NATURE

No. 3794 SATURDAY, JULY 18, 1942 Vol. 150

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Editorial and Publishing Offices
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Telephone: Merstham 316
The annual subscription rate is £4 10 0, payable in advance, Inland or Abroad

SCIENTIFIC MEN IN WAR-TIME

Strategy

FROM the outbreak of war in 1939—and indeed for a long time previously—it was obvious that the knowledge possessed by scientific men and engineers would be of decisive importance in the coming struggle. Means had to be found of making this knowledge available, and to this end the Central Register was formed. As is well known, the Register is intended to be a complete and up-to-date record of the qualifications, experience and present employment of scientific and professional men throughout the country. There have been criticisms of the extent to which it has been used, but nevertheless it must be recognized, from the figures that have been published from time to time, that it has served a valuable purpose in filling numerous posts where the special knowledge or aptitude of scientific men has been of direct service in the war effort.

As regards the senior men of science, many of them were quickly absorbed in a number of advisory committees attached to Government departments. This was, of course, no more than a development of the peace-time practice of using scientific consultants. Advice was sought and given on specific points, but it rested with officials and Ministers, often men with little appreciation of scientific developments, to decide policy and take action. The position was somewhat better where there were influential advisory councils consisting of departmental scientific advisers and eminent men of science from outside the Government service. Some of these bodies were appointed a good many years before the War, and have given valuable guidance ; among them may be mentioned the Advisory Council of the Department of Scientific and Industrial Research, the Medical Research Council, the Agricultural Research Council and the Aeronautical Research Committee. Among the war-time bodies of this character are the Civil Defence Research Committee, serving the Ministry of Home Security, and the Council for Scientific Research and Technical Development, serving the Ministry of Supply.

Still scientific men and their representative bodies had no direct voice in the formulation of policy. This defect was to some extent remedied by the formation of the War Cabinet Scientific Advisory Committee, composed of six eminent men of science, three of whom are Government servants and the other three the president and two secretaries of the Royal Society, thus preserving a balance between departmental and outside interests. The Committee, under the chairmanship first of Lord Hankey and now of Mr. R. A. Butler, reports direct to the Cabinet. A similar body under the same chairman, the Advisory Committee on Engineering, has analogous functions.

So much for the organization of scientific effort and for the means which have been adopted to ensure that sources of scientific and technical knowledge are at the country's service. But as Sir Henry Tizard pointed out in an address to the Parliamentary and Scientific Committee early this year, there are both tactics and strategy in the application of science.

Broadly speaking, the Scientific Advisory Committee, and the Advisory Committee on Engineering, with their numerous outside contacts, can exert an influence on the strategy of science; the Central Register and various departmental committees look after recruitment and tactics.

The next step is to examine the means adopted for translating strategy into action. The crux of the matter seems to be the system whereby the administrative side of Government departments exerts a disproportionate influence on the course of events. A great improvement in departmental outlook has resulted from the appointment of strong advisory councils including independent as well as departmental scientific and technical officers. The Air Ministry had long availed itself of external scientific advice, and the Ministry of Supply—which took over the scientific functions of the War Office—did the same through its Scientific Advisory Council and committees. By such means contact with the outside scientific world was ensured for their full-time workers. The Ministry of Aircraft Production took over in 1940 the scientific functions of the Air Ministry, but Sir Henry Tizard, rector of the Imperial College of Science and Technology, is a member of the Air Council as well as of that of the Ministry of Aircraft Production, and in the War Office Sir Charles Darwin has recently been appointed scientific adviser to the Army Council.

The position in the Admiralty is not so good. The Admiralty has maintained a Scientific Research and Experiment Department for many years, but its director has not the collaboration of an advisory council containing experienced outside scientific men, and the workers in Admiralty scientific establishments are far more isolated than elsewhere. Matters are improving, for a panel was appointed a little more than a year ago, containing two external scientific members, to examine the working of Admiralty establishments; and recently a group has been appointed to conduct operational research in connexion with the Naval Staff.

