is different. What he must object to is the attempt to bolster up any analogy with pseudo-scientific ideas that must inevitably mislead those who have had no scientific training.

Newton's idea was based essentially on the

comparison of the visible spectrum with an octave in music. The analogy has been fortified in detail by comparing the angles of refraction of different coloured rays through glass with the intervals in a musical octave. A glance at a modern glass list would immediately make one pause before trusting too much to a theory based on the dispersion of one particular glass. But there are in any event several difficulties about this octave business, not the least of which is that, as reported recently, young observers who have been operated on for cataract can see the near ultra-violet, and at a wave-length of 3,600 A. the colour is blue. On the octave theory, one would presumably expect it to be red. However, there is little scientific information in this book more recent than Newton's investigations ; there is certainly no mention of the hue discrimination curve nor of the locus of the spectrum colours in the colour triangle—two vital pieces of information in a discussion of this sort.

To overcome the difficulty that normally only one octave is visible, the author suggests that "the spectrum octave can be extended into a gamut of many octaves by definite manipulation in degrees of luminosity. [He appears to mean saturation.] But this extension does not find expression in terms of wave-vibration." Yet if the analogy is to find expression in any terms at all, wave-vibrations are the only possible terms.

As an instance of the misinterpretation of scientific data, the author refers to the fact that so-called monochromatic radiations may, when examined in an instrument of high chromatic resolving power, be found to break up into several components. He then concludes that the overlapping of these components may be responsible for the whiteness of different parts of the spectrum. Unfortunately, one cannot reasonably expect an artist to see the fallacy in an argument of this kind.

The trouble is that this book is symptomatic of the wide gap between the artistic and scientific approach to colour. Is it too much to hope that something may be done before long to bridge it ?

W. D. WRIGHT.

MUSICAL ACOUSTICS

The Musical Ear

By Ll. S. Lloyd. Pp. ix + 88 + 2 plates. (London, New York and Toronto : Oxford University Press, 1940.) 6*s*. 6*d*. net.

MR. LLOYD has done a public service by writing a book on musical acoustics which, while giving the latest results of scientific investigation, approaches the subject from the point of view of the musician. Too often the latter has had to complain of the attitude which many who write for him adopt ; that he ought to have taken a course in mathematics and physics at least up to university intermediate standard before reading their works, forgetting that, so overcrowded is the curriculum to-day that a knowledge of physical acoustics cannot be assured even to science students unless they have taken physics as one of the principal subjects of a degree course. It is true that it is impossible to write on sound nowadays without introducing concepts like frequency and phon or their equivalents, but Mr. Lloyd wisely does not confound his readers with an introductory chapter or appendix containing a long list of definitions. Instead he cleverly avoids defining many of the terms he has to employ, leaving the reader to sense their meaning from the context.

As for the contents, they form a series of essays on topics which embrace the relationships between physical acoustics, musical sounds and theory, and the ear—especially the ear. The author elaborates a point which the physicist and—more so—the musician is apt to overlook, namely, that the ear is, or should be, the final arbiter in sound experiments and that as an organ of response it has its limitations and idiosyncrasies. To the best of its ability it measures loudness, not intensity ; pitch, not frequency ; timbre, not overtone structure. In other words, a treatise on acoustics has a serious lacuna if it does not deal with the sensation of hearing. Pre-occupied with this aspect of music, the author is a little severe on Ellis who did, according to his lights, expound and amplify Helmholtz to the English reader. Mr. Lloyd also has an affection for mechanical rather than the more recent electrical methods of analysis and synthesis of musical sounds. In the essay entitled "Electronic Organs and the Phonodeik", the reader will find nothing about the former but a great deal about the latter. No one decries the importance of the pioneer work of Miller in this field, but the reader is not told that Miller had to apply a rather arbitrary calibration correction to his analyses with the phonodeik, a calibration which is largely avoided in modern electric wave analysers, by the possibility of omitting resonance cavities and bodies which were necessary in mechanical recording to produce the desired amplification.

A GREAT SWEDISH ASTRONOMER

Pehr Wilhelm Wargentin
Kungl. Vetenskapsakademiens Sekreterare och Astronom 1749–1783. Av N. V. E. Nordenmark. Pp. 464. (Uppsala: Almquist and Wiksells Boktryckeri A.-B., 1939.)

THOUGH Wargentin in his lifetime enjoyed a reputation which was both great and widespread—he was a foreign member of the Paris Academy of Sciences, of the Royal Society, of the St. Petersburg Academy and other similar bodies—he is probably little remembered outside his native land except by astronomers. Even in that circle he is known, perhaps exclusively, as an assiduous student of Jupiter's satellites in the days before Laplace investigated them as a dynamical system. In this voluminous memoir Wargentin is shown as a prominent figure in Swedish science in the great days of Linnæus and Scheele. In his versatility and by certain specific activities he is related to the Halley of the preceding generation. The memoir is in Swedish, but it includes (pp. 310–336) a résumé in French.

P. W. Wargentin was born in 1717, and as he died, like Euler, in 1783, he was an exact contemporary of d'Alembert. He was a student at Uppsala in 1737 when Celsius returned from abroad and resumed his chair of astronomy. As the subject of his thesis for the master's degree Celsius proposed the motion of Jupiter's satellites. At the time Jacques Cassini's new tables were expected to appear (1740), and the candidate was intended to include some discussion of them. As it fell out, the copy ordered from Paris was delayed in transit. Accordingly, Wargentin prepared fresh tables for himself, based on such observations as he could find. This was done with such success that the new predictions not only surpassed those given in the "Connaissance des Temps", based on the tables of the elder Cassini, but also those derived from the belated new tables of the younger Cassini. This was a real triumph, but it was followed by a catastrophe. On a journey to Stockholm at the end of 1741 the MS. of the tables was stolen from the coach, and Wargentin was faced with the task of repeating his work, which took two years to perform. But the reward was commensurate. At the age of thirty-one, Wargentin was elected corresponding member of the Paris Academy of Sciences, and member of the Swedish Academy of Sciences, and of the Uppsala Scientific Society, all within one year. The following year he was elected permanent secretary of the Swedish Academy, and thereafter until his death, a third of a century later, the story of his life is very largely the history of the Academy.

At that time the Academy was only ten years old; it will be recalled that its bicentenary fell last year. For two years it had enjoyed the monopoly from the sale of almanacs, but the revenue from this source was only modest, and it was charged with the erection of the Observatory at Stockholm. Under the management of Wargentin the yield from the monopoly was almost trebled within a couple of years. By this means progress with the Observatory, of which he was to be the first director, was advanced; it was inaugurated in 1753. Even while it was unfinished he had continued his observations, and afterwards he obtained the necessary funds to add a quadrant by Bird and other instruments to the equipment of the Observatory. Outside what must be considered his life-work on Jupiter's satellites, Wargentin's contributions to astronomy were chiefly in the field of parallax research. When Lacaille went to the Cape of Good Hope in 1750 to observe the moon and Mars, Wargentin made corresponding observations himself at Stockholm, and organized four other stations in Sweden. Similarly, he organized observations in addition to his own of the transit of Venus in 1761 and 1769. Thus his astronomical work was by no means confined to one special field.

But it was there that he made his reputation by his indefatigible researches. As a means of attack on the longitude problem, the eclipses of the Jovian satellites had attracted early attention. The first tables were made by J. D. Cassini (1668, revised 1693). Bradley's uncle, James Pound, published new tables in 1719, and Bradley himself contributed a new version to Halley's "Tabulæ astronomiæ" in 1749. So it would appear from this passage (pp. 327–328): "Sans doute Halley publia-t-il dans ses Tabulæ astronomiæ de 1749 des tables remaniées par Bradley et dues plutôt à son oncle Pound. Halley n' avait naturellement pas encore connaissance, à cette époque, des tables de Wargentin qui se montrèrent bientôt supérieures à celles de Bradley." But this cannot be accepted as fair comment, for the simple reason, of course, that Halley died in 1742. In fact, Bradley's "Corrected Tables", which were published as stated in 1749, were finished in 1718, when he was barely twenty-five and was serving that apprenticeship with Pound during which it would be probably hard to distinguish clearly between the work of uncle and nephew. It may be surprising that these obsolete tables were included in the 1749 edition of Halley's collection, but it was most natural that ten years later Lalande substituted Wargentin's revised tables in his Paris edition of the same

collection. The observations were continued, and the tables were revised from time to time until they reached a state of perfection which was truly admirable. For they were scarcely surpassed, as de Sitter ascertained, by Delambre's tables of 1792, which were founded on the dynamical theory of Laplace, whereas the earlier method had been purely empirical. This process has been compared with Kepler's, but a closer analogy may be seen in the lunar theory of Horrocks, and Wargentin's success in isolating the main inequalities in the motions of the satellites was quite remarkable. As this work has met with the fullest recognition it was scarcely necessary to dispute (pp. 205, 327) Bradley's priority in noting the commensurable relation connecting the mean motions of the three inner satellites. Wargentin was fortunate in finding a task in astronomy exactly suited to his powers, and he carried it out admirably.

To this account of his astronomical work it should be added that besides the observations made on every possible night he initiated a routine of meteorological readings by day, the beginning of a continuous record to the present time. No assistant is mentioned, and he seems to have worked single-handed throughout.

But Wargentin the astronomer was only half the man, whose capacity for work must have been prodigious. As secretary of the Swedish Academy, then in its infancy, he developed all the activities which can be expected from a national academy. In general such duties devolve on a considerable number of individuals, but Wargentin combined them in his own person. He was secretary, editor of the publications, treasurer, foreign secretary and librarian all in one. In no respect did the interests of the Academy suffer from this concentration of functions ; on the contrary, it prospered in all departments. His success in nursing the revenue from the sale of almanacs has already been mentioned. He cultivated foreign correspondence with special ardour in addition to the domestic exchange of letters. As a result the Academy possesses more than 4,000 letters addressed to Wargentin, and it may be interesting to select a few names : Jean Bernoulli (40), A. v. Haller (45), Max. Hell (15), Lacaille (10), Lalande (38), Lexell (111), Linné (124), de l'Isle (20), Maskelyne (5). There is even a letter from Marat, dated 1779. Apart from this, the sample selected naturally reflects in the first place Wargentin's high position in the astronomical world.

The functions of a national academy are not confined, however, to its own affairs or to its foreign relations. It has many opportunities to offer advice to Government in the interests of the country, and such advice often involves great labour. When the Gregorian calendar was introduced in 1753 Wargentin played an effective part in recommending the change. This was appropriate to his professional character. More remote was an active share in the commission directing work on the Trollhättan Canal. Still farther afield was service on a commission to translate the Bible, where his special concern was with biblical chronology. But Wargentin had enjoyed the advantages of a wide liberal education in his youth. He could turn a set of Latin verses, though whether they would have satisfied the critical taste of Bentley better than Halley's may be doubted.

In 1769 Wargentin received the royal commission to construct a map of the Swedish coast. The work was unlike Halley's on the English Channel in the *Paramour Pink* because the observations had already been made. In this case the task proved too much for an overburdened man and it was relinquished within two years in an unfinished state. But one interest persisted through life and constitutes a second high claim to recognition. So early as 1736 the Swedish Government was taking an interest in vital statistics. This was fostered by the Academy and the new secretary soon took a leading part on an expert committee appointed by Government. The outcome of Wargentin's researches and reports was the creation of a permanent organization in 1756 which is said to have been the first of its kind in the world. From the data collected in the following years he formed tables of mortality which marked a great advance no doubt on previous knowledge, though the claim that they were the first to be based on exact data rather overlooks the "Breslau Tables" of Halley. The Swedish results met with the warmest reception from Richard Price, whose opinion of them may be quoted : "These observations are more curious than any that have been yet published, and leave us little to wish for on this subject, except that similar observations were made in other kingdoms under direction of men equally able and ingenious with Mr. Wargentin". Through Price they must have exercised an influence on British actuarial practice. In Scandinavian countries Wargentin laid a foundation the effect of which is still visible in the theory and applications of statistical science, so keenly cultivated in that region of Europe.

The author of the present memoir has drawn the portrait of his subject perhaps a little larger than life-size. With every discount, a very considerable figure emerges who was not only eminent in his own small country—according to his own estimate the population of Sweden was little more than 2·3 millions—but also a man of real distinction in the larger world of eighteenth-century science.

H. C. PLUMMER.

RECONSTRUCTION AND TOWN AND COUNTRY PLANNING

THE widespread destruction of property in the Greater London area which has attended the air raids of recent weeks should have brought home to everyone both the need and the opportunity for reconstruction which have come. The appointment of Sir John Reith, who is being made a baron, to the new office of Minister of Works and Buildings and First Commissioner of Works, suggests that the Government recognizes officially the magnitude of the task which lies ahead. So long ago as November 1939 an admirable paper by W. Braxton Sinclair on A.R.P. in town planning before the Air Raid Protection Institute indicated some of the possibilities in this direction if realistic and rational planning receives the executive authority to ensure that the plans are given appropriate effect.

The reconsideration of the planning of London in the light of civil defence is, however, only one point of view which needs attention before reconstruction is undertaken. Other important factors were indicated in the P E P (Political and Economic Planning) report on the location of industry and have since been reiterated in the report of the Royal Commission on the Geographical Distribution of the Industrial Population. Attention has recently been directed to the importance of this report by Lord Balfour of Burleigh, chairman of the 1940 Council, appointed by a conference of the Royal Institute of British Architects in February of this year for the promotion of the planning of social environment.

