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PLANNING OF RESEARCH

EARLY in 1944, the Government of India constituted a Research Planning Committee in accordance with the resolution of the Governing Body of the Council of Scientific and Industrial Research, to survey the existing facilities for scientific and industrial research in India and to "report on necessary measures of co-ordination, control, direction and development of such research by various agencies and also on other steps necessary for the planning of research in post-war India". The Committee's work was interrupted for a short time due to the absence of the Chairman in the U.S.A. on official duties and in the final stages, the Committee was denied the benefit of advice and collaboration of three members, Sir S. S. Bhatnagar, Sir J. C. Ghosh and Prof. S. K. Mitra, on account of their visit to England and America as members of the Delegation of Indian Scientists.

The Committee circularised two sets of questionnaire—one to the various universities, research institutes and Government departments interested in scientific and industrial research, and the other to industrial firms and chambers of commerce. To obtain a first-hand knowledge of the existing facilities for research, the Committee visited important centres of scientific activity and had personal discussions with scientific workers, university representatives and leaders of industry and commerce at some of these centres. The facts obtained through these channels have been critically appraised and presented in a comprehensive document* which also includes the recommendations of the Committee with regard to post-war planning of pure and applied research.

The Committee in its report records that the present research activity in India does not represent even the bare minimum whether judged by international standards or by the

actual requirements of the country in her present state of industrial development. The need for research is felt not only for facilitating an adjustment to post-war conditions but also for promoting the general cause of industrialisation at a time which will be rendered much more difficult by the forces of international competition. The capacity of Indian industry to withstand international competition will depend materially on its vision and its readiness to implement the latest results of research in a continual effort for improving its productive efficiency by economy in the use of raw materials, utilisation of by-products, reduced power cost, and so on. Research will also play a decisive part in the development of new industries for which the opportunities remain imperfectly explored.

Industrial research, in this country, is still in its infancy. Besides the lack of an effective link between our principal research institutions and the industrial interests concerned, a further obstacle to the inception of a suitable research atmosphere has been created by the fact that while Industry constitutes a Provincial subject, it is beyond the resources of most of the provinces to build up adequate research organisations for catering to the needs of local industries. The institutes set up by the Government of India have remained much too centralised for meeting the various regional needs. Moreover, industry, with some rare exceptions, has not become research-minded. Nor there is an effective *liaison* between industry and the research organisations.

If scientific and industrial research is to make any headway in India in the immediate future, the Committee feels that Government must take the initiative in setting up a suitable machinery for the development of research along sound lines, strengthen the science departments of universities and existing research institutions and bring about an effective co-ordination amongst all the institutions. For stimulating and directing scientific and indus-

*"Report of the Industrial Research Planning Committee, Council of Scientific and Industrial Research," 1945, Price Rs. 3.

trial research on a planned and comprehensive basis, the Committee recommends that the Government of India should forthwith set up a central research organisation to be called the National Research Council. This organisation would consist of representatives of scientists, universities, industry, labour and administration. The Hon'ble Member in charge of Planning and Development is suggested to be its *ex-officio* President. The Council, which should be an autonomous body, should have a total membership of 60 made up of 20 scientists elected by the universities and recognised scientific associations, 15 members elected by recognised chambers of commerce and associations of manufacturers, five members elected by recognised trade unions and other labour organisations, and 20 members nominated by the Government of India of whom not more than 8 may be official. Of these two should represent the railway administration.

The functions of the Council will be as follows:—

- (1) to organise and maintain national laboratories;
- (2) to establish and maintain specialised research institutes;
- (3) to stimulate pure and applied research in universities by grants-in-aid and by the institution of scholarships and fellowships;
- (4) to provide for the immediate problem of the dearth of technical and research personnel by the inauguration of scholarships available in India and abroad;
- (5) to stimulate and encourage research activities by industry;
- (6) to co-ordinate research activities of all the existing research institutes and departments of Government and undertake planning of research programmes on a comprehensive basis;
- (7) to function as a National Trust for Patents;
- (8) to set up a Board of Standards and Specifications;
- (9) to function as a Clearing House, encourage deserving scientific and technical societies and foster the growth of new ones on appropriate lines.

