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TOWARDS ADEQUACY OF SCIENTIFIC AND TECHNICAL MANPOWER

IN the present context of inadequate supply of scientific and technical manpower in our country, the recommendations* of the National Manpower Council of the U S A. will be read with wide interest. In the course of its report, the Council observes, "Nothing short of a determined co-operative effort involving government, industry, educational institutions and professional and other groups will attain this goal."

Such a co-operative effort, supported by informed public opinion, is to be achieved in regard to the following objectives: development of more reliable knowledge about our human resources; strengthening of the institutions which train scientists and professionals; maintenance of a continuous flow of students through colleges and universities; increased opportunities for capable young persons to secure higher education; and better utilisation of the available supply of scientific and professional personnel.

In regard to the first objective, the Council recommends that foundations and universities encourage and support research designed to increase our understanding of educational and career choice processes, of the factors facilitating the development of talent and intellectual ability, and of the conditions contributing to superior performance; that private and governmental agencies concerned with the development and utilization of scientific and professional manpower intensify their efforts to collect and analyse significant information about these critical resources; and that the Federal Government, because of its specific responsibilities and unique facilities, institute suitable guidance in the matter.

By way of strengthening the institutions which educate and train our scientists and professionals, the Council recommends: (1) that state and local governments, alumini, business, labour, and other interested groups and individuals intensify efforts to provide the financial

* *A Policy for Scientific and Professional Manpower.* Prepared by the Research Staff of the National Manpower Council. New York. Columbia University Press, 1953.

support required for the improvement of faculties and facilities; (2) that the President appoint a Commission composed of Government, university and industrial representatives to review the impact of governmental research and development contracts upon the primary responsibilities of universities and colleges to advance fundamental knowledge and train the scholars and scientists of the future; and (3) that institutions of higher education recognise that a dynamic society requires the kind of education and training that equips students to meet not only the demands of their first jobs but also the challenges of new tasks and problems which they will face years later.

To help maintain a continuous flow of students in colleges and universities, it is recommended that the public continue to support the present student deferment programme and that the sufficient flexibility be exercised in the matter of calling to active duty of students enrolled in ROTC programmes so that well qualified students are permitted to pursue graduate work prior to their military service.

In regard to the provision of greater opportunities for young people for higher education, the Council requires that the public and elected officials fulfil their responsibility to maintain good elementary and secondary schools by providing the financial and personnel resources needed to remedy present weaknesses in the educational system; that schools, professional societies, governmental agencies, and other interested groups act together to strengthen high school and college information and counselling services to insure sound organisation of schools, courses and careers; and that scholarship and fellowship programmes supported by private and public funds be maintained and expanded to help more young people of ability to acquire a higher education

Towards the last objective, *viz.*, better utilisation of available scientific and professional personnel, the recommendations of the Council are: (1) that the President initiate a review of legislation and administrative procedures governing the recall of reservists to active duty in order to develop a system of providing civilian participation in determining the distribution of scientific and professional personnel required to meet civilian and military needs; (2) that management intensify its efforts to determine the most effective balance among the different types of manpower it employs in order to insure efficient and economical operations and to provide for the further training of the manpower for which it is responsible; and (3) that business and Government intensify their efforts to develop executives who understand the importance of insuring that each highly trained employee has the opportunity to utilize his capacities as fully as possible.

Considering that the provision of right channels of training in science and technology go a long way in solving the problem of adequate national manpower, reference may also be made here to the valuable suggestions of Sir Richard Southwell on the subject, in the course of his Trueman Wood Lecture this year.†

Sir Richard holds that in every country the structure of technological education is (and should be) conditioned by the structure of its industry, and that this in turn is conditioned by its history and will not be understood except through study of it. Naturally, in planning the educational structure of a country, one must have regard to the structure of *its* industries. Proposals which would merely copy other nations without enquiry as to why their practice is different, defeat themselves. As he says, "If it is better designed to meet like needs, then let us copy it by all means; but let us be certain, first, that the needs it meets are not also different"

In regard to the role which the universities can play in a national plan for training in technology, Sir Richard's views are very interesting The universities are to be, in his opinion, the GHQ of the 'science which is pursued with a view to application', but *not*, be it noted, as having direct concern with applications. The teaching at undergraduate level should aim to instil a knowledge only of basic principles, and develop the power to grasp the essentials of a problem Like medical schools they are to train men not to practise but to learn; to learn an art which calls for more than technical erudition

The universities will also train at the post-graduate level: not only (as in the past) by *supervised research* of the kind that results in theses, but also (what a few have started already) by courses in the harder and newer parts of applicable science. To this end their teachers will keep close contact with the monotechnics and, through them, with industry; both as advisers and by visits in which they will learn of new industrial problems. Being the GHQ, the 'headquarters troops' must be mobile enough, if the larger ends of scientific and technical manpower are to be served adequately.