The conference in question was called to consider what immediate action could be taken to promote, through research groups or by other means, the planning of social environment on a national scale and to make more widely known the need for such planning. The work of the Council thus involves both research and publicity, and its activity in each field will be largely dependent on interested societies, the co-operation of which will be sought in their special fields of work. Lord Balfour has emphasized the way in which planning for post-War conditions must start from the recommendations of the Report of the Barlow Commission, and has also indicated the Council's general agreement with nine agreed points of principle reached by the Royal Commission. Beyond this, however, the Council recommends further investigations in a number of directions, particularly as there appears to be no immediate prospect of the proposed national board being established.

Among these new directions for investigation as a prelude to reconstruction are the problems raised by evacuation and the dispersal of industry, through the development in rural areas and elsewhere of immense war industries and undertakings. There are also the problems already mentioned arising from the destruction of buildings by aerial bombardment, and those of planning for demobilization so as to have ready for immediate operation a long-term constructive programme to bring hope and inspiration to a war-weary people, millions of whom will see their war occupations coming to an end. Lord Balfour rightly suggests that such problems may well call for a different type of national board from that envisaged by the Royal Commission, and that in view of the extent to which the winning of the War demands almost the entire attention of the Government, the preliminary research and thought should be devoted to these problems by a voluntary body such as the 1940 Council.

There is ample evidence that Lord Balfour of Burleigh's initiative is not premature, even if we are at the height of a life-and-death struggle. Valuable, however, as the efforts of an unofficial body may be, there are several reasons for doubting whether anything short of an official body will be adequate even for the preliminary work. For one thing, apart from the fairly considerable amount of research that will be required, the whole course of the War demonstrates the difficulty of predicting its termination with any exactitude. The fundamental lines of our planning can scarcely be determined too early if they are to be ready against an unexpectedly early termination of hostilities, the demands of which are likely to be no less searching than at the end of a prolonged struggle. Moreover, as the War proceeds, the problems in which immediate action affecting post-War policy and planning are imperative multiply. Not only does it frequently happen that the wisest immediate policy is that in line with long-range requirements of reconstruction, but also in the absence of such foresight fresh obstacles may be created or allowed to grow up in the way of the planning required on a national scale after the War.

The whole experience of the War of 1914–18 goes to show indeed that planning for reconstruction during a war is essential. The Ministry of Reconstruction which was created in August 1917 was actually the successor of a Reconstruction Committee appointed much earlier by Mr. Asquith

when still Prime Minister. The great value of the plans prepared by the Ministry before the Armistice is often obscured by the difficulties which appeared in 1920. Much social legislation of which we are now justly proud was embodied in those plans. While other projects encountered heavy weather either temporarily or permanently, it is quite clear that but for the work of the Ministry of Reconstruction our post-war troubles of 1919 onward would have been even more serious. So far from the formation of the Ministry being premature the evidence is rather that it was not initiated early enough for all the complex problems involved to be investigated adequately before it was necessary to formulate policy and take action.

The scope of the work and duties of the Ministry of Reconstruction as conceived after some six months work are well worth recalling at the present time. A statement issued to the Press for a meeting on January 24, 1918, indicates that the Ministry embraced branches dealing with commerce and production, including the supply of materials; with finance, shipping and common service; with labour and industrial organization; with rural development; with the machinery of Government, central and local, including health and education; and with housing and internal transport. The Ministry as a whole and the several branches in particular were concerned with the study of all proposals for dealing with post-War problems, whether under consideration by Government departments or committees or advanced by responsible bodies or persons, and with the development out of this material of a reasoned policy of reconstruction in all its branches. An advisory council, representative of all the leading interests concerned, had already been created by the Minister, organized in four sections on similar lines, and the statement indicates that in certain fields inquiry had already reached a surprisingly advanced stage.

Much of the work which was done then is clearly available for our guidance in the situation confronting us to-day, but whether or not the many investigations which are still required are prosecuted under private or Government auspices, the importance of some co-ordinating Government department charged with the prime responsibility for reconstruction can scarcely be denied. Already the difficulties in regard to relief accommodation and transport, the provision of shelters and the organization of evacuation of non-essential classes from threatened areas have indicated the need for some single supreme authority to deal with these problems in respect of London alone. Such an authority is needed partly to prevent confusion through divided responsibility or inadequate local resources in individual boroughs. Much more, however, the need is for inspiration and leadership and the power to cut through any network of 'red tape' or private interest that may stand in the way of swift emergency provision for the homeless or distressed, or the organization of shelters and transport services so as to secure the maximum possibility of sleep for London's workers.

If a leader of the right type could be found for such a post and given the sweeping powers essential, he could give new spirit and purpose to the whole work and quickly win the eager co-operation of the public. Nor should the effect be confined merely to relief of the immediate strain that the people of London are enduring. The disappearance of difficulties that at present seem formidable in the immediate situation would be of immense value also in dealing with reconstruction after the War, and leadership of the type visualized would supply exactly the right drive and direction required in the approach to problems of reconstruction during the War.

What seems to emerge from a review of the work and achievements of the former Ministry of Reconstruction is first that the educational work in preparation for reconstruction was insufficiently thorough and widespread, and secondly, that without disparaging the vision displayed by the Ministry, the importance of co-ordination and the extent to which problems of reconstruction are interlocked was not sufficiently realized. The first of these functions is one that the 1940 Council has undertaken to serve, but the second is undoubtedly one for the Government itself. Moreover, it cannot be expected that all the fundamental research which is required as a basis for planning can wisely be left to individual initiative. Government support and direction are required if only to see that resources are allocated to such effort as part of our national War effort, and in due proportion with other demands.

It is true, of course, that in some directions research is already proceeding under Government auspices, for example, under the Building Research Board, which is of direct importance to post-War planning although inspired by immediate requirements. Much more is possible in this way if only we are awake to our opportunities. For example, it has been pointed out how in the planning of a new city the incorporation of an appropriate green belt can be made to fulfil a military need to enclose and limit the city boundaries and provide dual encircling road communications with ample scope for the provision of aerodromes, anti-aircraft gun positions, searchlight stations and the like, and also accord with the principles of good civil planning. Similarly, in the provision of perfect road communications the military requirements

coincide in the main with the civil needs of the population.

While it is true that in town planning, as well as in regard to building, we need principles which have been reached as a result of scientific research, it should not be forgotten that in particular scientific fields a firm scientific basis is already available as a basis for policy. What is required in the matter of sunlight incidence, for example, as pointed out by Mr. Thomas Sharp in his excellent little volume on "Town Planning" in the Pelican series, is appropriate action on the facts already ascertained. The most disturbing feature of the whole situation is indeed just the shelving by the Government of the Report of the Barlow Commission.

It cannot be too strongly insisted that unless the long-term problems involved in the location of industry, evacuation, and national defence are faced now, formidable and perhaps unsurmountable obstacles may be placed in the way of the scientific use of our resources and of post-War reconstruction. Town and country planning have acquired a new importance, and the formulation of a national policy is imperative.

For this reason alone Mr. Sharp's little book deserves widespread attention. It is not merely that he directs attention to the dangers attending a policy of drift or to the essential unity of town and country planning. He stresses the need for a clearly thought out and well-defined policy, but the greatest value of his book may well lie in the revelation it will bring to many of the opportunities which clear vision and determined policy can put within our reach.

It is indeed important to remember those opportunities in view of the triviality and narrowness of some of the aims of our statutory town and country planning, its inadequacy or ineffectiveness, particularly on the larger issues, in face of the rights of private property, and the inadequacy of the agents to which such planning has hitherto been entrusted. It should be remembered, moreover, that the English contribution to the art of building towns was once an original and a valuable one, while its achievement in the countryside in the eighteenth century, as Mr. Sharp points out, was one of the most successful creations of its kind in the contemporary world.

The knowledge of the way in which the opportunities for improvement which changing conditions offered was taken by our eighteenth century forefathers should be an inspiration to us amid the even greater opportunities of to-day. If we vigorously seize them, snatching from them every possibility of doing our work in the finest instead of the easiest way, we may not only find new forms of expression worthy of the new materials and new powers with which science and technical advance have endowed us, but also, in so doing, once again build towns that will be worthy of us, possessing beauty and order and all the facilities for the living of that good social and physical life which it is the prime purpose of the town to provide.

Simultaneously, the opportunities in the countryside must be recognized and used. The preservation of the countryside must be recognized as a dynamic, not a static, ideal. The countryside is not merely scenery; it is a place of industry as much as is the town, a place of social and economic activity. It is a living organism to preserve which is merely to kill it.

No less in the countryside than in the town, we can if we will use the opportunities of social and economic change for the creation of new beauties and new possibilities of happiness. Already the problems encountered in evacuation have indeed shown how much might yet be done to make an even finer countryside in which, beside the harmony of all its constituents in a sympathetic relationship to each other, making a splendid whole which was the feature of the past, we have among those constituents the facilities necessary to enable the great new inventions to confer their immense benefits upon the countryside as well as on the town. Besides this, the exploration of agricultural policy in regard to food supply and health may well lead to new lines of development, to changes in the use of the land which have to be integrated into a national rather than a departmental policy if we are to reap their full benefits.

It is well that the opportunities which are before us should be so clearly indicated, and the extent to which we can, if we will, seize them while still prosecuting our War effort with all the energy at our command. Our environment will be modified by new forms of knowledge as well as by the demands of national defence or the consequences of enemy action, whether we consciously use that new knowledge in planning or not. The full advantages of social and economic reconstruction can only be secured if we embark now on the necessary planning and the investigations on which such planning must be based. If we attempt at once to take full account of the impact upon town and country planning and social conditions of the revolution in means of communication, and so plan the utilization of our resources for national defence that post-War reconstruction is kept clearly in mind, it should be possible to avoid many sacrifices of the requirements of peaceful living, to promote that educational process which must precede social reconstruction and to foster much of the scientific research which will supply the basic data alike for the purposes of total war and for the reconstruction to follow.

THE PROGRESS OF CAMOUFLAGE

IN NATURE of June 22, there appeared a leading article in which the camouflage organizations of Great Britain were severely criticized for not making sufficient use of scientific men and scientific principles.

As evidence of the way in which the scientific spirit is, however tardily, coming into its own in the conduct of the war, the following impressions of a visit to the headquarters of the Civil Defence Camouflage Organization may be of interest.

This is the largest central organization devoted to camouflage, and forms part of the Research and Experiments Department of the Ministry of Home Security, to whom Dr. R. E. Stradling is the chief adviser. The experimental work is under the direct supervision of Prof. W. E. Curtis, assisted by a technical staff which includes artists, engineers, architects, chemists, physicists, photographers, and a botanist. All the work is studied as an air problem. The sites and buildings to be camouflaged are first viewed and photographed from the air. If they are of major importance, a model is then made and camouflage applied to it. It is inspected in a special viewing room, where a turntable and a movable light provide varied conditions of illumination; and also out-of-doors from a greater distance. After the model has been, if necessary, corrected, and a colour photograph taken of it, the camouflage scheme is then applied to the actual site, which is then again viewed and photographed, this time in colour, from the air; and any final corrections required are then made. In the case of smaller buildings or those which offer less difficult problems, the model is dispensed with, and its place is taken by a two-dimensional sketch of the camouflage scheme.

One of the criticisms made in the earlier article was that biological principles were being largely disregarded. This certainly does not apply to the present work of the Civil Defence Camouflage Organization. What the biologist calls general resemblance, special resemblance, disruptive pattern, deflection, and mimicry are all now being employed as the situation dictates.

General resemblance is more commonly employed in military camouflage in the field, where mobile objects are coloured so as to be as inconspicuous as possible against a variety of surroundings. Special resemblance to particular natural objects is often extremely ingenious. Admirable methods of counterfeiting grass are now available, and artificial woods with 'sapless foliage' but permanent greenery spring up where required. Sham buildings, worthy of a film set, may be used to disguise landmarks.

In biological mimicry of the typical or Batesian kind, a harmless organism evolves so as to counterfeit the appearance of one better protected against enemies than itself. The reverse is true in mimetic camouflage: an object of military importance, such as an armaments factory, is disguised to resemble a non-military objective. Some of these schemes are most successful.

In biological deflection, the attack of an enemy is drawn away by conspicuous pattern from a more vital to a less vital part of the body, or from a biologically more important individual (such as a brooding duck) to a less important one (such as the drake, the racial function of which is over for the year once he has fertilized the eggs). In a similar way, false targets may be employed in war to draw attack away from real ones: without giving away vital secrets, it may be said that some of the deflection methods now employed are both ingenious and effective.

Disruptive pattern, however, when all is said and done, is the most essential tool of camouflage for large stationary objects such as buildings; and this is now being employed to extraordinarily good effect. One of the earlier criticisms was that the pattern used was on too small a scale to be effective against air attack, but this no longer holds, and remarkable illusions are produced.

Another criticism made in the earlier article was that structural methods were being neglected, and undue reliance placed on paint, which by itself is often helpless to disguise shadows and hard outlines. This was true to some extent during the early months of the War, but to-day (though not until after a struggle) various structural devices are being utilized on a large scale, and a special engineering section has been formed in the camouflage establishment to deal with the unfamiliar and troublesome problems involved in their proper use.

