GENERAL SCIENCE

Knowledge and Action Are Two Aspects of Science

Economics Should Cooperate With Science in Rescue Of Millions of Underfed People, Especially Children

By SIR RICHARD GREGORY, Bart., F. R. S.

An address at a dinner-conference given in his honor by Science Service on December 13, 1938, at Washington, D. C. Sir Richard has just retired as editor of the British journal, *Nature,* and he now is chairman of the new Division for Social and International Relations of Science of the British Association for the Advancement of Science. He came to America to deliver the Carnegie Institution of Washington's Elihu Root Address. (See SNL, Dec. 17).

AT THE meeting of the British Association for the Advancement of Science, held at Cambridge, England, in August, last, a new Division was established to be concerned with social and international relationships of science. The main purposes of this organization are to further the objective study of the effects of advances in science upon social conditions, and to promote the welfare of human communities through international understanding of them. This action of the British Association followed the appointment a year earlier of a Committee on Science and Its Social Relations by the International Council of Scientific Unions, which is the leading organization of national scientific societies and academies of the world. This Committee is investigating various aspects of the social influence of definite scientific discoveries upon the life of human society from the points of view of nations themselves and of science.

Contributions of Pure Science

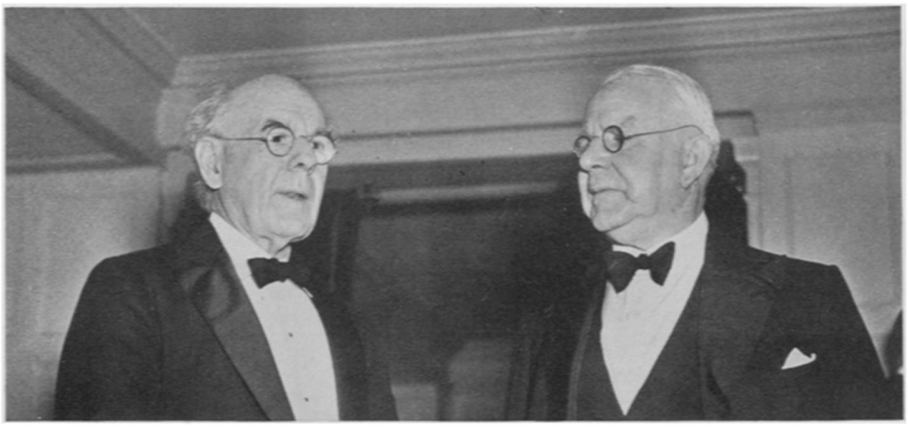
To say that scientific discovery and invention have transformed the whole social and economic conditions of modern life is merely to state what is generally accepted but not so commonly understood. Most people do not realize that the greatest developments both in the arts of peace and war have had their origin in discoveries made purely in the pursuit of new scientific knowledge and not undertaken with practical purposes in mind.

From Faraday's discoveries at the Royal Institution, London, has developed the vast engineering industry, which in the light, power, and traction companies, electro-chemical plant and the companies manufacturing electrical equipment and apparatus, provides employment for millions of workers. The radio industry is similarly the outcome of the scientific researches of Maxwell and Hertz on the properties of electric waves; and to Marconi belongs the credit of developing laboratory experiments into a system of communication through the ether. He was an engineer with vision, who put knowledge into action, and on that account his name is rightly associated with the commercial development of wireless telegraphy, and not because of his scientific contributions to the subject. As he himself acknowledged at the beginning of this century, "The experimental proof of Hertz, thirteen years ago, of the identity of light and electricity, and the knowledge of how to produce, and how to detect, these ether-waves, the existence of which had been so far unknown, made possible wireless telegraphy."

To foresee the possibilities of a discovery, to transform a laboratory experiment into the mechanical plant of a large works, or to apply it to the needs of ordinary life, requires aptitudes not commonly possessed by the scientific investigator. The engineer usually has such practical purposes in mind: discoveries are to him things to be used and not ends in themselves, as they are to the man of science. The two types of mind are, however, complementary to each other, and both are essential if knowledge is to be linked to action. Light itself is not made manifest until it comes into contact with matter; similarly, scientific knowledge has to be reflected in social service—intellectual or material—before its existence is recognized.

