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BIOLOGISTS IN WAR-TIME

'GUNS not butter' may have some merit as a war slogan but cannot be considered a good axiom for warfare. Without fats, with their high calorific value, there would not be the muscular energy to build more guns. In the strategical planning of modern wars the only sound precept is—guns and butter. Under conditions of emergency or unpreparedness it may be necessary to concentrate upon gun-production and neglect butter-making. This state of affairs existed in Great Britain before and during the early phases of the War, and the urgency of the demand for guns, tanks and aeroplanes, with all their associated equipment, laid great stress on the part the physicist, chemist, metallurgist and engineer could play in development and research.

Biologists during this first period of crisis well realized that they could not expect to be regarded as essential cogs in the war machine. They did, however, feel that as the first crisis passed, it would become evident that biologists had a contribution to make to the war effort. The Government was known to have recognized that the prolonged storage of reserves of grain and other foodstuffs is associated with special war problems concerned with mould, insect and rodent attack. These problems were already being investigated by biologists; it seemed likely that there would be further storage problems to investigate or advise on. In other fields there were encouraging signs that biologists could do useful work. Much attention was being given to the problem of crop failures and the incidence of wire-worms in the soil. There was, therefore, the feeling that there would be more war-time agricultural problems, but there was, however, the sobering reflection that wire-worms in newly ploughed up grassland had been a problem in the War of 1914-18 and that during the intervening decades little had been done to solve it. This was emphasized by Sir John Russell at the Conference on Science and the War Effort organized by the Association of Scientific Workers (see *NATURE* of February 21, p. 208).

By the middle of 1940 biologists first began to realize that they could not be expected to be directed into war work of a biological nature without themselves taking active steps to inquire whether problems existed or whether their biological knowledge could be put to a useful purpose. Already there was a tendency, not only among intelligent laymen but also among other men of science, to assume that in this War there was no place for biology—apart from the medical aspects—except in a few narrow fields. This attitude was not surprising, for to the non-biologist the progress in many other sciences, compared to that in biology, appears like the race between the tortoise and the hare. After a year of war the contest seemed even more unequal, and the physical sciences had a start. From the outset engineers, physicists and chemists had been mobilized in large teams to work in such specialized fields as radio location, chemical warfare and aeroplane design. Biologists in general had not had the advantage of co-ordinated team work. They also had the further

handicap that many biological developments cannot have the dramatic appeal of the technical developments which lead to the production of a new fighter or a more effective bomb. Misunderstandings, too, concerning the importance of certain branches of biological research and results have also played a serious part during this War, as emphasized by Dr. A. Walton at the Conference to which reference is made above.

Another aspect of this unequal expansion of non-biological and biological research led to a large demand, especially in radio location, for biologists with a knowledge of physics. As a result many biologists who saw no prospect of being employed in a biological capacity joined up as technicians in the Services. To other biologists, who by this time were convinced that there were biological problems to be solved, this progressive depletion of the ranks was more than disturbing. There was also the further cause for anxiety since objections were sometimes raised that biological research was essentially long-range and therefore could not be brought to a successful conclusion in war-time. In agriculture, many of the research stations had lost most of their research staff for advisory work under the county war executive committees. This policy had the advantage of capitalizing the knowledge of experts in advising farmers, but had the disadvantage that simultaneous research at a number of research stations, so essential if reliable results are to be obtained in a minimum time, was seriously handicapped for lack of facilities.

Although in agriculture this switching of biologists from research to advisory duties indicated an official recognition that research workers are capable of making constructive use of their research experience, in other spheres there seemed to be little realization that a large capital of knowledge existed among biologists which if properly employed would return a handsome dividend. Biologists were convinced that wherever biological material was used or stored in large quantities there must be biological problems connected with supply, preservation, provision of substitutes, etc. Some of the problems, it was felt, were capable of immediate solution or only required short-range research. What appeared to be lacking was the appreciation that the problems existed and the absence of any mechanism by which information could be obtained or contacts established.

This was the background in the early part of 1941 when the Association of Applied Biologists, the British Ecological Society and the Society for Experimental Biology agreed to form a joint committee to consider what was the role of biology in war-time, what parts biologists could most effectively play and how their services or biological knowledge could best be brought to bear both on the problems and on the prosecution of the War.

As announced on p. 238 of this issue, a committee—the Biology War Committee—has now been set up which is recognized by the Government and is linked to a new joint committee of the Department of Scientific and Industrial Research, the Medical Research Council and the Agricultural Research Council.

The formation of this Committee is an important step forward and we heartily congratulate the three Societies on the important step they have achieved. Under the new procedure, biologists now have a channel through which problems, suggestions or ideas can be transmitted to the joint committee of the three Government research organizations and through it to other Government departments or the Services. Similarly, biological problems encountered by these departments or requests for information can be referred back to biologists through the same channel. In this connexion it is clear that if the proper contacts are to be established and the most correct information obtained, the Biology War Committee must be aware of the workers and their research in all the main biological fields. The course that the Committee has adopted initially of co-opting members so that each field of biology is represented by an expert is, in war-time, the only possible one if the Committee is from the outset to maintain the fullest liaison with biologists.

The setting up of this organization raises a number of important questions concerning the relationship of biology—excluding the medical aspects—to the community not only in war but also in peace. That such a committee should be in being only after two and a half years of war reflects the failure of the community as a whole to appreciate the true implications of biology and the part it has to play under war-time conditions. This lack of appreciation cannot be laid at a single door, but is brought about by a variety of causes. First, the teaching of biology in schools has had until recently scant attention compared to the teaching of physics and chemistry. Secondly, in the past the curricula of school biology have had a sterile academic flavour and little stress has been laid on how biology directly affects the lives of individuals. To-day in this respect there are indications of change, but the change has come too late to affect appreciably as yet the general outlook.