A small executive body to be called the Research Board will be responsible for the administration of the work of the Council. The Board will be in charge of all the research laboratories and institutions set up by the National Council and directors of these institutions will be under the control of the Board. It will also maintain the closest contact with Directors of laboratories engaged in industrial research under the administration of the other departments of the Central Government. The Board will prepare comprehensive plans of research programmes and will take an active part in the establishment of research institutions by industries and distribute grants-in-aid to universities and other approved institutions with the help of the Grants Committee from funds specially allotted for the purpose.

The Committee recommends that the Council, given a bulk grant of Rs. 6 crores spread over five years, should make and carry out (i) the building and equipment of National

Chemical and Physical Laboratories, (ii) the building and equipment of certain specialised research institutes; (iii) giving grants-in-aid to universities for strengthening their research organisation, and (iv) training of research personnel by the award of scholarships tenable in India and abroad.

The establishment of a National Chemical and a National Physical Laboratory is recommended each at an estimated cost of Rs. 40 lakhs. It is further recommended that in the absence of industrial research associations in India (except for jute and tea) it is necessary for the State to take the initiative for the establishment of a number of specialised laboratories for fulfilling the object. Nine new specialised institutes are recommended in the following order of priority:—

Institute of Food Technology; Metallurgical Institute; Fuel Research Institute; Glass and Silicate Research Institute; Oils and Paints Institute; Buildings and Road Institute; Leather and Tanning Institute; Industrial Fermentation Institute; and Electro-Chemical Institute.

These specialised research institutes will deal with problems of basic and specific research relating to their respective spheres. Provincial and State Research Councils may send problems for investigations to these institutes and it will be open to individual manufacturers to refer specific problems of immediate interest to industry to such laboratories on payment of scheduled fees or by the establishment of fellowships.

The Committee considers that universities constitute the foundation of all research and suggests the strengthening of scientific teaching and research work in Indian universities. As an essential part of the five-year plan, the Committee recommends that the National Research Council should make substantial grants for strengthening the scientific departments of the universities. For this purpose the Grants Committee should make a survey of science and research departments of all the Indian universities and recommend to the National Research Council a scheme of financial assistance to the latter. Out of the bulk grant of Rs. 6 crores, the Committee says, a sum of about Rs. 2 crores should be set aside for giving grants-in-aid to the 19 universities. Further, adequate engineering research sections should be in contact with the engineering colleges. Teachers in such colleges should be in contact with the engineering industries.

To man the various laboratories proposed to be set up and to keep alive the research work in the country the Committee recommends that 700 research workers should be trained in five years involving an estimated total expenditure of about Rs. 50 lakhs: Rs. 27 lakhs for foreign scholarships and Rs. 23 lakhs for Indian scholarships. Industries should be encouraged to set up their own research associations on corporate basis by exemption of research expenditure of firms from income-tax assessment.

A network of corresponding research organisations should be set up in Provinces and major States. It is recommended that research councils on the model of the National Research Council composed of the representatives of

scientists, industry and administration, should be set up in all the Provinces and major States.

A suitable method for the exploitation of patents in respect of inventions made at either the national laboratories or universities and other research organisations should be evolved. A National Trust of Patents should be set up for the purpose of holding and exploiting all patents resulting from research financed by Government and those dedicated by individual scientists and by institutions, supported either by public funds or private endowments.

The institution of a Board of Standards for drawing up Indian standard specifications and the establishment of a technological institute on the lines of M.I.T. are recommended.