Yet another criticism was that the work was entrusted too exclusively to artists. The experience of the Civil Defence Camouflage Station is that artists are indispensable for design, both because of their gifts of observation and for their capacity to see and memorize a site in terms of colours and tones instead of in terms of objects of human significance, and also because of their technical knowledge as executants. But their work is carried out under the supervision of the

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physicist in charge, so that art is constantly guided and checked by science.

It must not, however, be supposed that perfection, scientific or otherwise, yet reigns in the camouflage world. In the first place, the Civil Defence Station is only one, albeit the largest, of the various organizations dealing with the problem. In addition, there is a large amount of private property not regarded as of sufficient importance to justify official action. In practice, however, owners of such property are consulting the Station in increasing numbers, with the result that there will be fewer unscientific monstrosities such as the cooling cylinders, mentioned in Nature of June 22, the white surface of which was adorned with naturalistic trees.

Not all the different organizations are as yet equally scientific or efficient, and in some cases, notably ships at sea, far too much use has been made of the anti-scientific principle of uniformity of colour and tone, which gives the most conspicuous possible pattern.

In addition it would appear that in some quarters camouflage has become a sort of fetish, implying the application of green and brown blotches of one or two feet in diameter, whatever the object to be disguised and whatever its surroundings. But here, too, the situation is improving.

Then, as may be imagined, co-ordination and central direction are difficult so long as we have numerous separate organizations which, starting independently, tend to preserve their independence. Something, however, has been done to remedy this, by means of a new co-ordinating committee, attached to the Civil Defence Camouflage Station, but containing representatives of other organizations, both official and non-official.

But the most important enemy of efficiency has been delay—delay between the completion of a scheme and the beginning of the application of paint to the actual building, delay which may involve several wasted months. In part this would appear to have been due to official regulations and methods of working, in part to carelessness or inefficiency on the part of the private firms the buildings of which are being camouflaged, or of the firms undertaking the actual camouflage.

Another trouble is the habit of regarding camouflage as something you put on to a building when it is completed. The notion that it would be much easier and cheaper, and much more likely to achieve really good disguise, if buildings were designed from the outset in relation to the problem of their camouflage, has scarcely entered the mind of authority or of builders. Buildings of the utmost regularity, and therefore extremely difficult to disguise, still continue to be erected, simply because that is the recognized pattern for buildings for that particular purpose.

Photographs of one of the few buildings which has been designed from the outset in co-operation with camouflage experts make one realize what could be achieved. The huge structure is part of the English landscape, complete with fields, woods, roads and hedges, and is as nearly indistinguishable as could be imagined.

The camouflage services inevitably suffer from the high cost of many of their schemes, the shortage of supplies, and the fact that camouflage is low on the list of priorities. It is clear, however, that in spite of a slow start, the art of camouflage has in the last six months gone far in utilizing scientific knowledge and scientific methods.

J. S. H.

OBITUARIES

Sir Harold Carpenter, F.R.S.

Sir (Henry Cort) Harold Carpenter, professor of metallurgy in the Royal School of Mines, London, whose death at the age of sixty-five occurred on September 13, was regarded as the leader of the metallurgical profession in Great Britain. He came from a family which produced several distinguished men, and in view of his career it is particularly interesting that one of his great-great-grandfathers was Henry Cort, whose inventions did so much to establish the position of England at the head of the iron industry in the eighteenth and nineteenth centuries. Carpenter, however, was not originally trained as a metallurgist. He studied chemistry at Oxford and Leipzig, and became research fellow and demonstrator in Owens College, Manchester.

When the National Physical Laboratory was established in 1902, Carpenter was appointed to take charge of chemical and metallurgical work. The choice was fully justified by the production, in a very short time, of several important researches, the chief of which was the determination, with B. F. E. Keeling, of the range of solidification and the critical ranges of the iron-carbon alloys. Although much work has since been done on this system, the latest determination confirms the essential accuracy of their results, other investigators having been less successful in obtaining equilibrium. The aluminium-copper system was examined with similar minute accuracy, while other papers dealt with the heat treatment of high-speed tool steels and with complex alloys of iron—a remarkable output for the early

days of a new institution with very limited staff and equipment.

In 1906 Carpenter was appointed to the chair of metallurgy in the Victoria University of Manchester, and in 1914 he moved to the Royal School of Mines, after a tour of metallurgical centres in the United States with the object of seeing industrial smelting processes at first hand. Under his guidance both these laboratories became active centres of research. Besides the determination of the equilibrium diagrams of binary and ternary alloy systems, and studies of the growth of cast iron, his work dealt largely with the growth of metallic crystals after mechanical strain. In this way, as the result of a series of well-planned experiments, he was led to the study of single crystals, and this new method of preparation proved to have many advantages over that of solidification from the melt. Partly with collaborators, he undertook a thorough examination of the modes of deformation of single crystals, and thus opened up a new and very important field of research. His interest in the processes by which metallic structures are formed was further shown by a series of papers in which the mode of separation of ferrite and pearlite from austenite in steels was studied in detail, and by an investigation, illustrated by beautiful photo-micrographs, of the structures of native copper and silver.

Carpenter was an admirable teacher. He had the faculty of interesting his students, who always held him in the greatest respect and affection. His courteous manner and wide interests made him an excellent chairman, an office which he held in the Metallurgy Research Board and the Gas Cylinders Committee, among other bodies. He had the unique distinction of having occupied the presidential chair of all three of the institutes connected with his science: the Iron and Steel Institute, the Institute of Metals and the Institution of Mining and Metallurgy. To all of these he gave devoted service. When, in 1929, the Treasury set up a committee to inquire into the position of scientific staffs in Government departments, he was appointed chairman, and the "Carpenter Report", with its far-reaching recommendations, has served as the charter of the scientific side of the Civil Service. The tact of its chairman had much to do with its success. In later years his services were more and more called upon as an adviser on matters of scientific administration.

When war broke out in September last, the Metallurgy Department of the Royal School of Mines was transferred to Swansea, where professor and students found a congenial home with Sir Harold's former assistant and collaborator, Principal C. A. Edwards. Shortly before, with Dr. J. M. Robertson, he had completed a book which had been long in preparation, and forms an enduring monument of his work. This two-volume treatise on "Metals" covers an extraordinarily wide range, from crystal structure to industrial processes. In spite of its size, it has nothing of the encyclopædia in its character, but is a clear and most readable survey of the field of metallurgy, accurate in detail but never allowing the main lines to be obscured. Only the unavoidably high cost of so large a book prevents its more extensive use by students.

Many honours came to him. He was elected fellow of the Royal Society in 1918 and knighted in 1929. He received honorary degrees from the Universities of Wales and Sheffield and was a corresponding member of the Royal Swedish Academy of Science and of the Société d'Encouragement, and an honorary member of the American Institute of Mining and Metallurgical Engineers. He was awarded both the Bessemer and Carnegie Gold Medals of the Iron and Steel Institute, the Institution of Mining and Metallurgy and the Thomas Turner Gold Medals, the Carl Lueg Gold Medal of the Verein deutscher Eisenhüttenleute, the Platinum Medal of the Institute of Metals and, only this year, the Honda Gold Medal of the Japanese Institute of Metals.

Lady Carpenter, formerly Miss Ethel Lomas, was his devoted and constant companion, and in acknowledging the award of the Bessemer Medal, he paid tribute to her constant support and aid in his work. Mr. Headlam-Morley's account of him in *The Times* of September 26 gives a striking picture of the impression which his personality and character made on his many friends. He was a lover of walking and of the mountains, and had seemed to be well in health, but although there were no external signs of arterial disease it was well advanced and his death from heart failure occurred while on a country walk near Swansea.

C. H. DESCH.

Mr. F. Hutchinson

IN the death on April 6 of Francis Hutchinson, New Zealand loses one more member of that distinguished band of naturalists who were the forerunners of present-day scientific research in that country. He lived during the period which saw the transition from the pioneering work of Colenso, Haast, Hochstetter and others to the present age of specialists and research laboratories, and like his friend Guthrie-Smith (whose death was recently recorded in NATURE) most of his studies were made in the field.

Hutchinson was for some years editor of the *East Coast Naturalist*, a pioneer journal conducted in manuscript, and occupying a unique place in the scientific literature of New Zealand. He also contributed occasionally to the *Transactions of the New Zealand Institute*. He will, however, be chiefly remembered for the moulding influence he exerted on many of the present-day generation of research workers of his country; he had a genius for expressing the facts of Nature in language calculated to stimulate the imagination of the boy, and the number of younger scientific workers who owe their first teaching to him is itself a tribute to his memory.

A few years ago Hutchinson presented to the nation a tract of virgin forest at the foot of the Birch Mountains for preservation as a scientific reserve. Mrs. Hutchinson, who survives him, was his companion on many naturalist expeditions in the mountains of Hawkes Bay, and is at present engaged on a study of the lichen dyes of New Zealand.

H. BARRACLOUGH FELL.

NEWS AND VIEWS

Science and the National War Effort

In order to ensure the continuance of the fullest co-operation of scientific workers with the Government in the national war effort, the Lord President of the Council, after discussion with the Royal Society, has, with the approval of the Prime Minister, appointed a Scientific Advisory Committee with a secretary from the Cabinet Secretariat. The terms of reference of the committee are: (*a*) to advise the Lord President on any scientific problem referred to them; (*b*) to advise Government departments, when so requested, on the selection of individuals for particular lines of scientific inquiry or for membership of committees on which men of science are required; (*c*) to bring to the notice of the Lord President promising new scientific or technical developments which may be of importance to the war effort.

The members of the committee are: Lord Hankey, G.C.B., G.C.M.G., G.C.V.O., chancellor of the Duchy of Lancaster (chairman); Sir William Bragg, O.M., K.B.E., president of the Royal Society; Dr. E. V. Appleton, F.R.S., secretary of the Department of Scientific and Industrial Research; Sir Edward Mellanby, K.C.B., F.R.S., secretary of the Medical Research Council; Sir Edwin Butler, C.M.G., F.R.S., secretary of the Agricultural Research Council; Prof. A. V. Hill, O.B.E., F.R.S., M.P., secretary and Foulerton research professor of the Royal Society; Prof. A. C. G. Egerton, F.R.S., secretary of the Royal Society and professor of chemical technology in the Imperial College of Science and Technology.

Social Survey of Tyneside

In "Tyneside: the Social Facts" (Newcastle-upon-Tyne: Co-operative Printing Society, Ltd., 1940. 1*s*.) Mr. D. M. Goodfellow gives the results of a session's work of a tutorial class organized by the Workers' Educational Association in Newcastle-upon-Tyne, which shows the effects of the depression in Tyneside. A short summary is given of the death-rates from tuberculosis, pulmonary and non-pulmonary, in the Tyneside area which shows that the Tyneside districts in 1917 showed increases for the most part much greater than in corresponding districts throughout the country, while by 1921–25, the reduction in the incidence of tuberculosis was far less than in the whole country, except for one town; although the position improved by 1935–37, the improvement was appreciably less than in England and Wales as a whole. These high tuberculosis rates, in spite of a relatively high standard of public health services, much superior to that of the Welsh areas, is attributed to the effects of a false prosperity which reached its apex during the War of 1914–18 and weakened Tyneside's resistance in the long depression that followed, overcrowding and large families rendering the area specially vulnerable.

Children and Poverty

Mr. Goodfellow accordingly points out that sanatorium treatment of tuberculosis must be followed by real enterprise to remove the poverty of the patient. Infant mortality figures confirm this effect of the last war on Tyneside. In 1911–13, Newcastle, Tynemouth, South Shields and Gateshead were all below the infant mortality average for English county boroughs. By 1914–16, as a result of increased industrial effort without proper safeguards, these four Tyneside boroughs had infant mortality rates much higher than English county boroughs as a whole and while from 1911–13 to 1935–37 in the country as a whole infant mortality was reduced by practically 50 per cent, the Tyne black spots showed no such improvement. These figures again are related to overcrowding. In 1925, one baby in three in Tynemouth was born in a one-room apartment, and even in 1933 one baby in five suffered this fate although in 1938 the rate had fallen to one in 20. The figures are again related to the work of infant welfare centres. In Leeds, for example, with an infant mortality rate of 64 per 1,000 births, the rate fell to 21 among babies attending the clinics.

Mr. Goodfellow's review of the maternity and child welfare centres on Tyneside shows the variation in the provision for such services made in very similar areas and emphasizes the need for radical reorganization of local government services taking account of the needs of all types of district. Similar variations or discrepancies occur in the school medical services, in the provision of school meals, milk, or for defective children. During the past few years Tyneside and Durham have fallen further behind other districts in regard to malnutrition of school children, even by present methods of assessment the percentage of under-nourished children being more than three times as high in Tyneside and Durham as it is in London and the south. Equally wide variations occur in the Tyneside districts in regard to the percentage of elementary school children leaving school at the age of 15 or over, although it should be noted that in five years Tyneside has lost more than 15 per cent of its elementary school children.

