

AN INTERNATIONAL SCIENCE CO-OPERATION SERVICE

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ON the occasion of the recent meeting of the Royal Society in India, and the admission of several Indian fellows, Mr. Winston Churchill sent a message which included the following words: "It is the great tragedy of our time that the fruits of science should, by a monstrous perversion, have been turned on so vast a scale to evil ends. But that is no fault of science. Science has given to this generation the means of unlimited disaster or of unlimited progress. When this War is won we shall have averted disaster. There will remain the greater task of directing knowledge lastingly towards the purposes of peace and human good. In this task the scientists of the world, united by the bond of a single purpose which overrides all bounds of race and language, can play a leading and inspiring part".

When, however, we come to the concrete necessity of implementing these truths, we see everywhere a growing conviction that after the War a much higher degree of international science co-operation must be attained. There are many who believe that the time has gone by when enough can be done by men of science working as individuals, or even in groups organized in universities or societies, within individual countries, and contacting each other as individuals, across national boundaries. Science and technology are now playing, and will in the future increasingly play, so predominant a part in all human civilization, that some means whereby science can effectually transcend national boundaries is urgently necessary. The various science co-operation offices which have already been set up under the stress of war in the capitals of the United Nations constitute a piece of machinery too precious to be allowed to disappear after the War.

The fundamental need for more intimate scientific contact among the nations might conceivably be met by a system of scientific attachés at the various embassies; but this might be found to harness the free movement of science in too much diplomatic formality. It is more likely to be partly met by sending from one country to another industrial scientists with loyalties limited to particular commercial interests; but this is very unsatisfactory, for their advice is unlikely to be truly unbiased and disinterested. What many of us would like to see would be an international science co-operation service, the representatives of which in all lands would have diplomatic status (or whatever status was accorded formerly to League of Nations officials) and full governmental facilities in communication and transportation, but who would be drawn from both government and academic laboratories, and hence would be free from commercial entanglements. One of the immediate aims of such an international service would be the conveyance of the most advanced applied and pure science from the highly industrialized Western countries to the less highly industrialized Eastern ones, though this is not to say that there would be no scope for westbound traffic too. In what follows, these ideas will be more fully worked out and concrete proposals made.

Existing Machinery

Many recent recommendations (for example, the Beveridge Report, the Unilever paper on unemploy-

ment, the Nuffield College Statement, and the Report of the League's Delegation on Economic Depressions²) have laid great emphasis on the desirability of utilizing whatever is possible among the international agencies established to further co-operation during the War. It is generally recognized that the similar organizations which grew up during the War of 1914-18 were scrapped much too lightheartedly in 1918.

At the present time, then, a number of offices have been established to further scientific co-operation. Working trans-Atlantically are the British Central Scientific Office in Washington, maintained by the British Ministries of Supply, Production and other British organizations; and the American Scientific Office in London, mainly connected with the Office of Scientific Research and Development. Through these two offices, an enormous amount of information, of first-class war importance, has passed. As between Great Britain and the Soviet Union, apart from the detailed co-operation of war technologists and important visits of specific missions, such as the Surgical and the Chemotherapeutical Missions, there is in London an Anglo-Soviet Science Collaboration Committee, with which Sir John Russell has been prominently associated.

In view of China's relative backwardness in the industrial and technological field, it was natural that scientific co-operation between Chungking and the other United Nations' capitals should have been rather slow in getting under way, but since the early part of 1942 a Sino-British Science Co-operation Office (British Council Scientific Office in China) has been working very actively there. Since this Office has been under my charge, and since its working, in spite of exceptionally severe difficulties, both material and linguistic, helps to indicate the kind of thing that a science co-operation office may do, a short description of it may be given.

The Sino-British Science Co-operation Office (British Council Scientific Office in China) is financed by the British Council (for cultural relations with other countries), but was also accepted into an organic relation with the Chinese Government through the Council for the Promotion of Science in the National Defence, which has the status of a sub-committee of the Executive Yuan. It has, at present, a staff of seven scientific men and women, four British, two Chinese and one Indian. Its head works closely with the British Ambassador and the Ministers of all departments of the Chinese Government concerned with science and technology. In matters of pure science he is in continuous contact with the Science Division of the British Council, and in matters of applied and war science with a China office in the British Ministry of Production.

