

ORGANISATION OF SCIENTIFIC AND INDUSTRIAL RESEARCH IN INDIA.

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(A brief summary of the speech delivered by Sir S. S. Bhatnagar, Director, Scientific and Industrial Research, at the Symposium on Post-War Organisation of Scientific Research in India, held at Calcutta, on September 27-28, 1943, under the auspices of the National Institute of Sciences of India, is given below. The contribution relates specifically to a brief enunciation of the problems of post-war reconstruction, organisation of scientific and industrial research in India and the nature and functions of the proposed *National Research Council*.)

Post-War Problems.

Only a broad outline of the problems of post-war reconstruction can be attempted at present. A more comprehensive statement will become possible after the cessation of hostilities and the settlement of peace terms. The scope and pace of industrialisation are largely influenced by political as well as technical and economic forces. It may be presumed that in the post-war period, ample scope will be provided for both private enterprise and individual initiative in conformity with the avowed policy of the Allies 'of doing most good for most people'.

(1) The first concern of the Government during the period of transition from the war to a peace-time basis will be to find employment for the men demobilised from the army, navy and air forces and it is obvious that the fields in which they could be absorbed with advantage are agriculture, industry and commerce.

(2) The deficiencies in the present industrial structure of the country should be carefully examined and a programme for the post-war period, consistent with the size and resources of the country, should be prepared.

(3) Plant and machinery available in several factories, which have come into existence during the emergency for supplying military requirements and which cannot be sustained after the war, have to be utilised for the production of civilian requirements. Possibilities have to be explored for starting consuming and subsidiary industries to absorb the surplus production from factories which have enhanced their peace-time capacities to meet the abnormal demands created by war.

(4) The utilisation of structural steel and other salvage materials of construction, released by the demolition of temporary war buildings, for restoring normal constructional activities requires consideration.

(5) Information relating to the availability of raw materials and processes developed during the war period has to be collected, carefully assessed and applied to the development of new and profitable industries during the post-war period. Exploratory surveys of raw materials of animal, vegetable and mineral origin have been carried out and the reports of such surveys, particularly those prepared by American experts, contain a wealth of information that will be of value in starting new industrial ventures. Thus the availability of zinc, silver and lead ores in Mewar and Rajputana territories, of arsenic in the North-West Frontier Province, and of coal in Kathiawar and the Punjab, have been brought to light by these surveys and new possibilities are indicated for developing chemical industries in these regions.

(6) A bold policy of developing the non-ferrous industry in Indian metals will have to be pursued.

(7) Plans have to be prepared for augmenting the food reserves of the country. Increase in food production involves the application of fertilisers. The development of the fertiliser industry, on a scale hitherto not envisaged, is a *sine qua non* of increased food production.

(8) The development of the fuel and power resources of India is necessary for accelerating the pace of industrialisation. The scientific utilisation of low-grade coals needs special attention.

(9) The shipbuilding, automobile and other transport industries should be given a fillip as the necessity for merchant vessels and transport vehicles would become urgent during the post-war period to facilitate the movement of raw materials and manufactured goods.

(10) Banking organisations have to be started for financing new and essential industries, and questions relating to protection and tariff will have to be carefully examined.

These and other problems which will emerge after the war require urgent consideration by both the scientists and industrialists of the country. The scientific effort which has proved so effective in the war period should not be allowed to slacken when peace returns, but should be greatly intensified to solve the problems of reconstruction.

Scientific and Industrial Research in India.

The organisation of industrial research in India, with a view to make her industrially self-sufficient, has been engaging the attention of the Government of India for some time. Early in 1940, the Government inaugurated the *Board of Scientific and Industrial Research* and during the past 3½ years, although mainly occupied with the solution of urgent problems relating to the war effort, considerable attention has been devoted to the organisation of scientific and industrial research on a scale commensurate with India's expanding needs. Plans have already been prepared for establishing a National Chemical Laboratory, a National Physical Laboratory, a Metallurgical Research Institute, a Central Glass and Silicates Research Institute and a Central Fuel Research Station. When these are given effect to, India will be provided with facilities for research reasonably adequate to meet her immediate requirements.