Furthermore, this welcome modification of biology from that of 'pure' botany plus zoology to the more comprehensive science of man and mankind is still being opposed by powerful authorities. Too many biologists still 'pride' themselves on their ignorance of the impact of their science on society.

Many biologists in our universities still look askance at applied biology. That outlook has had its repercussions right down to our primary schools, and herein, we think, lies the reason for the prevalent view, held even in many authoritative circles, that there can be very little *direct* use for biologists in our war effort. We welcome the founding of the Biology War Committee if only for the purpose of dispelling this out-of-date view; and, perhaps the Committee will succeed in rousing other biologists to their social responsibilities. The Committee might have another effect—that of counteracting the attempts of some biologists to disturb the relations of modern science to society under the pretext of preserving the freedom of scientific research. The establishment of this Committee in no way jeopardizes scientific freedom; rather will it help in the long run to preserve it.

The discoveries and technical developments of the non-biological sciences impinge directly on the life of every citizen, and it is literally brought home to him that science is affecting his way of life. That is seen especially in the sciences of physics, chemistry and engineering, in the development of radio, plastics and the motor-car. Because of his everyday familiarity with these products of science he learns to appreciate that each is a specialized field. He fully comprehends that a motor-car mechanic is not likely to be able to repair a radio set, and generally realizes that experts who design motor-cars do not design radio gramophones. But when it comes to biology, except perhaps in the farming community, biologists, when not classed as medical men, anthropologists or psychologists, may be distinguished as botanists and zoologists but no further. The idea is still prevalent that the sciences of botany and zoology are not like physics and chemistry, that is, widespread in their many fields, but sciences in which all branches come within the orbit of a single individual. It is not uncommon to find that a botanist's primary function is regarded as his ability to identify and classify plants, and it comes as a shock to learn that botanists may be interested in other things for which a knowledge of the physical sciences and mathematics is essential. For this prevailing view the biologists have largely themselves to blame. Is there, for example, any science other than biology which has found it necessary to form a society to deal especially with its 'applied' aspects. Yet nearly forty years ago certain more progressive biologists felt the need for such a society and thus founded the Society of Applied Biologists, which deals with those aspects of biology which ought to come within the purview of any general biological society. This Society, together with others equally as progressive and broad-minded, is now the very one to turn its attention to the value of its work to the war effort.

This misunderstanding of the scope and breadth of the biological field is in peace and war a serious handicap to the appreciation of what are biological problems or to what extent biologists can help in solving them or even preventing them arising. This misunderstanding brings in its train other misapprehensions. It is not always realized that biologists are not all equally competent to deal with every biological problem, and that for a given problem there is likely to be one kind of biologist who can solve it most effectively. It is not appreciated that most biological problems are complex and may for their solution require the united efforts of several different specialists not all of whom may be biologists. Nor is it fully understood that biologists have an important contribution to make by suggesting preventive measures.

It is to be hoped that the Biology War Committee by its activities will demonstrate how wide are the fields that the biological sciences cover and so bring home the value of biological research and study. The approach must, however, be twofold and the community educated to adopt a more biological outlook. As Sir John Graham Kerr points out in his communication in *NATURE* of February 21, p. 221,

the training of biologists is at the present time at a discount though the lessons of biological study may find their application in the design of the fuselage of fighter aircraft or the correct size of a Government department. Biologists, in this respect, are, as we have already pointed out, themselves much to blame. They have not sufficiently brought home to themselves or to the layman that, apart from food production and dietetics, biology is concerned in such diverse things as corrosion in condenser tubes, the purification of coal gas, the preservation of structures in bombed buildings and the fouling of ships' bottoms.

Now, the foundation of the Biology War Committee, with its strong membership, will be able to change all this. We heartily endorse its being and terms of reference, and feel it is an occasion for congratulation that the Government views it with favour, since this Committee can, and must, do much, not only for our war effort, but also for biology itself. It can raise the science of biology from the slough of complacency in which it has wallowed for decades to the firm road on which it rightly belongs—that of a science not only of cultural value but also of inestimable practical value to the progress and evolution of civilization, a value on a par with that at present attached to the sciences of medicine, engineering, physics and chemistry.

PURITY AND FINE MEASUREMENT

Chemical Species (La Notion d'espèce en chimie)
By Prof. Jean Timmermans. Translated from the revised French manuscript by Prof. Ralph E. Oesper. Pp. ix+177. (London: Macmillan and Co., Ltd., 1941.) 18s. net.

PROF. TIMMERMANS of the University of Brussels and director of the International Bureau of Physico-Chemical Standards, was the author of a book entitled "La Notion d'Espèce en Chimie" which was published in Paris in 1928. This most useful little book has now been amplified to bring it up to date and very satisfactorily translated into English by Dr. Oesper with the title "Chemical Species". The book deals with these questions: What is a chemical species and how can a given physico-chemical system be defined without ambiguity? How should a substance be refined so that it accords with such definition of purity? And what precautions are necessary in the precise measurements of its constants? There is much available data in the literature, good, bad and indifferent, but it is not always easy to know which are the best values to choose. Richter, the editor of "Beilstein", in an article on how that great handbook was compiled wrote, "the principles to be followed in such critical choices have been laid down by Timmermans": they will be found in Part IV of "Chemical Species".

The book is not a treatise; it is a statement of principles, illustrated by many interesting notes. Much of it is the common knowledge of chemists, indeed their stock in trade; but it would be difficult to find in any other publication the principles which govern the preparation of a pure substance and the conditions for the determination of its constants with known accuracy collected together and set out in a reasoned way so completely. It would be well that