Although such advisory councils have done invaluable work, there is ample evidence of continued dissatisfaction with the rate of application of scientific and technical knowledge and development in the national war effort. The Association of Scientific Workers has been investigating alleged misuse of man-power and materials, and its findings are being forwarded to the Ministries of Labour and Supply, and there have been numerous suggestions in the Press for the more efficient utilization of the excellent scientific and technical resources of the country, including a revival of the suggestion for a Ministry of Science. A vigorous letter from Prof. A. V. Hill dealing with the importance of scientific and technical guidance in the highest circles of government was published in *The Times* of July 1, and succeeding correspondence has shown that his proposals have provoked wide interest. Prof. Hill says that many of our disappointments and failures to match Axis moves in the past have been due to technical mismanagement, in the sense that there has been neglect to anticipate future requirements and to profit by operational experience. The Chiefs of Staffs organization deals with operations, the Ministry of Production deals with supply; but there is no comparable body to advise the Cabinet or the Chiefs of Staffs directly on scientific or technical aspects of either operations or supply. Such a body is necessary to guide those who are directing the strategy of the present conflict. He then describes in outline the organization which has been adopted in the United States. A year ago an office for Scientific Research and Development was established under the chairmanship of Dr. V. Bush, formerly of the Massachusetts Institute of Technology, with three departments: the National Defense Research Committee (under Dr. J. B. Conant) to deal with research and development of weapons; the National Advisory Committee on Aeronautics (under Prof. J. C. Hunsaker); and the Committee on Medical Research (under Prof. A. N. Richards). This body reports direct to the President. Recently a Joint Committee on New Weapons and Equipment, consisting of Dr. Bush (chairman), one technical staff officer from the Army and another from the Navy, has been appointed, with executive authority, to work with the American Chiefs of Staffs organization, advising on technical, engineering and scientific matters, and guiding research and development in the interests of the Fighting Services.

The formation of a small body with similar powers and similar qualifications is long overdue in Great Britain. A committee or council so constituted, with high authority and direct access to the innermost councils of the State, and including adequate independent scientific and technical opinion, would be in a position to supervise the whole range of research and development coming within its field of knowledge, and to provide the co-ordination and cohesion necessary in waging a war in which the machine element plays so large a part.

Tactics

Strategy and tactics in the application of scientific developments both fail if the individual men of science are unable, for any reason, to respond to the calls made on them. To pursue the military analogy, they must keep 'fighting fit'; their minds must be fresh, active and responsive, and their knowledge must be up to date. In normal times, scientific men working in university or similar laboratories have the continuous stimulus of contact with other men engaged in diverse work, both inside and outside their own field of study; many of them spend a certain amount of time in teaching. They are members of learned and professional bodies through which the relevant literature is made available and meetings for discussions are arranged. In short, there is every facility for maintaining contact with the progress of thought in a selected field, and also with the everyday world. Workers in industrial laboratories are perhaps not quite so fortunate, in that trade 'secrets' have to be borne in mind, and they may not feel quite so free to speak in discussions. Nevertheless, it will be conceded that industrialists in general realize that research workers must be given latitude

in this matter, and they usually encourage them to keep up their scientific contacts.

Scientific men in Government service are in many cases on a very different footing. In certain laboratories and establishments, notably those working under the three research councils (Department of Scientific and Industrial Research, Medical Research Council and Agricultural Research Council), they are, for the most part, almost as unfettered as are research workers in a university. Their work is usually published through the ordinary channels, and is submitted to discussion both by their own colleagues and by outside independent scientific workers. In other departments, particularly those attached to the Fighting Services, conditions of secrecy impose restrictions. It must be recognized that many of the investigations undertaken by such departments cannot be divulged, but because this is so, it does not follow that every investigation is a sealed project, and that the unfortunate individual or individuals to whom it is allotted should retire into monastic seclusion, separating themselves from their scientific brethren. Indeed by so doing, they cut themselves off from the fertilizing influence of discussion and criticism, and the quality of their work suffers accordingly. In time of war, the position is aggravated, and there is the very real danger of the administrative element taking alarm and decreeing that all work carried out in the department is secret. The proper course is to acknowledge frankly the limitations imposed by the nature of the work, and take appropriate steps to mitigate their effect.