Civic Authority and Social Development

The local rates show the same wide fluctuation, and Mr. Goodfellow points out that if civic conscience is to be developed, Newcastle, Gosforth and Whitley Bay and Monkseaton must enter a unified Tyneside and give it the benefit of their rateable value. The attitude of mind which has allowed business people to reside in Gosforth on profits made out of Jarrow or Felling or Hebburn, while disowning all responsibility for even the barest minimum of decent existence in Jarrow, Felling or Hebburn is utterly inconsistent with civic decency. Mr. Goodfellow

considers that the new region should also include Durham, partly to avoid Tyneside, as an industrial region, being swamped by a conservative and agricultural county, which has not yet shown itself to possess industrial standards in its social services, and partly because of Durham's achievements in the development of such services, and he also points out the example set by some of the districts such as Felling in changing their character from a slum-ridden overcrowded little town to one of the best garden cities in the country. If such districts lose control of their own civic life the division of powers between local and regional authorities will require the closest consideration to avoid friction or deadlock, and Mr. Goodfellow advocates the transfer of control of all services and ownership of all public utilities to the regional authority as most conducive to social development.

Conflicting Ideals and War Aims

ON the outbreak of war, the -ologies and -isms into which the world of European civilization had been divided since the irruption of the dictator into national and international politics were resolved into an opposition of Christianity over against paganism. Such at least has been the rallying cry with which Britain, in what may be termed her official proclamations, asks for and has received the moral and material support of the members of the British Commonwealth of Nations, the United States of America and the remaining free peoples of the world. It must be patent, however, that in the present stage of development of modern thought, a literal interpretation of this bond as a subscription to a theological formula, as would seem to be implied, would set outside the pale not only those who are members of the other great religious systems of the world, but also those who, while intellectually 'non-jurors', have entered upon the struggle to secure the ascendancy in world affairs of that spirit which inspires Christianity, but is not peculiar to it, with a fervour and passionate devotion which has all the intensity of religious emotion. To say this is not to imply a revival of the over-long opposition of religion and science. It is rather to emphasize what has been in fact an approach to composing their differences; but there are not lacking those who in the cause of intellectual integrity would prefer to clarify the issue and to rest upon a statement of our aim in its simplest and widest appeal as being alone acceptable to those who adopt the point of view of the rationalist.

Such a line of argument is set out, for example, by Mr. A. Gowans Whyte in "Make your own Religion" (The Thinker's Forum, London, Watts and Co., 1940. Pp. 47. 6*d*.). After passing in review the evidences of the failure of Christianity—unkindly drawn in part from the utterances of the Churches themselves—and the bankruptcy of a Christianity which alternatively depends upon a few generalized moral principles, Mr. Whyte sets out on "an adventure" towards a new religion, a religion which is "a search for the truth" and "the satisfaction of the will to know" as opposed to "the will to believe". The object of this "will to know" is the building up of a picture of the universe and man's place in it in accordance with the doctrines of evolution. Christian morality, it is argued, is not far and away superior to all other codes as the Divine law, but is as imperfect as those other codes and is subject to change in form from time to time and from place to place. The ideal on this view—a moral system which enables the individual to live "a full mental, emotional and physical life in harmonious association with others equally blessed"—is, it is admitted, still a long way ahead, but progress will depend upon knowledge of the moral evolution of mankind and upon a mind set free "to learn, to probe, no doubt, to reject, to accept, as experience and reason suggest"—in other words upon the principle of freedom of thought for which really we are fighting.

Additions to the British Flora

ALTHOUGH only an infinitesimal proportion of the alien plants which reach Great Britain in some form or other and take root ever succeed in establishing themselves, much less colonizing the country, a small number of additions to the flora that have established themselves in recent years from garden escapes or alien casuals of industry may have some important bearing upon the flora of the future. In 1928, F. W. Holder and R. Wagstaffe, of the Southport Scientific Society, found an alien composite with small yellow flowers at Freshfield, West Lancashire (vice county 59, botanically "South" Lancashire), which Druce afterwards identified as *Siegesbeckia orientalis*, fairly widely distributed in the southern hemisphere, but not previously recorded in Britain. In the twelve years since then, the species has firmly established a colony of plants at the Freshfield station and J. D. Massey, in a communication to the Liverpool Botanical Society, has pointed out that it differs from Ridley's description of the species in the "Dispersal of Plants Throughout the World" in growing much taller (5–6 ft.), in always possessing five long narrow bracts instead of four, and has glands on the leaves and stem as well.

About the same period, R. E. D. Baker discovered *Scirpus americanus* (Pers) by a slack on the Freshfield dunes, its only other European station being on Jersey, although W. G. Travis had an unnamed 1909 specimen from the same Freshfield site in his herbarium. Since then, the colony of *Scirpus americanus* has considerably extended on the site to about half an acre, and J. D. Massey has successfully transplanted a second colony 100 yards south. The steady colonization of the countryside by such Petasites garden escapes as the winter heliotrope and white butterbur (*P. albus*) may be emulated by another white butterbur, *Petasites japonicus*, which was recently added to the Cheshire flora (Eric Hardy, *J. Bot.*, April 1940). Wilson has noted it in Lakeland ("Flora of Westmorland"), and the former record elicited specimens in the British Museum herbarium from additional stations at Denham and Langsdale, and elsewhere from Denbighshire (*Field*, August 28).

Engineering in the University of Glasgow

In less troublous times professional engineers all the world over would undoubtedly have wished to collaborate in celebrating the centenary of so important an event as the founding in 1840 of the regius chair of civil engineering and mechanics at the University of Glasgow. The second occupant of the chair, Prof. W. J. Macquorn Rankine, was an exceptionally brilliant man to whom all fields of knowledge seemed alike, and there are few branches of engineering science to which he did not make some notable contribution. In his time there was no thought of the expansion that was soon to take place, which now makes separate subjects of civil, mechanical and electrical engineering. As *Engineering* of September 27 points out, he was also an accepted authority on naval architecture. His influence was, and still remains, potent in many branches of design. The *Glasgow Herald* of September 16 says that he was "the first really powerful thinker in this country to bring the highest mathematical resources to bear on engineering practice".

Rankine died in 1872 and was succeeded by James Thomson, brother of Lord Kelvin, who was one of the earliest to develop the large-size centrifugal pump. In 1889 he was followed by Archibald Barr, who will long be remembered for his collaboration with Dr. Stroud in the production of the Barr and Stroud range-finder. He also left an enduring monument in the James Watt Engineering Laboratories of the University which he initiated. Barr's successor was the late Prof. J. D. Cormack, during whose tenure of the chair the centenary of the death of James Watt provided an occasion for the establishment of two new chairs, in heat engines and electrical engineering. They were actually founded in 1921, and with the existing John Elder chair of naval architecture, completed (at least, for the time being) the subdivision on modern lines of the comprehensive curriculum that Rankine had undertaken single-handed, and which his own work had done so much to expand. It would be interesting to speculate how the popular attitude towards engineering in general would have been affected if its study had continued under the earlier title of 'natural philosophy'.

Electric Utilities at the New York World's Fair

In the August issue of the *Edison Electric Institution Bulletin*, Mr. Gardner Boyd sums up the results of the first hundred days of the electric utilities exhibits at the New York World's Fair. When the Fair opened its gates on April 30, the electric utility industry presented two separate exhibits to the public. One was designed to give visitors an understanding of the public service objectives and their contributions to present-day living. The other was planned to show farmers the many ways in which electricity will serve them with profit. It has been said that so far the attendance at the Fair has been poor. This is true in comparison with standards required for profitable operation determined by the Fair management in advance of the opening; but so far as the electric utilities exhibit is concerned, attendance has been excellent both from the numerical point of view and from the qualitative aspect. To August 15, the total number of visitors to the main exhibit—Forward March of America—was 3⅛ millions. It has not been possible to make a continuous count of visitors to the electrified farm. From spot checks made frequently and compared with attendance at Forward March of America for the same periods, it appears from these comparisons that the farm draws regularly 75–80 per cent as large an attendance as Forward March of America, and that the total attendance at the two exhibits up to August 15 was approximately six millions.

At the farm there is an information bureau to which many visitors turn. Primarily they want to find out more about the various appliances and pieces of electrical equipment demonstrated at the farm. In order that they may be fully served, they are asked to fill in cards giving their names and home address, the appliances about which they want information and the name of the electric utility that serves them. Many thousands of these cards have been filled up. The information on the cards is promptly forwarded to the manufacturers and others who contributed material and equipment used on the farm, and to the utility companies serving the inquiries named.

Applications of Synthetic Rubber

In an article entitled "Synthetic Rubber" appearing in the *Engineer* of September 13, Mr. A. E. Williams reviews the progress made with the synthetic rubber called neoprene, which was first developed in the United States about seven years ago by the Du Pont Company and is now manufactured by Imperial Chemical Industries Ltd. The starting point for neoprene is calcium carbide; its properties can be varied by incorporating different substances in various proportions. Generally speaking, the initial cost of synthetic rubber is higher than that of natural rubber, but owing to its resistance to temperatures above 140° F. and to acids and oils, it proves much cheaper in the long run. Exhaustive tests have been made to show its resistance to oil, and in one of these, whereas the tensile strength of natural rubber fell to 25 per cent of its original value, the strength of neoprene was reduced only to 93 per cent. It has many uses, among which Mr. Williams mentions those for driving belts, the bonding of metals, inking rollers for printing machines, hoses for petrol and oil, the protection of insulated electric cables, seals for refrigerating apparatus and the manufacture of flexible ebonite, a substance finding many different applications in industry.

Hemp Drug Addiction in India

The October issue of the *British Journal of Inebriety* contains an instructive article by Brevet-Colonel R. N. Chopra and Captain G. S. Chopra of the School of Tropical Medicine, Calcutta, on the present position of hemp drug addiction in India. Hemp drugs in India are at present used in three forms, namely, *bhang*, which is taken as a beverage, while *ganja*,

which is nearly four or five times more potent, and *charas*, the effects of which are even stronger than those produced by *ganja*, are mostly smoked. The cultivation of the hemp plant which grows wild in Northern India along the southern slopes of the Himalayas is strictly controlled for narcotic purposes. The total consumption of hemp drugs in British India during 1934–35 amounted to 1,031,496 lb.

According to the writers there are at least between 855,844 and 1,000,000 hemp drug addicts in India, or approximately 0·5–1 per cent of the total population. The main causes of addiction in order of frequency are association with other addicts, religious and emotional factors, substitution for other drugs, disease and minor ailments, and hard work, worry or strain. The commonest age to contract the habit is between twenty-one and thirty. The effects of the drug on the central nervous system can be divided into three stages: first, the stage of primary stimulation and excitement; secondly, the stage of depression and anæsthesia; and thirdly, the stage of secondary stimulation and excitement. Moderate habitual use may not be attended with harmful effects, but continued excessive indulgence impairs the normal functioning of the nervous system, renders the addict incapable of mental exertion and causes general debility and premature decay.

Robert Boyle

ALTHOUGH Robert Boyle (1627–1691) is well known for his law of compression of gases and for his clear definition of a chemical element (given in his "Sceptical Chymist", 1661), his many other services to chemistry and physics are less appreciated. M. Schofield (*Chem. and Ind.*, **59**, 615; 1940) has sketched some of these. Boyle's work in physics centred around his air pump, several models of which were constructed, and his experiments in a vacuum are of considerable interest, particularly in connexion with the barometer, the fact that sound is not propagated in a vacuum, and the boiling of water under reduced pressure. Experiments on freezing mixtures and hydrostatics, including the measurement of specific gravities, were also carried out by Boyle. In the field of chemistry he criticized the prevailing views on elements and pointed the way to a correct view of these, made experiments on combustion which emphasized the importance of the air, investigated the action of acids and alkalis on indicators, prepared phosphorus and ether, and was near the correct interpretation of respiration.

Dr. Désiré Bourneville

DR. DÉSIRÉ MAGLOIRE BOURNEVILLE, a pioneer in the welfare of defective children, was born at Garencières in Normandy on October 21, 1840. He studied medicine in Paris, where he qualified in 1870. Three years later he founded *Le Progrès Médical*, which soon became one of the leading French medical journals. In 1879 he was appointed senior physician to the Bicêtre infirmary, where he took charge of a service almost entirely devoted to idiocy and other forms of mental defect in children and published the *Comptes rendus de Bicêtre*. In the following year he founded the *Archives de Neurologie* under the patronage of Charcot, whose works he had edited some years previously. Bourneville was one of the first in France to confirm Hertoghe's observations on thyroid cachexia and to prove the value of thyroid medication. He was also the first to describe the association of sclerotic nodules in the brain with mental defect and epilepsy which is known as tuberous sclerosis. He took an active part in the laicization of hospitals and in the foundation of training schools for nurses at La Salpêtrière, Laribosière and Pitié hospitals. In 1905 he retired from the Bicêtre infirmary and was appointed director of the Vallée Foundation for the treatment of idiots and mentally defective children. He died on May 28, 1909.

Luigi Bodio

LUIGI BODIO, a celebrated Italian statistician, was born at Milan on October 12, 1840. After serving as lecturer in economics in the Technical Schools of Leghorn, Milan and Venice, he was appointed first permanent secretary of the Central Office of Statistics and in 1878 its director. In 1885 he was elected secretary to the International Institute of Statistics and in 1905 director. In 1901 he was made a senator of Italy. His writings were numerous and varied, the most important being on external commerce (1862), statistics in relation to politics, economics and allied sciences (1869), movement of population in Italy and other European States (1878) and Italian emigration (1894). He died on November 2, 1920.