In planning the research programme, the *Board of Scientific and Industrial Research* has taken into consideration the post-war trends in the heavy chemical dyestuff and process industries. The developments in the chemical industry will largely be determined by the availability of sulphuric acid at economic prices and measures for expanding this industry, which has not been possible during the war, will have to be taken when peace comes. We need sulphur from all sources. The use of gypsum, the use of SO₂ gas and of pyrites will have to be encouraged. Considerable expansion in the fertilisers industry is foreshadowed. The future of alkali industry is tied up with developments in the glass, textile, rayon, petroleum, rubber and other industries. Spectacular developments in the synthetic organic chemical industry will be witnessed in the post-war period. In the field of solvents and plastics and in the industries connected with oils and fats, synthetic textiles, light metals and alloys, paper pulp, petroleum refining and processing and glass and ceramics, substantial expansion can be predicted. (Exploratory and industrial research, carried out under the auspices of the Board of Scientific and Industrial Research, have yielded results of value to developments in these industries. It is interesting to note in this connection that a list of 'infant and young industries which are expected to experience rapid growth in the post-war period' compiled by Richard M. Lawrence, Atlas Powder Company, Delaware (*Chem. and Met. Eng.*, 1943, 50, 101) contains several items, which have received the special attention of the Board of Scientific and Industrial Research during the past two years.)

This is a proof of the soundness of the programme of research and development planned by the *Board of Scientific and Industrial Research*. For industrialising the process developed in the laboratory, a more intimate association with industries is essential. In this connection, the following quotation from a recent number of *Chemical Age* is pertinent: 'The one bright spot in India's sombre picture a sorry spectacle, indeed, in comparison with the achievements of China which we described recently—is provided by the *Board of Scientific and Industrial Research*. This organisation, set up about two years ago, has made an excellent start. Limitations on its usefulness are imposed, however, by the scale and structure of India's industry. The results of its researches could be applied

far more fruitfully if there could be close collaboration between the experts of the *Board* and experts of the manufacturing concerns. As it is, the Board is somewhat in the position that would face our *D.S.I.R.* if there were no industrial research associations, nor adequate laboratories belonging to commercial companies. The difficulties of large-scale production cannot be precisely forestalled by laboratory research work alone, so that the results and work carried out by the *Board* often cannot be applied commercially. As with the hen and the egg it is not possible to say which comes first, the individual industries or the inventions and discoveries arising out of research. Consideration of India's plight leads one to the conclusion that research without industry is as futile as expecting to get an egg without a hen or a hen without an egg. The problem is "shall India have chemical industries of her own, or must she remain dependent upon the western hemisphere?"

I am not unaware of the criticisms that have been levelled against the structure of this organisation. As it is well known, I am not the author of this constitution. There may be defects in the constitution of the *Council* and of the *Board of Scientific and Industrial Research*. These lend themselves to correction in the light of experience gained. I am myself one of its critics. In fact, a special committee of the Governing Body of the Council is now engaged in examining the constitution; its report is eagerly awaited. But the fact remains that this organisation in spite of its defects has done a great deal of excellent work and has already helped the production of goods worth more than five crores of rupees. Nevertheless, a change in the constitution to facilitate quicker and smoother working is necessary.

A National Research Council for India.

I welcome the idea of the sponsors of this symposium of establishing a *National Research Council of India*, on the model of similar organisations in the United Kingdom, United States of America and Canada.

It is obvious that its functions will be purely advisory. It will concern itself mainly with the planning of scientific work in accordance with national needs and help in the training and supply of scientific and technical personnel for pure and applied research. A research council of this type will serve to cement together all the scientific organisations of India, and as long as it is not dominated by one or more groups of scientific or regional interests, it will exert a healthy influence on the development of scientific research in this country.

In planning and successfully carrying out our programmes for the future, it is essential that we should have a correct appreciation of our position as men of science, *vis-à-vis*, the Government. It has often been claimed by some individual scientists and even by a few scientific organisations that a millennium is round the corner and is easy of attainment if only the scientist is given a place of authority in deciding the policies of the Government and if a fraction of the national income is earmarked for scientific research. This is an exaggeration. 'The man of science can give valuable assistance in solving problems facing society by searching out the facts and, on the basis of the facts, suggesting remedies. He could probably be consulted more frequently than has been the case. When, however, his advice has been given, his duty as a scientist is at an end.' This rational, if sober, view of the place of scientists in organised society is presented by Sir Robert Pickard, Professor Alexander Findlay and Sir W. L. Bragg in a joint letter appearing in a recent number of the *Chemical Trade Journal*. It is the considered view of the most men of science that the administration of scientific and industrial research organisations should be left to scientists themselves, without any strangulating control by Government departments, not conversant with scientific details. By over-estimating his own importance in society, the scientist will hardly serve the cause of science. He has to keep before him the ideal of selfless service to the cause of humanity.