The Committee emphasises that research can yield its best results only when it is backed by a comprehensive industrial plan. This will not only inspire enthusiasm among research

workers but will serve the practical purpose of indicating an order of priority in the various lines of investigation. The Committee accordingly recommends that the National Research Council must work in close co-operation with the department of Industrial Planning so that industry and research will each stimulate the other.

The Committee further emphasises the organic relationship between the different categories of research, viz., agricultural, medical and industrial, and welcomes the constitution of the Scientific Consultative Committee in the Department of Planning and Development as a body expected to secure the necessary co-ordination at a high level. The Committee, however, considers it necessary to examine the possibility of bringing all the research activities of the various Government departments under the administrative control of the Member for Planning and Development.

RESINATED FABRIC LAMINATES

THE development of jute fabric-shellac laminates by the Indian Jute Mills' Association, an account of which appeared in this *Journal* last month (August 1945, pp. 202-03), provides an appropriate opportunity for reviewing briefly the basic work carried out in India on the subject of resin-impregnated fabrics which find numerous industrial applications. The work dates back to 1926, when successful investigations on a laboratory scale were carried out in the *University Chemical Laboratories, Lahore*. The commercial possibilities of the products attracted wide attention, and at least two Indian industrialists, one from Calcutta, and another from Cawnpore, came forward to finance the development work on fabric-shellac laminates, particularly for constructional purposes and for the production of containers. When the *Board of Scientific and Industrial Research* was inaugurated in 1940, the problem of resinated fabrics was taken up once again for detailed investigation. Metal containers were in short supply and there was an urgency for finding substitute materials. Resinated laminates of textile materials and paper suggested themselves as suitable substitutes, providing wide scope for the development of a large range of containers. A considerable amount of basic work, both on the methods of spreading resin on fabrics and on processing them, was carried out. Successful processes were developed for the manufacture of resinated laminates both of fabrics and of paper, in the laboratories of the *Board* (cf. Indian Patent Nos. 28277 and 28281) and handed over to industry and army for exploitation and development.

The application of shellac or other resins to fabrics, which is the primary process in the production of this class of materials, can be carried out in one or the other of the following ways: (1) dusting shellac or applying molten lac without the use of any solvent, but using only wetting agents, and passing the treated material between hot rollers to ensure uniform spreading of the resin, (2) impregnating with aqueous dispersions of powdered shellac, and (3) impregnating solutions of shellac, in solvents selected for their easy availability or cheapness or processing advantage.

The resin coated materials are further processed to obtain laminates. They can be passed between hot rollers or compressed in hydraulic presses to obtain products of any desired compactness and finish. A variety of samples were prepared in the laboratories of the *Board of Scientific and Industrial Research* by employing various methods of spreading shellac and of processing the treated fabrics. For the production of unburstable containers (Indian Patent No. 28247) solutions of shellac in alcohol or ammonia were employed, and for jettison tanks, required by the U.S.A. Air Force, either dispersions of shellac in water, or molten lac with extenders or wetting agents, were preferred. It is obvious that for the production of laminates on a commercial scale, one or the other of the methods investigated in the laboratories of the *Board of Scientific and Industrial Research* or modifications thereof, will have to be employed. Wartime successes have been determined largely by the availability of processing materials and manufacturing equipment, and recourse had to be taken often to alternate processes as expedients, such as the one developed by the Indian Jute Mills' Association, for securing immediate results. As the emergency conditions, do not obtain any longer, future developments will be determined largely by the quality of the products and the efficiency of the processing techniques. The laminated boards have already found use in the production of a large number of useful products (cf. Indian Patent No. 30680). We are glad to learn that the processes developed by the scientists in their research laboratories are being increasingly utilized by industry. This is to be welcomed. History teaches us that every development of an enduring character originated in a research laboratory. It is appropriate that the *Council of Scientific and Industrial Research* has been pursuing an enlightened and liberal policy with regard to the processes developed in its research laboratories, which aims at providing all possible assistance to industry. Further applications of resinated laminates envisaged by the work of the *Council* will be watched with keen interest.