Amerindian Relics

SOME notable additions to the collections of the Smithsonian Institution illustrating the culture and history of the North American Indian peoples are recorded in communications recently issued by the Institution from Washington. The ethnographical interest of these objects is considerably enhanced by their historical and personal associations. Two corn husk dolls, for example, presented by the widow of the late J. N. B. Hewitt, who was the foremost authority of recent times on Iroquois culture and philosophy, are notable as being an exact reproduction of the dress of a man and woman of the Iroquois as described in contemporary accounts at the close of the eighteenth century. The Iroquois Federation of the Five Nations, founded in the seventeenth century, played a part of no little importance in the War of American Independence, though disrupted by a divided allegiance. The dresses of both male and female are of blue broadcloth decorated with glass, shell and porcelain beads and coloured ribbons. That of the woman is particularly elaborate.

Among Indian leaders in the war of resistance to the authority of the United States of the later nineteenth century, Sitting Bull, chief of the Sioux, won something of a world-wide reputation. Even in America, where at one time he was regarded as the worst of "bad Indians", he is now often made a

symbol of the struggle of the Indian against conquest and absorption by the white race. Sitting Bull was a shaman or religious leader rather than a war chief in accordance with the dichotomy of function usual among these proples. Authentic relics of this chief are rare, although pairs of moccasins said to have belonged to him are found in collections scattered widely over America and Europe. The authorities of the Smithsonian Institution hitherto have allowed authenticity to one relic only in their collections, a sawed-off flint-lock taken at the time of his surrender. To this is now added a red clay tobacco pipe and buckskin tobacco pouch presented by the widow of Major-General James McArthur, who obtained them from the chief when he himself was a lieutenant in the Seventh U.S. Infantry. The pipe is of catlinite, the red clay of the Upper Missouri, commonly used by the Indians for this purpose, and has a long rectangular wooden stem. The pouch is 17 inches long with characteristic Sioux decorative work in glass beads and dyed porcupine quill.

New Fossil Primate from Sterkfontein, South Africa

Further study of the large human-like third upper molar of which the discovery at Sterkfontein was recorded recently by J. C. Middleton Shaw in the columns of Nature (**143**, 117; 1939) and a comparison with remains of the fossil Plesianthropus and Paranthropus of Broom have led to some interesting conclusions as to the possible significance of this new Sterkfontein primate. These further considerations have been discussed by Dr. Shaw in a communication to the *Annals of the Transvaal Museum* (**20**, 2; 1940). There would appear to be no doubt that the new molar belongs to neither Plesianthropus nor Paranthropus; and it differs from the third molars in all the material from fossil apes which has been described by W. K. Gregory. If, therefore, it belonged to a fossil ape, it must be concluded that that ape differed, at least so far as the upper third molar is concerned, from any ape hitherto described.

Evidence of the character of the corresponding tooth in fossil man, unfortunately, is inadequate. Dr. Shaw, however, detects certain resemblances between his tooth and that in Sinanthropus, except that it is larger and presents certain differences as to the crown, while there is, again with the same proviso as to size, a resemblance in the moderate taurodontism and smooth simple crown surfaces to certain Neanderthal specimens. Although no fossil human remains have been discovered at Sterkfontein, Dr. Shaw puts forward the tentative suggestion that the tooth of his discovery may be a relic of an early African human type, possibly of Pleistocene age and, therefore, a contemporary of Plesianthropus and Paranthropus. If this should be confirmed by further evidence, this is the first fossilized remains of man discovered in the Union of South Africa.

Excavation at Gnezdovo, U.S.S.R.

Soviet archæologists have recently made interesting discoveries during excavations at the village of Gnezdovo, near Smolensk. The vicinity is a veritable treasure-house of Slavonic monuments; in it are up to 7,000 tumuli, numerous settlements and small towns relating to the first 1,000 years before our era. Excavations have been completed of the central town at Gnezdovo, considered by many archæologists as the original town of Smolensk. An area of 120 square yards was uncovered up to an average depth of 6½ ft. In one half of the excavated area was revealed an ancient Slavonic earthen dwelling place with a stone fireplace and hearth and many utensils. There were found bone, flint and iron implements, and primitive clay pots. Copper articles (clasps and buckles) found there indicate that the dwelling place relates to the middle of the first 1,000 years of our era.

In the other half of the site excavated was discovered a very rare burial; lying on a funeral pyre was a half-burned woman in full attire and wearing many ornaments. Around her throat was a valuable necklace; suspended from a silver chain was a golden Byzantine coin, six highly ornamented gold medallions and five silver medallions. Below the medallions hung a number of multi-coloured beads, including silver ones. It is believed that the burial relates to the tenth century, and that the ornamentation is of Byzantine origin.

Gold Mining in Wales

Mining for gold has been carried on in various parts of Wales during the past two thousand years, but has experienced many vicissitudes and has frequently lapsed for long periods at individual workings. An attempt was made some three years ago to bring again into commercial production the Roman Deep mine at Pumpsaint, Carmarthenshire, but circumstances were adverse to the venture. According to *Engineering* of September 20, the plant has now passed into the hands of Messrs. George Cohen, Sons and Company, Ltd., for disposal. Local tradition says that the name 'Pumpsaint', which means five saints, is linked with a stone, having in one surface five small depressions, supposed to have been caused by the heads of five saints who used it as a pillow. Messrs. Cohen suggest that the hollows were caused by primitive ore-crushing stamps, and that the stone was part of the very early plant used at the mine.

The Start of Education

"Elementary Education: What is It?" (U.S. Office of Education, Bulletin 1940, No. 4, Part 1) is the first of four summaries which have followed a conference in 1938 on the subject. It is planned to give a bird's-eye view with relation to later studies and is valuable as presenting the views and criticisms of many teachers, though a little heavy in its methods of exposition. The general public needs to realize in simple language that the word 'education' means not pushing in information but drawing out the best that a child can do. To note among the experiences to be included in an elementary school "analysing" and "evaluating" seems rather advanced for a tender age, unless the child's determining of values provides

hints for the teacher; one of Mark Twain's clever children valued her mother most and the new kitten came next. Elementary schools hold the centre of the stage so far as numbers are concerned. There were in the United States nearly 23 millions of the teachable in 1936, and between that date and 1930 a decrease of 4 per cent in attendance is noted. But States vary widely in the opportunities they supply.

What is said of a broad interpretation of the curriculum and of mental growth is excellent. Dramatic play, begun naturally by children as individuals, should be organized as a regular part of the school programme. It is well to take long views about later life, where education goes on steadily among the wise. The main business is to discover a child's special aptitudes and get over a reluctance to tackle subjects which may appear difficult, such as arithmetic. But, while there is talk of a "stable and desirable type of personality" as one of the aims to be achieved, and of democracy and good citizenship, we find nowhere any declaration whether the child is to be educated to meet the current standards in business, or to reach a higher morality which is dissatisfied with them. Culture has in practice little chance of competing with the attractions of that broad way, the *via dollarosa*.

Recent Earthquakes

FOUR strong distant earthquakes were registered at Kew Observatory during September. They were on September 12, 19, 21, and 22. The second of these was the greatest, having a ground amplitude at Kew of 47 μ, and being estimated at a distance of 17,400 km. The second was at a distance of 6,100 km. with an estimated depth of focus of about 390 km., whilst the third, probably distant about 140°, had a depth of focus of approximately 500 km. News from other observatories is awaited before the epicentres and depths of focus can be given with precision.

On September 4, two local earthquakes were felt in Palestine each of which lasted about 10 seconds. No damage has been reported and the shocks were not registered at Kew. It is reported in the Press that an earthquake was felt in Copenhagen early on September 28. No damage was reported. Earthquakes are rare in this district and the shock may have been caused by fault slipping in the Sound separating Denmark from Sweden.

The coast of Chile in the neighbourhood of Iquique was shaken by a violent earthquake about 6 a.m. (local time) on October 4. Reports of damage and details of the shock are not yet to hand. Chile as a whole is very liable to earthquake shocks, and Iquique has been affected on a number of occasions in the past, notably on May 9, 1877, when there was widespread destruction due to large sea waves caused by the earthquake in addition to the extensive damage done by the earthquake itself, and on January 23, 1878.

During April, May, June 1940 forty-seven earthquakes were registered at the Riverview College Observatory, New South Wales, as compared with fifty-six in the first quarter of the year. The Observatory is equipped with two Wiechert horizontal 1,000 kgm. instruments, one Wiechert vertical seismometer of 80 kgm., two Mainka 450 kgm. seismometers and three Galitzin aperiodic seismometers with galvanometer registration, orientated north-south, east-west and vertical. The largest two shocks of the period appear to have been on April 1 when an amplitude of 23 mm. was obtained and on May 28 when an amplitude of 22 mm. was reached. The shock of April 18 was felt in the region of the Duke of York Islands, New Britain, etc. The shock of May 24 is reported to have had its epicentre in Peru, and the earthquakes of June 18 and June 22 were deep focus shocks. The instruments are occasionally affected by microseisms which are at times severe. The microseisms do not often preclude the accurate reading of the seismograms, details of which are given in the Observatory report.

Research on Juvenile Leisure

THE Socio-Psychological Department of the Manchester and Salford Council of Social Service is engaged in research into the problems of leisure time activities of juveniles. The research at present is centred around the psychological difficulties of juveniles in taking up educational leisure-time occupations. The department wishes to get in touch with those who have conducted similar research in order to co-operate and co-ordinate the research done. Information can be obtained from G. Wagner, Manchester and Salford Council of Social Service, 16–18 Queen Street, Manchester 2.

Announcements

PROF. A. EINSTEIN, who has been professor of theoretical physics in the Institute for Advanced Studies at Princeton since 1933 has been admitted to American citizenship.

DR. MILAN A. LOGAN, assistant professor of biochemistry at Harvard University, has been appointed Andrew Carnegie professor of biochemistry in the College of Medicine of the University of Cincinnati, in succession to Dr. Albert C. Mathers.

DR. W. A. CLEMENS, director of the Pacific Biological Station at Departure Bay, a branch of the Fisheries Research Board of Canada, has been appointed head of the Zoology Department of the University of British Columbia.

THE Academy of Sciences of the U.S.S.R. has awarded the Pavlov Prize for 1940 to Prof. Maria K. Petrova, of the Pavlov Institute of Physiology and the Institute of Evolutionary Physiology and Pathology of the Higher Nervous Activity. The annual Pavlov Prize of 20,000 roubles, for the best work in the field of physiology, was instituted by the Soviet Government in 1936. The winner of the Prize this year is known for her study of experimental neuroses, their mechanism and therapy. She has written a treatise on this subject, one volume of which has been published, and the other is in the press.

LETTERS TO THE EDITORS

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

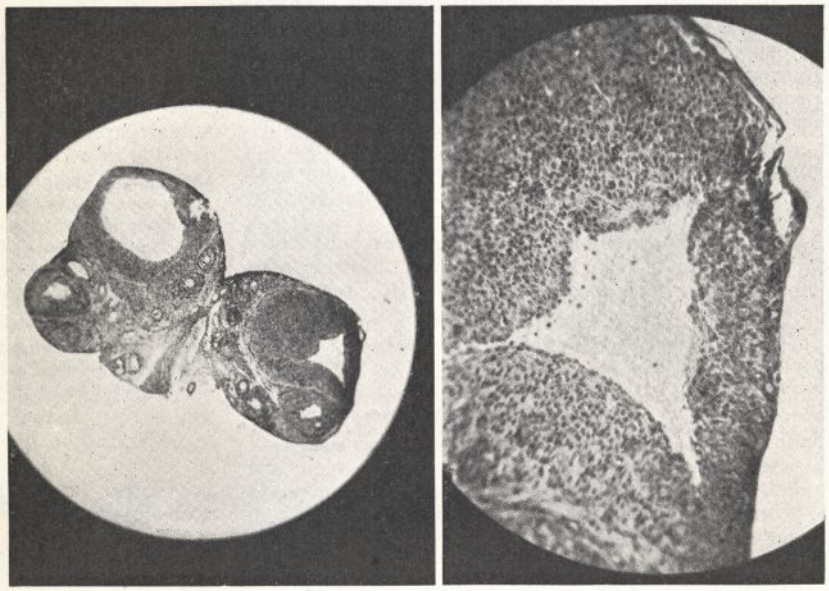
In the present circumstances, proofs of "letters" will not be submitted to correspondents outside Great Britain.

Gonadotropic Hormones in the Urine of the Giraffe

It has been considered that during pregnancy only the primates excrete gonadotropic hormones in high concentration in the urine, and that pregnant Equidæ do not, although the concentration of gonadotropic substances may be increased in the blood. It was not expected that antelopes would give positive results.

We had occasion to examine the urines from a number of captive giraffes and the following preliminary results are of importance.

The first animal, a female 2-para, aged six years, was mated on December 24, 1937, and her female calf was born on April 8, 1939 (468 days).