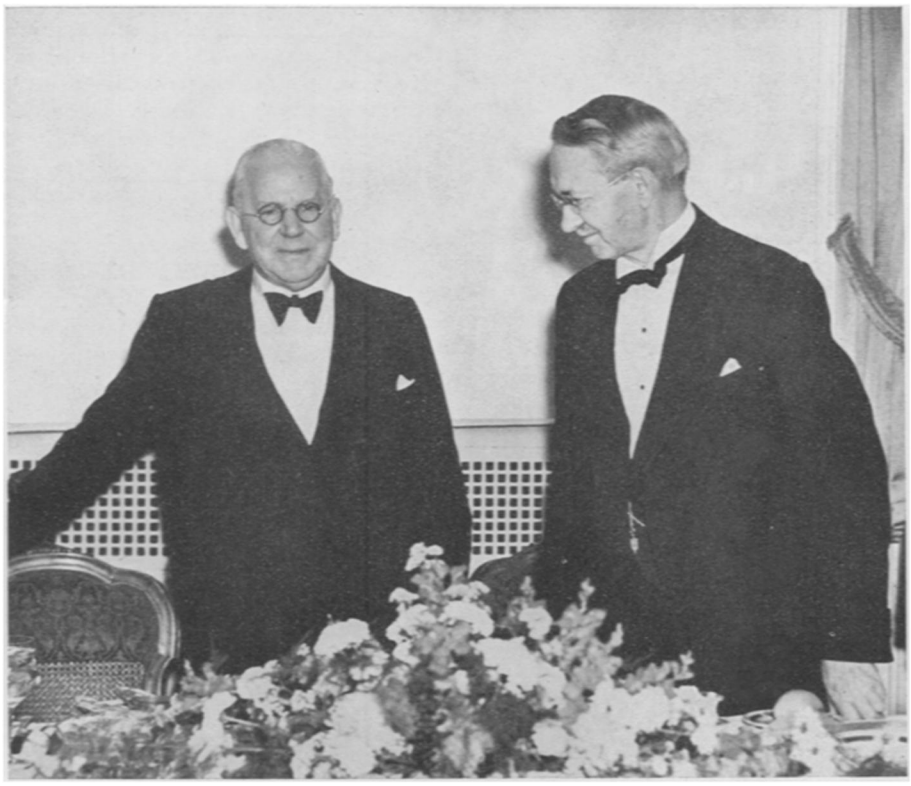
It may be said, therefore, that knowledge, like energy, is the power of doing work, and it only becomes effective when it is released. On the mechanical side, the potentialities of science are continually being made kinetic in inventions which add to human comfort and power; and these applications have revolutionized social and economic conditions. Industrial changes have been so great and rapid that it is no wonder that social instability exists everywhere. Statesmen and administrators need wide knowledge and keen foresight to enable them to make the most effective use of the technical forces which are shaping the conditions of modern life. The scientist and technologist usually have their attention concentrated so closely upon their own particular subjects that they are indifferent to the social effects of their own activities.

Lack of familiarity with scientific matters has been an important factor in the crumbling away of our social structure under the stress of economic disaster, but we can stabilize the new social pattern by securing that action is related



SCIENCE AND NATURE

Dr. J. McKeen Cattell, editor of the American science journal "Science" is shown here chatting with Sir Richard Gregory, for many years editor of the British science journal, "Nature."



INTRODUCING THE SPEAKER

Dr. Edwin G. Conklin (right), president of Science Service, is introducing Sir Richard Gregory to an audience of scientists and newspaper men attending the dinner given in his honor.

to knowledge. We are living in a period of great industrial and other material changes, the consequences of which can scarcely yet be predicted by the technical man, let alone be visualized by the average administrator. Equally we are at the beginning of a new era of biological knowledge with new possibilities of physical and mental health, if our resources are planned intelligently with the object of satisfying real human needs.