The work of the Office is divided into three aspects, which may be called respectively contact, supply and output. Under the first, a channel is available whereby Chinese Departments, such as those of Health, Mining, Ordnance or Agriculture, can maintain contact with the corresponding organizations or any other agencies desired in London or Washington (in the latter case through the British Central Scientific Office there). Help is also made available from India, as, for example, in the printing of maps for the Chinese Geological Survey, or the provision of a list of edible and poisonous plants in North Burma and the Shan States for the Chinese Surgeon-General. All such dependence on India as the forward base for Chinese science and technology involves careful maintenance of contact.

In the field of supply the great task has been to do something towards breaking the blockade of China's scientific life after the planned destruction of her laboratories by the Japanese and their re-establishment in the non-industrial hinterland. The Office is available to supply, and has supplied in very substantial amounts: (a) already existing information on any question in either pure or applied science, (b) ideas and proposals from the West to meet specific problems arising in China, (c) scientific literature in all branches, including books, typescripts, offprints, microfilmed journals, microfilm reading-machines, etc., (d) actual essential research apparatus, instruments and chemicals. At the time of writing, some five hundred important scientific books have already reached China and some two thousand more are on the way; those from Great Britain are supplied on a kind of 'lend-lease' principle; but the Office also secures American scientific books when asked for. Nearly a hundred crates of scientific apparatus have arrived, for Government as well as university laboratories and for applied as well as for pure research.

In the field of output, the Office sends to the West (a) manuscript papers by Chinese men of science for publication, (b) current Chinese publications in science, (c) abstracts of Chinese work in Western languages, (d) articles and résumés describing the work of Chinese scientific workers and technologists, etc. The field of output is naturally smaller than that of supply, since even before an exhausting ten years of warfare China was not highly developed technically and scientifically; but even in questions of technical aid the Chinese have been not only willing but also able to help their Western Allies, as the examples of the use of bamboo in aeroplane construction, and the preparation of quartz crystals for stabilizing radio frequencies, may bear witness.

In addition to all this work, the Office is able to advise Chinese technical departments from time to time, and to give assistance to the Chinese Ministry of Education with problems of the sending of scientific personnel to the West for study.

The work of the Office has complemented in a fortunate way that of the technical experts sent to China by the Cultural Division of the American State Department. These experts, of whom some twenty-five have visited China during the past year and a half, and whose work has been in general markedly successful, have been attached to the relevant Chinese Ministries and have worked entirely, as it were, in the field. Such a system of procedure lacks a central clearing-house through which requests for scientific information and aid can be co-ordinated. The British Office, which has throughout maintained close contact with the American experts, has been able to fill this need.

It may be said that the functions of Science Co-operation Offices are largely of a 'post-office' character. There is some truth in this. The Chungking Office, in particular, has had the task of assuring contact between Chinese and Western men of science and technologists in circumstances of special difficulty, including a blockade such that communication with the outside world is only possible by air. In post-war conditions, with the resumption of normal mail communications and the disappearance of censorship, the purely post-office work of such a bureau must necessarily be expected to decrease. The post-office aspect of a Science Co-operation Bureau, however, is really only a part of its work. In order to be successful

it must spontaneously collect and disseminate scientific information. Without being able to answer all scientific queries themselves, its staff must know where the answers can be obtained. They must familiarize themselves with the conditions of scientific and technical life and thought in the country where they are stationed. They must have the confidence of the resident diplomatic personnel and be able to advise them authoritatively on problems relating to science and technology. They must be unfailingly at the service of the ministers of the Government Departments concerned with science.