A *B*

Examination of the urine for gonadotropic hormone gave a negative result on August 24, 1938, but later specimens examined on November 11 and 26, 1938, showed positive ones when tested on rats and mice by the method of Ascheim and Zondek. Thus a group of 12 rats receiving 3·6 c.c. of the latter two urines, which were shaken out with ether before injection, gave the following results :

	No. of rat	Body-weight	Œstrus	Weight of the ovaries	Histology of the ovaries
Nov. 11, 1938.	18871	26·6 gm.	*G*	11 mgm.	III
	18872	28·0 ,,	*G*	9 ,,	I
	18873	28·0 ,,	*G*	11 ,,	III
	18874	30·4 ,,	*G*	13 ,,	III
	18875	25·8 ,,	*D*	9 ,,	—
	18876	26·8 ,,	*F*	14 ,,	III
Nov. 26, 1938.	19099	29·0 ,,	*G*	16 ,,	III
	19100	27·8 ,,	*A*	10 ,,	I
	19101	26·6 ,,	*A*	9 ,,	I
	19102	27·0 ,,	*G*	11 ,,	III
	19103	26·0 ,,	*A*	6 ,,	—
	19104	30·4 ,,	*B*	8 ,,	I

A = typical anœstrus vaginal smear; *B* = decreased number of leucocytes, increased number of not cornified epithelial cells; *G* = a vaginal smear with less than 5 per cent of leucocytes and more than 95 per cent cornified epithelial cells; I = enlarged follicles present; III = corpora lutea present.

The typical effects in the ovary of rat 19102 are seen in the two accompanying illustrations; *A* shows a section from the whole organ and *B* a young corpus luteum at higher magnification. The changes produced are comparable with those found in rats after the administration of gonadotropic hormones of the chorionic type (few but large corpora lutea).

Examinations of the urines from other non-pregnant female giraffes and also a male giraffe gave negative results.

Our preliminary results thus indicate that the excretion of gonadotropic hormones during pregnancy is not limited to the primates as is generally assumed, but also occurs in the antelopes. We are continuing this work and are now repeating our observations on the original female giraffe.

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P. de Fremery.
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August 31.

Volatile Aldehydes Liberated by Periodic Acid from Protein Hydrolysates

Nicolet and Shinn[1] and Van Slyke *et al.*[2] have studied the action of periodic acid on hydroxyamino-acids, and in the cases of serine and hydroxylysine have demonstrated the rapid formation of one mole-

cule of formaldehyde. Block and Bolling[3] have made use of the rapid formation of one molecule of acetaldehyde from threonine on oxidation with lead tetracetate for determining this amino-acid in protein hydrolysates.

We find that periodic acid in an aqueous solution of sodium bicarbonate rapidly liberates acetaldehyde from threonine; the acetaldehyde was identified as the 2 : 4-dinitrophenylhydrazone. In quantitative work the volatile aldehyde liberated was determined by the method of Friedemann and Kendall[4] after aeration from the reaction mixture into an absorption tower containing bisulphite solution. Under the same conditions serine gave no volatile aldehyde. This is in agreement with the published data[5] on the vapour pressure of formaldehyde in aqueous solution at room temperature. Thus aeration affords a simple analytical procedure for the separation of formaldehyde from other lower aliphatic aldehydes in aqueous solution.

Under the same conditions, alanine, cystine, methionine, hydroxyproline, β-hydroxyglutamic acid, tyrosine, tryptophan, arginine and histidine yield no volatile aldehyde.

We have determined the volatile aldehyde liberated in this manner from various protein hydrolysates. The proteins were hydrolyzed with HCl, and excess of this was removed by repeated evaporation *in vacuo* before treatment with excess of HIO_4-$NaHCO_3$ at room temperature. The following values were observed :

Protein	Volatile aldehyde as N in % of total N of protein (1 mol. aldehyde = 1 atom N)
Wool (Merino 64s)	3·3
Casein	2·1
Gelatin (Coignet Gold Label)	1·0
Wheat gluten	1·2

Volatile aldehyde was in each case recovered in good yield from threonine added to the protein hydrolysate before the determination.

The volatile aldehydes were examined qualitatively by conversion to the 2 : 4-dinitrophenylhydrazones, which were identified by comparison with authentic aldehyde dinitrophenylhydrazones and mixtures of these derivatives. Melting points, mixed melting points and X-ray powder photographs were employed, the X-ray work being kindly carried out by Dr. W. T. Astbury, Dr. Florence O. Bell and Dr. K. M. Rudall, of the University of Leeds.

In the cases of wool, casein and gelatin only the acetaldehyde derivative was obtained, but with gluten a mixture of the dinitrophenylhydrazones of acetaldehyde and propionaldehyde resulted. The X-ray photographs seem to be conclusive that the mixture contains the propionaldehyde derivative besides that of acetaldehyde, but there are strong indications that the two form mixed crystals in certain proportions, and the presence of derivatives of still higher aldehydes is not definitely excluded. Both these latter aspects of the matter are being investigated further.

The liberation of propionaldehyde suggests, by analogy with the behaviour of threonine, that β-hydroxynorvaline may be present in the hydrolysate of gluten. It is interesting in this connexion to note the reported isolations from oatmeal protein[6,7] and zein[8] of preparations having the elementary composition of hydroxyvaline. No structural evidence was published in respect of these. Abderhalden and Heyns[9] prepared from synthetic β-hydroxyvaline and β-hydroxynorvaline the derivatives made by Schryver and Buston[6] and by Brazier[8] and found no agreement in properties; the preparations from protein were optically inactive, and Abderhalden and Heyns employed the racemic compounds for comparison. They did not, however, in the case of β-hydroxynorvaline take into account the existence of two centres of asymmetry in the molecule, which leads to four active and two racemic isomers. A specimen of the product of Czarnetzky and Schmidt[7] was considered by them to be leucine.

It is intended to undertake an isolative investigation of the substance giving rise to propionaldehyde.

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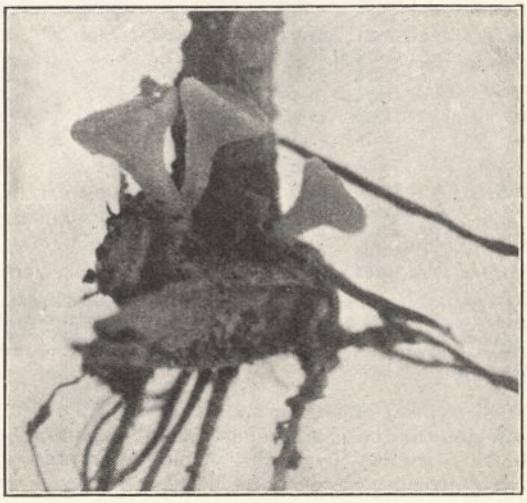
September 6.

[1] Nicolet and Shinn, *J. Amer. Chem. Soc.*, **61**, 1615 (1939).
[2] Van Slyke, Hiller, MacFadyen, Hastings and Klemperer, *J. Biol. Chem.*, **133**, 287 (1940).
[3] Block and Bolling, *J. Biol. Chem.*, **130**, 365 (1939).
[4] Friedemann and Kendall, *J. Biol. Chem.*, **82**, 23 (1929).
[5] Blair and Ledbury, *J. Chem. Soc.*, 26 (1925); Ledbury and Blair *ibid.*, 2832 (1925).
[6] Schryver and Buston, *Proc. Roy. Soc.*, B, **99**, 476 (1925).
[7] Czarnetzky and Schmidt, *J. Biol. Chem.*, **92**, 453 (1931).
[8] Brazier, *Biochem. J.*, **24**, 1188 (1930).
[9] Abderhalden and Heyns, *Ber. deutsch chem. Ges.*, **67**, 530 (1934).

Blind Seed Disease of Rye-Grass

WITH reference to the communication from Muskett and Calvert[1], we wish to record that in 1891 Prillieux and Delacroix[2,3] described, in France, a parasite *Endoconidium temulentum*, on rye (*Secale cereale*), which possessed toxic properties. The genus Endoconidium was based on this fungus on account of the endogenous formation of its microconidia. Its perfect stage was later variously ascribed to the genera Phialea, Stromatinia and Sclerotinia. In the blind seed fungus we have found that the microconidia are produced endogenously as in Endoconidium; measurements of the apothecia, ascospores and microconidia agree closely in the two fungi; also



positive results have recently been obtained by infecting the flowers of rye with spores of the blind seed fungus. The only point of difference is that macroconidia have not been described in Endoconidium.

Then while Muskett and Calvert[1] report apothecia of the blind seed fungus only on dead rye-grass seed, we have found as many as three of these apothecia on a caryopsis which has given rise to a perfectly normal seedling, as shown in the accompanying figure. This suggests that the fungus does not always behave as a pathogen. Several systemic fungi have already been reported on *Lolium perenne*; McLennan[4,5] has described one endophyte and one mycorrhizal fungus, Sampson[6] a second endophyte which produces microconidia, and Neill[7] has described an endophyte which may be identical with that described by McLennan; this last was found in the course of an investigation into a suspected herbage toxin. The results of our cultural experiments suggest that these systemic fungi may not be entirely dissociated from one another or from the blind seed fungus.

With regard to the Pullularia occurring along with the blind seed fungus, our experiments have had similar results to those reported by Muskett and Calvert; it appears that Gemmell[8] described the blind seed fungus under the name *Pullularia pullulans*.

A consideration of the foregoing statements indicates that neither the cause of the low germination of rye-grass nor the identity of the associated fungi has yet been adequately investigated. A fuller account of work on these points will be published in due course.

In view of the recent letter from Glasscock[9] on this subject we should like to emphasize that infection with the "blind seed fungus" is not necessarily correlated with low germination in rye-grass. In a recent test, of 19 seeds bearing conidia of the fungus 13 germinated and have given rise to normal plants.

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[1] Muskett, A. E., and Calvert, E. L., NATURE, **146**, 200 (1940).
[2] Prillieux, E., and Delacroix, G., *Bull. Soc. Myc. Fr.*, **7**, 116 (1891).
[3] Prillieux, E., and Delacroix, G., *Bull. Soc. Myc. Fr.*, **8**, 22 (1892).
[4] McLennan, E., *Proc. Roy. Soc. Vict.*, **32**, N.S. 252 (1920).
[5] McLennan, E., *Ann. Bot.*, **40**, 43 (1926).
[6] Sampson, K., *Trans. Brit. Myc. Soc.*, **21**, 84 (1937).
[7] Neill, J. C., *N. Zealand J. Sci. Tech.*, **21**, 280A (1940).
[8] Gemmell, A. R., *W. Scot. Agric. Coll. Bull.*, 136 (1940).
[9] Glasscock, H. H., NATURE, **146**, 368 (1940).

Non-parallelism of Lattice Planes in Tin Coatings on Steel

X-RAY and optical examination of the crystals of the tin layer of tinplate has shown that a continuous change of orientation takes place along such crystals in their direction of growth.

Back-reflection X-ray photographs taken at a series of points along such a crystal are characterized by a movement of the reflection spots from one photograph to the next. Photographs taken with the specimen moved uniformly during the exposure consist of continuous lines instead of spots. It follows that a change of orientation takes place along the crystal, and that this change is continuous.

Visual inspection of an etched surface of such a crystal, or inspection by the optical method previously used for the determination of the orientation of tin crystals[1] confirms the existence of the effect. It is observed in exceptional cases that the crystals undergo several complete rotations, as evidenced by the periodic appearance of bright patches on the etched surface. The extent of the rotation is variable, but in the few cases where it has been measured it has had values up to 40° per cm.

The proposed explanation is that the conditions of formation of the layer cause a greater concentration of iron in the tin near the tin-iron interface than at the free surface, and that this causes a gradual contraction of the lattice as the interface is approached. Calculation shows that a contraction of the lattice of 0·04 per cent at the tin-iron interface would introduce a departure from parallelism in the lattice planes sufficient to account for the observed rotation.

It is also suggested that this explanation may apply to the striated structure sometimes observed in the tin layer on copper tinned by hot-dipping[2].

It is to be expected that this type of 'non-parallel crystal lattice' would be present wherever a concentration gradient exists as, for example, in cored crystals, under such conditions that the lattice spacing depends on the concentration.

It is hoped that a full investigation of this effect will be undertaken in due course, but the present abnormal conditions may cause considerable delay in full publication.

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September 16.

[1] *Proc. Phys. Soc.*, **47**, 733 (1935).
[2] *Trans. Farad. Soc.*, **31**, 1299 (1935).

Submarine Canyons

PROF. W. H. BUCHER, as reported in NATURE[1], argues that the marvellous submarine canyons of the continental slope are due to tsunamic (or tunamic) waves. I am delighted to find this view advanced by so competent an authority, for though I gave evidence for its adoption in 1938[2], my voice has been as of one crying in the wilderness. In fact, Prof. Douglas Johnson, in an approximately complete recent survey of the subject[3], has overlooked the seismic possibility altogether, except for very limited applications put forward by Prof. F. P. Shepard[4] from 1931 onwards.

F. B. BAILEY.

Geological Survey and Museum,
London, S.W.7.

[1] Bucher, W. H., NATURE, **146**, 407 (1940).
[2] Bailey, E. B., *Trans. Geol. Soc. Glasgow*, **20**, 1 (1938).
[3] Johnson, Douglas, "The Origin of Submarine Canyons" (New York, 1939).
[4] Shepard, F. P., *U.S. Coast and Geod. Surv. Assoc. Field Eng.*, Bull. 3, 87 (1931).