† *Training for Science and Technology.* The Trueman Wood Lecture by Sir Richard Southwell, F.R.S. *Jour. Roy. Soc. Arts*, 1953, **51**, 794.

NOBEL AWARD FOR PHYSICS, 1953

THE NOBEL PRIZE FOR PHYSICS this year has been awarded to Professor Fritz Zernike of Groningen University, Holland, for his invention of the phase contrast microscope. Professor Zernike is now aged 65. He took his Doctorate Degree at the University of Groningen in 1915 and has continued to work in the same institution ever since.

Professor Zernike has made significant contributions to wave optics and diffraction theory, both in the field of optics and x-rays. The celebrated Zernike-Prins formula for the diffraction of x-rays opened a new line of investigation for understanding the structure of liquids. Ideas of phase contrast were put forward and discussed by Zernike in several papers even in the 1930's, but it was mainly in the post-war period that it has been widely applied in microscopy.

It is true to say that progress in a vast field of biology has been held up owing to the lack of a satisfactory method of observing the structure of living cells. In ordinary methods of microscopy, these could be studied only by fixing and staining the required structures. This is so, because a living cell is a highly transparent object and no differentiation between the different structures would be observable unless they are preferentially stained. Nevertheless the cell is composed of regions of different refractive indices, so that they offer varying optical paths to a beam of light going through it, and thus produce varying phase changes in the different regions of the transmitted beam. In the phase contrast microscope, these changes in phase are converted into variations of intensity, by introducing an optical device known as a "phase plate", into an ordinary microscope. The thicker regions would appear darker, thus producing the necessary contrast in the appearance of the cell. Indeed, we might regard the effect of phase contrast illumination as similar to a (hypothetical) dye which is stained at every point of the object with an intensity proportional to its thickness.

The phase contrast microscope has proved to be invaluable in the study of living cells in their natural state The biologist who studies such materials can now be reasonably confident that the image he sees gives something approaching a true picture of what is actually present. The importance of phase contrast microscopy to biological research cannot therefore be overestimated.

NOBEL AWARD FOR CHEMISTRY, 1953

THE NOBEL PRIZE FOR CHEMISTRY has been awarded this year to Professor Hermann Staudinger of Freiburg University, West Germany, for his classical investigations in high polymer chemistry extending over three decades.

Professor Staudinger started his researches about 1915 with naturally occurring complex organic substances like cellulose, rubber, etc., whose behaviour was puzzling to the early orthodox organic chemists, who consequently discarded these substances from their range of investigations. Staudinger has held the view right from the beginning that structural theories of organic chemistry are quite adequate to deal with these complex organic molecules. In fact, he brought order into the so-called 'anomalies' of complex organic molecules, to which he gave the name 'macro-molecules', and therefore he can be aptly described as the father of modern high polymer chemistry. His researches have however found the greatest appreciation only in the past few years, because of the tremendous value they have lent to the industrial high polymers, *viz.*, plastics.

Professor Staudinger's researches were concerned with cellulose, rubber, fibroin, polyoxymethylenes and ethylenes, polyindenes and polyvinyl compounds, notably polystyrene and polyacrylic esters These investigations, quite apart from their utilitarian aspect to plastics industry, have given a great insight into various fundamental aspects of the phenomenon of polymerization itself In fact, models of these synthetic polymers are highly useful in explaining the structure and properties of natural polymers. The Staudinger relation between the viscosity and molecular weight of a macromolecule in its various modified forms has been an invaluable tool in the hands of high polymer chemists all the world over. Staudinger has also tried to explain the physical properties of high polymers such as their elastic, rubbery, viscous, resinous and thermohardening behaviours, as well as their technical properties like toughness and tensile strength on the basis of the nature, configuration and interaction of the units in the long chain macromolecule.

Professor Staudinger has had a wide influence in building new schools of research in high