Even for peace-time, however, the post-office aspect of such agencies is not to be despised. In all ages, exceptional scholars have acted as clearing-houses for science and learning, and the more so the worse the political chaos of the age. In the Middle Ages the monastic houses and the Arabic translators in Spain fulfilled such functions, or the Sung Confucians in China, or, in the seventeenth century, the tireless Comenius (Bishop Komensky). Exiled from his native Bohemia, Komensky kept together through years of wanderings not only his Church, the *Unitas Fratrum*, but also the band of adherents of the 'new, or experimental', philosophy, whose later great achievement was the foundation of the Royal Society, suggested by Komensky himself. And when the Royal Society was founded, what a post-office did Oldenburg, its first foreign secretary, keep! He it was who opened the series of letters from the microscopist, Leeuwenhoek, in which for the first time the new world lying beyond the limits of ordinary vision was described. A scientific post-office, indeed, requires the qualities of a "department of insufficient addresses", for its aim should be to ensure that a communication reaches its proper destination, a destination that the author himself may only vaguely know.

It was said above that Science Co-operation Offices should be in a position to give unbiased advice to Governments. It was also said in the preamble that they should aid in conveying the most up-to-date science and technology from the industrially advanced Western countries to the less-advanced Eastern ones. Here is a machinery for assisting the Eastern Governments, under strictly international auspices, with genuinely unbiased and disinterested information on their problems of industrialization. It would be a substantial improvement on the scramble of advisers with relatively narrow loyalties which is otherwise only too likely to be seen.

Besides the Washington, London and Chungking offices which have already been mentioned, steps have recently been taken in London towards a much higher degree of scientific co-operation among the constituent States of the British Commonwealth than heretofore. The British Commonwealth Science Committee was set up under the chairmanship of the President of the Royal Society in October 1941 in order to secure scientific co-operation in tackling the emergency problems of the immediate post-war period, to ensure that the most should be made of common scientific resources for improving scientific knowledge and the life of the people throughout the Commonwealth, and to consider means of promoting research co-operation in pure and applied science. In an Indian article³, Prof. A. V. Hill wrote: "The British Commonwealth Science Committee has suggested the desirability of maintaining permanent scientific and technical representation in London and possibly also in other capital cities of the English-speak-

ing world. It is further of the opinion that if scientific and technical representatives of the Dominions and India are permanently established in London, these, together with official representatives of science in the United Kingdom and the Colonies, should be constituted into a British Commonwealth Science Collaboration Committee, to act with the Royal Society in the discussion of topics of common interest, to keep in touch with all agencies for the collection and dissemination of scientific information, to further schemes for co-operation in research and to make such recommendations and proposals for common action as seem fit". Prof. Hill went on to express the hope that such co-operation would lead in due course to a more general collaboration.

The interim committee's report has been published⁴. Its discussions so far seem to have centred mostly on the extension and rationalization of the existing means of broadcasting scientific information (for example, the abstracts journals), on research collaboration schemes, and on schemes for facilitating reader movement of scientific men from one country to another. But the extension of such schemes to the United States has been discussed. The interim committee has stressed that the implications of the Atlantic Charter point inevitably to the need for closer political, social and technical collaboration with the United States, the U.S.S.R., China and other countries or regions, such as Africa. It has accordingly expressed its hope that arrangements will be made to seek the co-operation, so far as may be practicable and appropriate, of scientific and technical representatives of the United States, the Soviet Union, China and other countries outside the British Commonwealth, permanently established in London. The editorial in *Nature* goes on to say that "the wisdom of this last recommendation is so patent that the support of all scientific workers is assured", but urges that concrete support should be manifested by scientific men through their professional organizations. This has no doubt since been done.

The foregoing remarks will have sufficed to show that the nucleus of a British Commonwealth Science Co-operation Service has been forming in London for some time past. Since it would lack, by itself, the vigour and influence of a truly international organization, its sponsors are clearly willing and anxious to enter such an organization if it can be brought into being.

At this point the question arises as to what would be the relationship of an International Science Co-operation Service to the activities of the scientific divisions of such organizations as the British Council and the Cultural Division of the American State Department. There certainly need be no conflict. Such organizations exist to demonstrate the cultural goodwill of their respective States towards the countries receiving the scholars and experts they send, and to bring to the notice of these other countries the scientific achievements of their past, in which they take a legitimate pride. The International Service would only have to keep in close contact with all such activities.