RESEARCH ITEMS

Archæology of Fanning Island

FURTHER information relating to the ruins of Fanning Island, one of the equatorial islands of the Pacific, was obtained by Kenneth P. Emory in 1934 when he visited the island again after an interval of ten years (Bernice P. Bishop Museum, *Occasional Papers*, **15**, 17 ; 1939). Three additional ruins were noted and examined and four basalt adzes found after the departure of the first expedition were studied. The three ruins now described lie on a ridge of sand along the south side of a trail from the lagoon jetty and the cable station. Of the first only a small pile of coral 10 ft. in diameter and a foot high remains. Several small slabs on edge are planted here and there, and an area less than 16 ft. is covered with scattered stones. The next structure, nearly 60 yards to the west, is a small collection of loose slabs which may originally have formed an alignment. The third ruin, 47 yards farther west, is the most definite. It seems to have been a mound or platform covering two vaults constructed at ground-level. At the south end kerbs mark a rectangle 6 ft. by 10 ft. Around the outside edges are many loose slabs in disorder and smaller stones which must have served as the fill of a grave or have formed a platform built over the vault. Human teeth, fishbones and one-piece fishhooks found within the rectangle point to its use as a grave. Firmly embedded kerbs and two large limestone slabs north of the rectangle suggest another grave. There is a suggestion of a retaining wall at the north border of the ruin. About 400 ft. south-west is a place where limestone slabs had been quarried in ancient times. The four adzes resemble those of Samoa and Tonga, and not those of the Marquesas, Hawaii, Cook Islands, Society Islands and other groups of marginal Polynesia. The fishhooks, composite and one piece, relate to Tonga. The dressed stone enclosure has affinities with the royal burial places of Tonga and its sixteenth century dressed stone work, but nothing like it is found outside Tonga. The marking of burials with conspicuous superstructures of stone is a strong feature of western Polynesia, weak or absent in eastern and marginal Polynesia.

Folding of the External Ear of Lorisoid Monkeys

THE ear pinna of Galagos and their relatives is capable of a peculiar folding designed to protect a sensitive organ and brought into action when the animals desire to avoid objects which might cause physical injury. If some object is suddenly thrust towards the ear it immediately retracts, and retraction is the typical condition in sleeping animals. W. C. Osman Hill finds that the ears of the Lorisoid genera Loris, Nycticebus and Galago are characterized by having transverse discontinuities in their cartilages near the upper extremities (*Ceylon J. Sci.*, Sect. 13, **22**, 135 ; 1940). These discontinuities are bridged over by perichondrium and are connected with the presence of a lamina of striped muscle fibres (corrugator pinnæ) under the control of the will. Some of the differences between Loris and Nycticebus on one hand and the Galagos on the other are associated with the more active habits of the latter, which demand a more sensitive, in other words a more expanded organ, and hence one that is more actively contractile. Tarsius differs from these genera in lacking all these specialized structures, but is more typical in possessing a tragus.

Californian Trout

COMPARED with the meagre range of trout species in Britain, Californian rivers and lakes contain remarkable variety. John O. Snyder lists nine species of Salmo belonging to the rainbow trout series, four species in the "cut-throat" series, and one species of char, *Salvelinus spectabilis*. Not satisfied with these, enthusiasts have introduced Loch Leven trout from Scotland, and four other species from various parts of the United States (*Calif. Fish and Game*, **26**, 96 ; 1940). Short descriptions of all these species, some illustrated by photographs and coloured plates, indicate salient characters, and brief accounts of migration and the barriers to migration, scale-reading, conservation, food-habits, artificial propagation and distribution have been contributed mainly for the information of anglers and the inquiring layman.

Ripening of the Banana

THE banana differs from many other fruits in that cut from the tree (after allowing some forty days for early stages of development) it will continue to ripen—none the less the developmental processes at work whilst on the tree probably have a determining influence in respect of the time limits at which fruit may be cut for exportation. Considerable practical importance probably is attached, therefore, to such studies as those described by H. R. Barnell, of the Low Temperature Research Station, Imperial College of Tropical Agriculture, Trinidad (*Ann. Bot.*, N.S., **4**, 1940). He has followed the changes in dry matter and various types of carbohydrates and acidity in the pulp and skin of the fruit, during development in the plant, from the time the fruits emerged until they rotted. It had been proposed to study the quality of fruit left to ripen on the plant, but in these Trinidad observations, after the 'hundredth' day, the fruit began to split and then to fall and rot. It would seem that the Gros Michel variety under these conditions is more suited to picking at an incipient ripening stage and export than for home consumption as ripe fruit gathered from the plant. The banana is relatively unusual also in the low sugar content in the early stages of development, when starch is rapidly accumulating ; the splitting later is associated with a rise in water content of the pulp as the sugar content begins to increase. Off the plant bananas at this period will ripen with sugar formation in the pulp, but there is less danger of splitting as only a relatively small amount of water can migrate into the pulp from the skin. Unlike the apple in its high starch accumulation and low sugar concentration, the banana also differs in that along with starch synthesis there is a continuous fall in the acidity of the pulp—rising acidity values are only met with as starch hydrolysis begins after about the 'hundredth' day.

Life-Cycle of *Blastocladia Pringsheimii*

THE discovery, by Kniep in 1929, that the water mould *Allomyces javanicus* exhibited heterogamy of flagellate gametes, focused attention upon closely related fungi for the possibility of similar phenomena. Elizabeth Blackwall has studied the life-history of an allied species, *Blastocladia Pringsheimii* (*Trans. Brit. Mycol. Soc.*, **24**, Pt. 1, 68–86; June 1940). Resting spores were successfully germinated, but no gametes were demonstrated. Motile swarmers appeared, however, and formed germlings which grew directly into the characteristic pustule. There is, therefore, as yet no evidence of a sexual phase in this life-cycle, but the demonstration of apparently non-sexual swarm spores in a Phycomycete is nevertheless of considerable mycological interest.

Genetics of Verbena

G. H. BEALE (*J. Genetics*, **40**, 339–358; 1940) shows that the garden Verbena derives its variation from two sources. The first source is derived from hybridization between four species of Verbena. Eight gene differences are presumably derived from this hybridization; these show various degrees of dominance. On the other hand, ten gene differences resulting from mutation during the last hundred years show complete dominance of the 'wild type'. There are two series of triple allelomorphs in which the extreme dominant and recessive members produce a similar phenotypic effect, which differs from the intermediate member of each series. Aberrant ratios, modifying factors and exceptionally close linkages are probably related to the hybrid origin of the garden Verbena.

Theory of Differential Periodicity

G. F. SLEGGS (*J. Genetics*, **40**, 385–392; 1940) has amplified his theory of differentiation of an organism. He suggests that differentiation is due to the direct action of genes which are arranged on the chromosome at various angles of rotational stagger. The formation of new nuclei is equivalent to the spreading of chemical lattices in superimposition, thus producing an optical pattern. Such staggering of genes in the chromosome column produces strain which gives rise to the high synthetic activity of living matter. Sexual interaction involves chemical union between gene columns of different stagger form, thus intensifying synthesis (growth) in the diploid. Crossing-over, dominance, lethal genes, the origin of species, and species divergence are discussed in relation to this theory.

Use of Refrigeration to Delay Age-hardening

THE age-hardening which takes place in duralumin after the normalizing treatment brings about a pronounced and rapid decrease in ductility. Whereas the effects of age-hardening on the proof stress, ultimate strength, and hardness require about four days for completion, a decrease in ductility sufficient to interfere seriously with cold-pressing operations takes place in rather less than two hours. It is known that the rate of age-hardening can be retarded by lowering the temperature of storage of the freshly normalized material. Experiments have been carried out by Arrowsmith and Wolfe (*J. Inst. Metals*, **66**; 1940) to demonstrate the relationship between this temperature and the rate of age-hardening, with the object of determining the maximum temperature at which a desired increase in permissible storage time can be obtained. A practically convenient time is four days, and this is made possible by storing at a temperature of $-6°$ to $-10°$ C.

Impregnation of Poles with Copper Sulphate

AN abstract of an article by Yosio Nakazima, on the rapid deterioration of poles impregnated with copper sulphate, has been published in the April number of the *Quarterly Journal of the Institute of Electrical Communication Engineers*, Tokyo. The author, who is a member of the Sendai Bureau of Communications, gives an account of an investigation carried out to find why copper sulphate impregnated poles erected in a certain district by the Sendai Bureau deteriorated so rapidly. Experimental investigation showed that it was due to the properties of the ground where the poles were erected, the ground becoming alternately moist and dry and thus dissolving the copper sulphate. A preserving band for preventing this was purchased in the market, but it was no more effective than the procedure previously carried out of scraping away the rotted portion and coating it with creosote. Poles impregnated with creosote by the Bessel process are best suited to this kind of soil. In the present method of investigation, much importance is placed on the amount of copper sulphate per average cubic metre, and little attention is given to the uniformity of the cross-sectional presentation. It was found that this uniformity was most important. It is believed that by diluting the solution used at present for impregnation to a density that would deposit about 3·5 kgm. of copper sulphate, and by impregnating the pole well and uniformly, the same degree of protection can be attained as in present practice. This subject well deserves further study, especially from the economic point of view. The original paper gives a discussion of the method used at the Sendai Bureau of Communications for testing the finished impregnation.

Solar Faculæ and Solar Constant Variations

H. ARCTOWSKI read a paper on this subject at the annual meeting of the U.S. National Academy of Sciences held during April 22–23. The daily solar constant values for the years 1926–1930 have been compared with the areas of faculæ in order to search for the direct correlation between solar phenomena and the variations of solar radiation advocated by C. G. Abbot. The solar constant data have been taken from vol. 5 of the *Annals* of the Astrophysical Observatory of the Smithsonian Institution and those of the areas of faculæ from the results of measures made at the Royal Observatory, Greenwich, of photographs of the sun taken at Greenwich, at the Cape and in India. It has been found that the mean values for the days of maxima and minima of the solar constant and the five days preceding and following these days give curves similar to those of the faculæ of the same dates. The mean maximum as well as the mean minimum of the solar constant variation, however, are slightly in advance of those of the faculæ.

DRUGS AND WAR-TIME ALTERNATIVES

FOR the guidance of general practitioners, hospitals and drug manufacturing houses, an official committee composed of recognized medical authorities, acting under departmental ægis, has compiled a list of drugs the importation of which is considered unnecessary. It is suggested that drugs on this list should be used with the strictest economy while the War continues. The purpose of this recommendation is to support the Government policy to cease using cargo space and foreign currency to import drugs which are not essential in war-time or for which substitutes can be obtained at home.

The official committee suggests substitutes which are considered suitable for some of the drugs included in the list. Instead of aconite, it is suggested that benzocaine should be used for local application; since the sources of aconite are Germany, Switzerland and France, importation is not possible. The note against Balsam of Tolu (a South American product) is that no substitute is necessary. With regard to buchu leaves, cubebs, balsam cophiba and sandalwood oil, it is suggested that one or other of the following substitutes should be used: sulphanilamide, hexamine, mandelic acid, sodium benzoate, scoparium. In place of the Mozambique drug, calumba root, the use of quassia is indicated. As a substitute for cantharides, the sources of which are Spain, Russia, Hungary and China, mustard is suggested.

Small production of English caraway seed is available; in the past our main supplies have come from Holland or Germany; home production should be encouraged but, in the meantime, aniseed is suggested as a substitute. The importation of cassia from China is unnecessary. Instead of coriander seed, derived mainly from Morocco and Russia, the use of cardamons is proposed, supplies being plentiful. Male fern and carbon tetrachloride are suggested as substitutes for cusso. The therapeutic value of fig is said to be doubtful.

Synthetic analgesics are recommended to replace gelsemium, an American importation. Another American drug, hamamelis, might be replaced by tannic acid. Instead of Mexican jalap and its resin, the use of colocynth, stocks of which are of fair size, is proposed. Tannic acid is suggested in place of krameria, and kaolin in place of linseed for poultices. Lobelia herb, which comes from the eastern United States, may be replaced by nikethamide or leptazol, or by stramonium, should the home-produced drug be available. As substitutes for pelletierine tannate, which is derived from Mediterranean countries, male fern and carbon tetrachloride are recommended. Indian podophyllum is suggested instead of the American root, and isphagula instead of psyllium seed. Salicin may be replaced by sodium salicylate, scammony by Indian podophyllum and senega root by iodides, ammonium bicarbonate and ammonium chloride.

PROGRESS IN SEISMOLOGY

THE forty-fifth report of the British Association committee on seismological investigations was to have been presented at the meeting to have been held at Reading. This meeting was cancelled, but the report in question is now in print.

In spite of the War, seismology has made progress in Great Britain during the year. The committee has Milne-Shaw seismographs on loan at Oxford (2), Cape Town (2), Edinburgh and Perth (West Australia). All these are in operation, except one at Oxford. There is also a Jagger shock recorder in operation at Comrie. The seismograph (Milne-Shaw No. 63) and seconds regulator clock sent to Fiji last year have not yet been erected. They are awaiting the construction of the projected meteorological station at Suva, which will most likely be a matter of only a few months. A complete new recording outfit supplied with two motors and drums, one spring-driven and the other with an electric drive, has been sent to Entebbe. The original recording units sent out in 1923 have also been overhauled and repaired in West Bromwich and returned. New mirrors have been sent to several Indian stations.

Miss E. F. Bellamy is carrying on with the work at Oxford with the part-time assistance of Mr. Cook, in the absence of Mr. J. S. Hughes and Prof. H. H. Plaskett. The old system of co-ordinates has been used in the preparation of the International Seismological Summary, since no decision was taken at Washington last September on the adoption of geocentric co-ordinates. Very little material is now being received for the Summary. Last September the Milne-Shaw N-S seismograph at Oxford was dismantled and stored for safety, the seismological basement being well shored up and protected. During the year, Mr. R. E. Ockenden has again made a valuable gift to the John Milne Library, and the British Association Seismological Committee has been responsible for publishing new seismological tables by Dr. H. Jeffreys and Dr. K. E. Bullen.