Scientific workers in Government departments have indeed to meet special difficulties. There is grave danger of stagnation, and senior men may easily tend to become officials rather than working men of science. It is not sufficient to have a permanent scientific staff, supplemented during war-time by leading scientific workers, together with a number of temporary juniors, and to supply them with equipment and literature; they cannot develop their powers to the full in isolation. Yet this is the position in some Government Departments. It is only a reasonable precaution, at which none will cavil, that those in Government service should be expected to obtain official permission to carry on outside scientific activities; but in practice they may be actively discouraged from maintaining their contacts with the world of science.

There have been many suggestions in the past few years for improving the lot, and the efficiency, of scientific workers in Government service. The appointment of scientific advisory councils including independent scientific men, to survey progress and development in the various Departments of State, could scarcely fail to have beneficial effects. One of the first would no doubt be diminished isolation of the scientific men, particularly the younger ones, with a resulting improvement in the quality of their services to the nation. The criticism of their colleagues plays an important part in developing and maintaining at a high level the powers of scientific workers; it is an essential part of their equipment, the importance of which increases with their responsibilities.

FORMATION OF THE GANGES DELTA

Deltaic Formation

With Special Reference to the Hydrographic Processes of the Ganges and the Brahmaputra. By Prof. C. Strickland. Pp. xvi+157. (London, New York and Toronto: Longmans, Green and Co., Ltd., 1940.) 9*s*.

WHETHER one judges by length of sea face or by distance from the apex, the combined delta of the Ganges and Brahmaputra is the largest in the world, which gives it an importance not lessened by its density of population, and its length of known history. Consequently the appearance of a work dealing comprehensively with its mode of formation and continued modification is of importance not only to geologists, but also to engineers, administrators, and medical men, and to all others who have to deal practically with the working and changes of deltaic rivers.

Much has been written in the past on various aspects of the combined delta of these two rivers and of their history as a whole, the two most important works being James Fergusson's classic paper "On Recent Changes in the Delta of the Ganges"[1], and Chapter 17, on the "Indo-Gangetic Plain", of the second edition of Medlicott and Blanford's "Manual of the Geology of India", as revised by R. D. Oldham in 1893. Fergusson is one of those rare men who have produced classics in two branches of knowledge, the other being his "History of Indian and Eastern Architecture"; and both his classics still hold the field to the present day as the most important works in their respective spheres.

No detailed or even continuous geological survey of the Ganges-Brahmaputra delta has ever been attempted owing to the paucity of geologists in India compared with the tasks; but certain of the major aspects of the Indo-Gangetic river system including the deltas have been dealt with by geologists, while some of the more detailed aspects of the Ganges-Brahmaputra delta have been discussed from time to time by settlement officers, and by engineers concerned with irrigation, drainage and river training; further, of recent years, gravity observations by the Geodetic Branch of the Survey of India, and by the staff of the Burmah Oil Company, have led to the acquisition of knowledge, not all of it published, concerning the configuration of the basement upon which the delta rests.

It is timely, therefore, that some one should attempt to synthesize the growing knowledge on this delta, especially one who has had abundant opportunity to make personal observations on the behaviour of rivers in deltaic tracts as an adjunct to his own professional work. For Dr. C. Strickland, who is a member of the professorial staff of the School of Tropical Medicine, Calcutta, has had occasion, in his medical capacity as a research worker on problems connected with the causes and prevention of malaria, to travel far and wide, not only in Bengal and Assam, but also in Burma and Malaya, and elsewhere; like Fergusson he has made full use of his opportunities to observe the detailed behaviour of deltaic rivers.

In his book the author devotes the first twenty-six chapters to the discussion of the hydrographic processes at work in the Ganges and Brahmaputra, assuming the rock basement on which the alluvium