Existing International Bodies

For the success of an International Science Co-operation Service, it would be essential that it should come under the aegis of whatever instrument of world organization the United Nations agree to set up at the end of the War. No doubt this

will be centred on the 'big four' among the Allied Powers.

The International Science Co-operation Service could thus take its place among a number of international organizations, some with broad frames of reference, others with more restricted ones, which exist already or are in process of formation. The International Health Organization and the International Labour Office, two of the most successful agencies of the League, have never died, and are now in process of re-organization. The status of the International Institute of Intellectual Co-operation seems at present indeterminate. The International Institute of Agriculture, the World Power Conference, and the International Locust Control Commission, would all, it is believed, need little or no reviving.

Among the new organizations, the United Nations Relief and Rehabilitation Administration is at present most in the public eye; but the Food Conference at Hot Springs⁵ ordered the creation of an Interim Commission on Food and Agriculture which is now drawing up plans for a permanent Commission for submission to the United Nations. All such organizations must be expected to have a good deal of concern with scientific research as applied to nutrition, agronomy, etc. The International Science Co-operation Service would have to keep in close touch with that side of their activities, and since its scientific frame of reference would be broader, would probably be able to offer them considerable help. It would be expected to outlast some of them, however, such as U.N.R.R.A., the existence of which has always been regarded as probably limited.

Current Trends

To-day one has only to open any book or paper dealing with world affairs in any relation to science and technology to find writers expressing views closely related to those here put forward. Thus Prof. D. Mitrany, in a paper recently issued by the Royal Institute of International Affairs⁶, argues for what he calls the 'functional' development of international organization. International government should be organized along the line of services to meet specific ends and needs. "A different complexion would be put on the problem of security if frontier lines became overlaid with a natural growth of common activities and common administrative agencies. Moreover, functional organization offers some prospect of mitigating the difficulties which arise out of State claims to equality by evolving arrangements which show a measurable and acceptable relation between authority and responsibility, relating authority not to sheer power but to the weight of responsibility carried by the several members." Precedents here are the European Danube Commission, the North Atlantic International Ice Patrol, the North Sea International Fisheries Board and the International Astronomical Union, so important for navigation. New organizations which should on no account be scrapped are the Combined Production and Resources Board, the Combined Raw Materials Board and perhaps the Allied Supplies Executive Secretariat. An International Science Co-operation Service has not yet originated; but no field could be more suitable than science for such a type of organization.

Allied to such conceptions is that of Dr. Arnold Raestad's International Centre of Scientific Information⁷. This proposal, however, relates rather to the

extremely important subject of popular education in science. Such a centre would be continually receiving and digesting reports of scientific progress throughout the world, and producing data suitable for elaboration by the journalist, the radio speaker, the film producer and the organizer of exhibitions. It would be a projection on a world scale of agencies such as the successful American Science News Service. It might ultimately be very suitably associated with the International Science Co-operation Service.

Allied also is the proposal of the British Association's Committee on Post-War University Education that some kind of world council of universities should be set up, sponsored perhaps by the Association of Professors and Lecturers of Allied Countries in Great Britain, and the Conference of Allied Ministers of Education⁸.

In quite another sphere, the changing face of the modern world has necessitated proposals for the reform of the British Foreign Service⁹. Attachés and counsellors trained in economics are expected to play a greater part in embassies after the War than hitherto. The question has often been raised whether men with a scientific training should not also be included on embassy staffs. It was debated in Parliament in July 1943¹⁰ and the proposal strongly recommended by Lord Samuel. In the course of the discussion great emphasis was laid on the Government's post-war plan for science, including arrangements for consultation and co-operation with the Dominions and the other United Nations.