The Accra earthquake of June 22, 1939, has been investigated, all the macroseismic work being conducted by the Geological Survey of the Gold Coast under the direction of Dr. N. R. Junner. The focus was found to have been below a very steep slope in the bed of the ocean to the south of Accra, and it is hoped that full details will be published in due course.

Dr. A. T. Dollar is continuing the work on British earthquakes from the Geology Department of the University of Glasgow. Further matter has been obtained for the catalogue of British earthquakes for the period January 1, 1916–October 1, 1935, and 27 more permanent voluntary observers have been added to the 321 previously on the list, though Channel Islands observers have been lost owing to evacuation. Since July 1, 1939, the following British earthquakes have been investigated: July 18, 1939, Manchester; February 2–3, 1940, Stirling; March 18, 1940, Birmingham; and a mine shake, July 5, 1939, Bargoed, Glamorgan. Information is now being collected concerning the earthquakes of July 9, 1940, North Argyllshire, July 14–15, 1940, West Midlands, and July 16, 1940, Stirlingshire.

WHEAT DIET AND LEPROSY

IN a valuable paper published recently, Drs. R. G. Cochrane and M. Paulraj, and Miss M. D. Salmond (*Indian J. Med. Res.*, **27**, 4 ; 1940) discuss the results of their treatment of certain symptoms in leprosy by the administration of a wheat diet. The experiments were carried out at the Lady Willingdon Leper Settlement during the last two years.

The authors point out that it has been recognized since the publication of Jonathan Hutchinson's book on leprosy and fish-eating in the latter part of the nineteenth century that there is a strong possibility that the causative factors of the disease may be dietary. However, most workers are of the opinion that the spread of leprosy in individual communities is attributable more to contact with open cases than to nutritional deficiencies. The authors have been working on the problem from the dietary aspect but as yet their findings are in general still inconclusive, and therefore they confine their report to a single observation regarding the value of a wheat diet in the relief of painful neuritis and certain joint pains. The experiments were carried out to test the suggestion that excessive consumption of carbohydrates may be responsible for metabolic imbalance. Wheat was therefore substituted for rice in the diet of the patients.

Thirty-seven cases were examined, and in every case where the wheat diet was consumed for three months or more, there was either complete relief or substantial alleviation of the painful symptoms. One curious difficulty experienced during the course of the work was the great reluctance of the Indian patients to take wheat instead of rice. In some cases, even when relief had been obtained from the wheat diet, the patients insisted on returning to rice. For adults 21 ounces, and for children 12 ounces, were the amounts of wheat administered each day. Throughout the investigation, the patients continued to receive the standard treatment of the institution for leprosy.

Analysis of the results shows that of patients treated for bone pain, 85·7 per cent showed complete relief, and 14·3 per cent partial relief. The corresponding figures for nerve pain were 69·5 and 30·5 per cent. The authors point out that whereas there was a constant improvement in nerve pain, there was no corresponding improvement in the leprosy condition. In reply to the possible objection that there were no controls, they state that as none of the patients had responded to palliative treatment beforehand, they automatically constituted controls themselves.

In conclusion, the authors state that their experiments show that the new method is worthy of trial where previous remedies have failed. It should be tried as a therapeutic measure before resorting to operative methods for painful neuritis, except in cases where there is a marked swelling of the nerve-sheath and threatened abscess-formation. The method, in addition to the hydnocarpus treatment, does not appear to hasten the disappearance of *Mycobacterium lepræ* from the skin and mucous membrane of the nose.

SCIENTIFIC AND INDUSTRIAL RESEARCH IN NEW ZEALAND

THE fourteenth annual report of the Department of Scientific and Industrial Research, New Zealand*, includes the Minister's statement together with the report of the secretary, and the reports of the several research committees of the Council as well as reports on research work at the agricultural colleges, the Physical Testing Laboratory, the Dominion Laboratory, the Geological Survey Branch, the Dominion Observatory, the Magnetic Observatory and Meteorological Branch. Immediately on the outbreak of war, the resources of the Department were placed at the disposal of the defence authorities, the Ministry of Supply, and the various controllers operating thereunder.

Investigations relating to problems of supply, increase of production and conservation of natural resources were initiated by the Department itself. The campaign against plant diseases and insect pests has been intensified and in view of the importance of soil survey to land development, those in progress are being accelerated as much as possible and a survey of the soil of the North Island is already well advanced.

A new industry which is now well on the way to successful establishment is the production of linen fibre. Prior to the outbreak of war, investigations, both local and overseas, into the possibilities of establishing such an industry had been made with very encouraging results. Trial planting of selective varieties of linen flaxes in Canterbury showed that fibre of the desired quality could be successfully grown and would at the same time provide for a profitable diversification of farming practice. Further developments in the war cut off the supplies of linen fibre formerly obtained by Britain from European sources, and an appeal was made to the Dominions to accelerate production of linen flax as rapidly as possible to help to meet the deficiency.

The Department is giving special attention to methods of storing fruit and dairy produce designed to meet emergency conditions. The research carried out on the cold storage of fruit has covered refrigerated gas storage of apples, the effect of fertilizers on storage quality, and wastage in citrus fruits. A programme of orchard storage experiments designed to give information to enable the best methods of non-refrigerative storage to be adopted, is also planned, as well as the erection of a semi-commercial scale refrigerated gas store. Close liaison has been established with the Department of Industries and Com-

* New Zealand. Fourteenth Annual Report of the Department of Scientific and Industrial Research. Pp. 100. (Wellington: Government Printer, 1940.) 2*s*.

merce through an inter-departmental technical committee upon which both departments are represented with the view of examining New Zealand's local resources of minerals and all other raw materials with the view of supplying substitutes for those materials which are more difficult to obtain or are unavailable as a result of the War.

The Geological Survey has carried out quantitative surveys of deposits of such minerals as bentonite, manganese, chromite, clays, refractories, oil shale, sulphur and coal which are of special industrial importance at the present time. The Survey has also actively assisted the Mines Department and various companies engaged in the exploration of the potential petroliferous areas of the Dominion.

The detailed survey of New Zealand's coal resources is being further extended and the necessary chemical investigations have been carried out in the Dominion Laboratory, which has also undertaken special work in relation to the gas storage of fruit as well as investigations of substitute fuels for use in emergency. The Research Associations for Leather and Shoe Manufacturing and the Wool Manufacturing Industries have given special attention to maintaining the standard of quality of the products of these industries. Through these associations very great help has been rendered in technical problems arising from the greatly increased demands to meet Government contracts as well as supplying the ordinary requirements of the trade. On the outbreak of war, the Meteorological Office and Apia Observatory were immediately transferred to the control of the Air Department for the period of the War so that the service supplied by this office should be primarily available to the defence forces. The Department has also compiled a register of the scientific personnel of New Zealand and the detailed information thus obtained has already been of real practical use.

The Dairy Research Institute has continued its research in cheese-making, particularly on the determination of methods of preventing the failure of cheese starters in factories as well as on butter-making, including the keeping properties of butter and the hardness of butter. The Plant Research Bureau has continued its work on the development of pure and smut-free seed-wheat and has also made important contributions to the establishment of the linen flax industry. The Plant Diseases Division has been concerned with work on the diseases of cereals, Brassica, grass and tomatoes, etc., as well as seed disinfectants, copper sprays, both in the field and in glass-houses. The results obtained with copper sprays indicate that so far none of the Bordeaux substitutes is equal to Bordeaux mixture in disease control when compared on the basis of equal concentrations of copper. Excellent control of tomato leaf mould has been obtained with Shirlan *AG* in glasshouse tests under commercial conditions. The Plant Chemistry Laboratory has been responsible for work on the cyanogenetic glucoside of white clover as well as on plant hormones. Fruit research of the Department has covered fertilizer experiments on apples, the biological control of woolly aphis, chemical control of various insect pests such as red mite, leaf hopper, and bronze beetle, biological studies of mouldy core of apples and spraying experiments. Tobacco research has also included experimental work with fertilizers, investigations on mosaic and on collar rot disease, on the damping-off fungi, and on the effect of steam sterilization of the soil on seed germination.

FORTHCOMING EVENTS

Thursday, October 17

INSTITUTE OF FUEL (at the Connaught Rooms, Great Queen Street, London, W.C.2), at 2.15 p.m.—Mr. W. M. Selvey: Presidential Address.

Friday, October 18

NORTH-EAST COAST INSTITUTION OF ENGINEERS AND SHIPBUILDERS (in the Lecture Theatre of the Literary and Philosophical Society, Newcastle-upon-Tyne), at 6 p.m.—Annual General Meeting. Mr. W. A. Woodeson: Presidential Address.

APPOINTMENTS VACANT

APPLICATIONS are invited for the following appointments on or before the dates mentioned:

TEACHER OF SCIENCE, MATHEMATICS AND TECHNICAL DRAWING at the County Technical School, Halesowen—The Director of Education, Education Office, County Buildings, Worcester (October 17).

HEAD OF THE BUILDING DEPARTMENT and LECTURER IN CIVIL ENGINEERING—The Secretary, Technical College, Sunderland (October 21).

LECTURER IN ELECTRICAL ENGINEERING AND PHYSICS—The Clerk to the Committee of Management, Technical College, Shrewsbury.

WIRELESS ENGINEER for the POSTS AND TELEGRAPHS DEPARTMENT, Gold Coast—The Crown Agents for the Colonies, 4 Millbank, London, S.W.1 (quoting M/5976).

REPORTS AND OTHER PUBLICATIONS

(not included in the monthly Books Supplement)

Great Britain and Ireland

Ministry of Home Security. Air Raid Precautions Memorandum No. 16: Emergency Protection in Factories. Pp. 8. (London: H.M. Stationery Office.) 1*d*. net. [259

Medical Research Council. Bulletin of War Medicine. No. 1, September. Pp. iv+64. (London: H.M. Stationery Office.) 2*s*. 6*d*. net. [309

Proceedings of the Royal Society of Edinburgh, Session 1939–1940. Vol. 60, Part 3, No. 19: The Effect of the Inhibition of Respiration and Assimilation of the Diatom *Ditylum Brightwelli* (West). By Dr. D. Bhatia. Pp. 245–259. 1*s*. 3*d*. Vol. 60, Part 3, No. 20: The Structure and Behaviour of the Chromosomes of the Sheep during Mitosis and Meiosis. By I. A. Ahmed. Pp. 260–270. 1*s*. (Edinburgh: Robert Grant and Son, Ltd.; London: Williams and Norgate, Ltd.) [309

War-Time Problems: Training Industrial Workers. Pp. 12. (London: National Institute of Industrial Psychology.) 3*d*. [309

Ministry of Health. Memorandum on Measures for the Control of Mosquito Nuisances in Great Britain. By Lt.-Col. J. A. Sinton and P. G. Shute. (Memo. 238 Med.) Pp. 30. (London: H.M. Stationery Office.) 6*d*. net. [210

Other Countries

Indian Lac Research Institute. Annual Report for the Financial Year 1939–40. Pp. ii+38. Bulletin No. 42: The Viscosity of Shellac-Urea Solutions. By G. N. Bhattacharya. Pp. 14. 3 annas. (Namkum: Indian Lac Research Institute.) [259

Report on the Department of Agriculture, St. Lucia, 1939. Pp. ii+38. (St. Lucia: Government Printing Office.) 6*d*. [110

Report of the Aeronautical Research Institute, Tôkyô Imperial University. No. 188: Application of the Similarity Theory of Turbulence to the Flow through a Straight Pipe of Annular Cross-Section. By Susumu Tomotika, Kô Tamada and Yukimasa Saito. Pp. 27–60. 45 sen. No. 189: Note on the Application of the Momentum Transport Theory to the Turbulent Flow through a Straight Pipe of Annular Cross-Section. By Susumu Tomotika and Hazimu Umemoto. Pp. 61–76. 30 sen. No. 190: Application of the Vorticity Transport Theory to the Turbulent Flow through a Straight Pipe of Annular Cross-Section. By Susumu Tomotika and Kô Tamada. Pp. 77–96. 35 sen. (Tôkyô: Kôgyô Tosho Kabushiki Kaisha.) [110

New Zealand: State Forest Service. Annual Report of the Director of Forestry for the Year ended 31st March 1940. Pp. 40. (Wellington: Government Printer.) 1*s*. [310

Union of South Africa: Department of Mines. The Mineral Resources of the Union of South Africa. Pp. 544. (Pretoria: Government Printer.) 5*s*. [410

Catalogues

Dunns Seed Wheats, 1940. Pp. 12. (Salisbury: Dunns Farm Seeds, Ltd.)

OFFICIAL ANNOUNCEMENTS

BRITISH POSTGRADUATE MEDICAL SCHOOL

Owing to the calling up of the Librarian, a temporary librarian is required for the duration of the war. Applicant must be a trained librarian, with experience of medical reference work and knowledge of languages; salary, £5 per week. Applications from candidates liable for military service, or likely to become liable in the course of the war, will not be considered. Further particulars may be obtained from the Dean, British Postgraduate Medical School, Ducane Road, London, W.12, to whom applications, with copies of testimonials, should be sent not later than October 16, 1940.

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