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Science and the Community

CENTURIES of tradition and experience have given us, as Prof. A. N. Whitehead has pointed out, a tradition that each generation will live substantially amid the conditions governing the lives of its fathers and transmit those conditions to the succeeding generation. In his words, "we are living in the first period of human history for which this assumption is false". The time span of important change no longer exceeds considerably the normal span of human life, and we have now to meet change as the normal—not the exceptional—experience.

This necessity for change has at least two aspects. It involves the modification of man's nature to meet the new conditions, a re-adaptation to his environment. It also involves the modification of his existing social, economic, political and industrial organization and institutions to meet the requirements of an era of power production and rapid change, or the evolution of new forms of organization where the old prove inadequate and incapable of development.

The seriousness of the present international situation, no less than our economic difficulties, is largely due to the failure to face change and adapt institutions to meet it. In the Fascist and totalitarian State there are deliberate attempts to put back the clock and return to a simpler order of society, creative thought and adaptability being repressed in an attempt to maintain institutions evolved in a pre-industrial era. Simultaneously, in the assumed defence of the State, the full resources of a power production era are being marshalled for destructive purposes.

On the scientific side, even though in the training of the man of science there is still no concern with the social consequences of his work, scientific workers are to an ever-increasing extent turning their attention to such matters. In the five years since, in his presidential address to the British Association, General Smuts directed attention to the dangers arising out of rapid scientific advance as opposed to a stationary ethical condition, the relations between science and society have been considered on an increasing scale at the British Association meetings both in the presidential addresses and in sectional meetings. Two years ago, the Council suggested in a memorandum to the organizing committees of the various sections that discussions, papers or symposia should be included in their programmes bearing upon the relations between the advance of science and the life of the community.

The attention given to this subject in the programme of the present meeting is fully as great as in previous years. Discussions on chemistry and the community, cultural and social values of science, national nutrition and British agriculture, the psychology of mass entertainment, the reform of the examination system, the poultry industry, traffic safety, chemistry and food science, the strain of modern civilization, and addresses on the engineer and the nation, soil science in the twentieth century, etc., indicate over how wide a field scientific workers are seeking the solution of problems of social well-being and the interpretation of the results to the general community.

It is not on this account alone, however, that the impact of science upon society forms most appropriately the main theme of this year's presidential address. While more scientific effort than ever before is probably being devoted to the elucidation of social problems and the interpretation of the results to the community, there has

never been more general alarm about the possibilities of the application of the results of scientific discovery or greater willingness to endorse the late Sir Alfred Ewing's words: "The command of Nature has been put into man's hand before he knows how to command himself."

For this uneasiness the rapid deterioration in international relations during the past year, the weakening of international co-operation and the grim menace of re-armament have been largely responsible. In the growing effort being devoted to preparation for warfare, it is easy for the possibilities of a higher standard of living which science has placed within our grasp to be overlooked, and for the scientific worker to be associated rather with the perversion of his knowledge for destructive purposes. Again, the intensification of preparation for self-defence has tended to strengthen the fetters on freedom of investigation and exposition which dictatorships in many countries have already riveted on industrial and academic workers alike.

The growing impatience of the scientific worker at the extent to which his knowledge is made to serve inhuman ends finds admirable expression in Prof. J. C. Philip's presidential address to Section B (Chemistry) and is paralleled by the alarm at the continued threat to academic freedom and scientific research itself which, as the University Grants Committee pointed out in its report, lays a heavy responsibility on the universities of Great Britain if the Greek tradition of candid and intrepid thinking about the fundamental issues of life is to be preserved for mankind.

Sir Josiah Stamp, in his presidential address to the Association, which appears elsewhere in this issue (p. 435), has thrown down a challenge to creative thought on the impact of science upon society and the technique of change it involves, which comes at an opportune moment. The development of economic planning on a larger scale has made it painfully evident how the full effects of the wisest schemes may be neutralized by factors outside their control. Only by the widest co-ordination can the fullest benefits be secured, whether within the limits of an industry or of a national unit. The resistance of institutions to change not only increases the friction and makes change more difficult and the application of science less profitable and less readily accepted; it also tends to throw out of ratio what Sir Josiah Stamp has termed the scientific, industrial and political periods of gestation.

The present tendency is for the period of scientific gestation, or the interval between the first concept of the idea and its publication in substantially the form in which it is ultimately used extensively, to contract. It is even more demonstrable that industrial gestation, or the subsequent interval between this point and the time when the innovation becomes effective in an economic or industrial sense, has shortened materially and at greater social cost. This contraction is attributed to the greater amenability of the industrial community to scientific research and to our entering on an epoch of concerted industrial research in the last twenty years.