Lastly, with regard specifically to West and East, Sir Henry Dale, in his message to the President of the Indian Science Congress Association¹¹, said: "There is a general desire among men of science in Britain for more intimate collaboration with those in India who are working for the advancement of knowledge in the same fields of research". Similarly, Minister Chu Chia-Hua, president of Academia Sinica, thanking the foreign secretary of the Royal Society, Sir Henry Tizard, for the gift of a facsimile of the Charter Book, wrote: "We believe it is our task to help to evolve and carry into practice some guiding principles of rational education for the world as a whole. Our first step in that direction must be to encourage and start widespread intellectual cross-fertilization. The Sino-British Science Co-operation Office has already done much in that direction in this country, and we hope that it may form part one day, in the not too far distant future, of an Office of World Science Co-operation. Compared with the Royal Society, the Academia Sinica is young, and not only in age; but as an organization of intellectual pursuit, we pledge to contribute our 'widow's mite' to the general wealth and strength that will some day bring about the supremacy of the intellect and reason". This interest on the part of the Chinese in the establishment of international organization appears again in the summary of proposals issued by the Commission for the Study of Post-war World Peace, of the Chinese People's Foreign Relations Association¹². The summary stresses the importance of "international cultural and social co-operation". It is suggested that a cultural co-operation committee be established to undertake the work of changing the mentality of the people of the aggressor nations, and of strengthening cultural contacts. As regards social co-operation, the International Labour Office should extend its activities, including the improvement of social welfare and public health administration.

Proposals

For the purpose of discussion, the following concrete proposals emerge from the arguments of this memorandum. It is proposed:

(1) That an International Science Co-operation Service should be set up by the United Nations at the conclusion of the War under the aegis of whatever supreme international organization is devised, parallel with the International Labour Office, the International (Permanent) Commission on Food and Agriculture, and other similar bodies.

(2) That the functions of the International Science Co-operation Service should be (a) the promotion of scientific co-operation in all its aspects, (b) the collection and dissemination of scientific information, (c) the furtherance of schemes of collaboration in research, (d) the facilitation of the movement of scientific men across national boundaries, (e) the provision of advice on scientific matters to government and diplomatic personnel of individual States when desired, (f) the provision of scientific assistance to all other international organizations.

(3) That the International Science Co-operation Service be supported by funds, which relatively to those required for other purposes would, of course, be small, subscribed by the Governments of the United Nations on some agreed income-tax basis.

(4) That the International Science Co-operation Service should have permanent representatives in all countries or regions, with diplomatic or 'League-official' status, and guaranteed Governmental facilities for communication and transportation.

(5) That the International Science Co-operation Service should have permanent headquarters in some centre to be later decided on; but that apart from a central and peripheral permanent secretariat, a considerable proportion of the total number of its officials should be working scientists of every nationality serving on a temporary leave-of-absence basis, that is, seconded from governmental, academic and possibly industrial, laboratories; in order to ensure that the organization shall always preserve the true atmosphere and understanding of research.

¹ *Nature*, **153**, 63 (1944).

² *Nature*, **152**, 365 (1943).

³ *Indian Information* (May 1, 1944).

⁴ *Nature*, **152**, 29 (1943).

⁵ *Nature*, **152**, 67 (1943).

⁶ *Nature*, **152**, 309 (1943).

⁷ *Advancement of Science* (British Association), **2**, No. 8, 290 (1943).

⁸ *The Times* (April 3, 1944).

⁹ *Indian Statesman* (February 1, 1943). *Nature*, **153**, 91 (1944).

¹⁰ *Nature*, **152**, 129 (1943).

¹¹ *Nature*, **153**, 63 (1943).

¹² *Chungking Daily News* (July 5, 1944).

WATER SUPPLY AND HEALTH

IN his Chadwick Lecture, delivered on October 3, on the "Treatment of Water in Peace and War", Lord Amulree gave a history of water supply, discussed its effect on the health of the community and described the various processes of purification which are applied to a water supply in order to render it epidemiologically safe and acceptable to the consumer, and the special precautions that have been taken during the War to protect it against war hazards.

Lord Amulree began by pointing out that water is one of the necessities of life, and stressed the