It is to the third question, that of political gestation, that Sir Josiah Stamp directs particular attention. Formerly, the normal span of life of man and machinery provided a phase to which scientific advance could be adjusted for a completely smooth social advance. Technical changes now occur so rapidly that political institutions work far too slowly to make the required adaptation. Political gestation is a function both of human psychology and of social structure, and at present we do not know enough about the way in which ideas permeate, infiltrate or saturate society.

While to prevent disequilibrium it is necessary to evolve some means of contracting the period of political gestation, some of the factors which hitherto have diminished the force of impact on society are losing their previous force. Among such, Sir Josiah Stamp cites the natural increase of population, which is disappearing in all Western industrial countries, and the labour demands of new industries, which offset dislocations caused by labour-saving machinery.

If, therefore, the risk of innovation becomes mechanically rapid, the danger of improvident tardiness is the more acute, and it becomes essential to treat on scientific lines those questions of man's abilities, his affections and his tools which have been brusquely dismissed in the past. With the intensification of scientific effort and the greater subdivision of industry, the possible dislocation becomes more frequent and the way of meeting such change of greater public importance. Impact and change must, in fact, be treated as an area for scientific study, and society must endeavour to regulate the rate of change to an optimum point in the net balance between gain and damage.

No scientific worker can fail to recognize the practical difficulties of economic and political

prevision, as involved, for example, in Sir James Irvine's plea for a Ministry of Knowledge for the purpose of predicting the repercussions of new knowledge on all phases of life. None the less, a deliberate attempt may yet have to be made. Moreover, it is clear that the moral and social consequences of innovation, no less than the material, must be taken into account in our calculations, and it may even be desirable to repress the rate of development on the physical side in order to accelerate assimilation on the moral and human aspect. Birth control, for people, may yet demand corresponding measures for their impedimenta.

Sir Josiah Stamp adds one more voice to those which in recent years have pleaded for redistribution of scientific effort and resources. There is not too much effort being devoted to research in physics and chemistry as modifying industry, but there is too much relatively to the research upon the things they affect in physiology, psychology, economics, sociology. Additional financial resources should be applied more to the biological and human sciences than to the applied physical sciences or, if resources are limited, transfers should be made from one to the other.

What is required is not less science but a great extension of the area to which the scientific method is persistently and dispassionately applied. This is no time for a spirit of defeatism but for fuller support of those means of acquiring knowledge on the human and biological side where it is at present deficient. We must achieve an advance in the science of man commensurate with that which we have already secured in the science of matter.

For this task there are two essentials—a time of peace in which the problems can be effectively studied and the adjustments made, and courage and confidence strengthened by the conviction that the human spirit is not doomed to relapse into barbarism, but is fully as capable of emerging from an age of mechanization and standardization to one in which the teeming units of mankind enjoy not merely physical comfort and adequate leisure but also freedom of access to all the rich heritage of civilization. If scientific workers are stimulated by the presidential address and other discussions at the Association's meetings to make more constructive contributions to this question of peace and the impact of science upon society, the Blackpool meetings may well be memorable in annals wider than those of science alone.

Geophysics of the Indo-Pacific Region

Geographie des Indischen und Stillen Ozeans Im Auftrage der Deutschen Seewarte verfasst von Prof. Dr. Gerhard Schott. Mit einem Beitrag von Prof. Dr. Ernst Hentschel und Dr. Wolfgang Schott. Pp. xx+413+38 plates. (Hamburg: C. Boysen, 1935.) 36 gold marks.

EVER since Prof. G. Schott, ten years ago, published his great work on the geography of the Atlantic Ocean, geographers and oceanographers have been eagerly awaiting the companion volume on the Indo-Pacific region. In the present work the author has followed the same original plan and, commencing with a historical account of the discovery and exploration of these two oceans, he brings under review the whole sum of our present knowledge, ranging from the geological character of the coasts, through the topography and nature of the sea-floor, the meteorological conditions, the current systems and the physico-chemical character of the sea-water from the surface down to the great depths in the various regions into which these two oceans are divided, to the biological conditions present, including in this latter topic a survey of the anthropology of the whole area.

In his historical account of the great explorers, who opened up for us these wide spaces, Schott mentions the name of Francis Drake in a footnote and in his chart only shows him as having visited the west coast of America, whereas he also sailed the Malay seas, visiting Java and the Moluccas, and was in all probability the first to discover the Giant Robber crab (*Birgus latro*) and to note its habit of living in colonies and of climbing trees.

One great difficulty, which confronts all oceanographers, is the uncertainty of the mode of origin of the great oceans, and this applies especially to the northern part of the Indian Ocean, regarding which one school of geologists holds that it has been formed by the foundering of a great continent, Gondwanaland, while another school believes with Wegener that the oceans have been formed by a gradual drifting apart of the present continental masses. Schott apparently belongs to the former school, and he describes how Africa, Arabia and India are all stable land-masses that