A remarkable example of the close contact between scientific research and social or economic problems is afforded by work on human nutrition begun by Drs. Atwater and Benedict in the United States and continued by Sir John Orr at the Rowett Institute in Scotland. It is obvious that sufficient supply of the essential constituents of human diet, especially in early life, is necessary for healthy growth and physical fitness.

Much attention has been given in recent years to the determination of the right constituents of a satisfactory diet, and the ascertainment of the financial resources of the general human population to purchase such foods. Economists showed long ago, by records of family expenditure, that increases in income are associated with an increasing amount spent on food. What has been revealed by investigations carried out in recent years is that rising income, associated with increased consumption of milk, eggs, fruit, and a few other foodstuffs goes hand in hand with decreased death rate, better growth of children, greater adult stature, and much improved general health. On the other hand, it has been established that physique becomes worse, and diseases more prevalent, as family income falls.

The results of investigations carried out by Sir John Orr and his staff indicate that as many as twenty million, or nearly one-half, of the population of Great Britain would have their health improved by an increased consumption of the more expensive foodstuffs such as fruit, vegetables, milk and animal products, while examinations of family food budgets and family incomes show that price is the limiting factor for the consumption of these things. In a very large proportion of the population the income per head is less than that considered sufficient by scientific inquiry for the maintenance of optimum health. The unfulfilled needs of the people of Great Britain for essential foodstuffs are asessed at $500,000,000 a year as a minimum, and at double that value to maintain a standard of perfect nutrition.

Scientific studies of nutrition, with their social implications, and in relation to agriculture, have thus raised world-wide problems. A year ago an international committee of physiologists appointed by the League of Nations reported on the kind of diet which would be fully adequate for health. The standard given by this Committee is at present reached only by the wealthier half of the population of Great Britain and by an even smaller proportion in many other countries. The final report of a committee of the League on the Relation of Nutrition to Health, Agriculture, and Economic Policy is the most authoritative and suggestive survey of the subject that has yet appeared and provides a convincing case of relating knowledge to action. "Millions of people in all parts of the globe" the Report states, "are either suffering from inadequate physical development or from disease due to malnutrition, or are living in a state of subnormal health which could be improved if they consumed more or different food. That this situation can exist in a world in which agricultural resources are so abundant and the arts of agriculture have been so improved that supply frequently tends to outstrip effective demand remains an outstanding challenge to constructive statesmanship and international cooperation."

Nutrition Fundamentals

Any measures instituted to improve the physical health of the people of any country involve, therefore, the element of nutrition. Industrial progress must include responsibility for the maintenance of healthy growth in the life of the individual and of the community. The degrading social consequences of the industrial revolution, and of the attitude of labor to mechanical inventions, were due to the neglect of these human factors. Both rightly and wrongly, science has been blamed for much of the wastage of life which has been brought about by the rapid applications of scientific knowledge to purposes of peace and of war. Scientists are, however, citizens as well as scientific workers; and they are beginning to realize their special responsibilities for securing that the fruits of scientific knowledge are used for human welfare. They can no longer remain indifferent to the social consequences of discovery and invention, or be silent while they are blamed for increasing powers of production of food supplies, providing means of (*Turn to Page 410*)

From Page 407

superseding manual labor by machines and discovering substances which can be used for destructive purposes. It would be a betrayal of the scientific movement if scientific workers failed to play an active part in solving the social problems which their contributions to natural knowledge have created.

The view that the sole function of science is the discovery and study of natural facts and principles without regard to the social implications of the knowledge gained, can no longer be maintained. It is being widely realized that science cannot be divorced from ethics or rightly absolve itself from the human responsibilities in the application of its discoveries to destructive purpose in war or economic disturbances in times of peace. Men of science can no longer stand aside from the social and political questions involved in the structure which has been built up from the materials provided by them, and which their discoveries may be used to destroy. It is their duty to assist in the establishment of a rational and harmonious social order out of the welter of human conflict into which the world has been thrown through the release of uncontrolled sources of industrial production and of lethal weapons.

Scientists must make their contribution to the evolution of a philosophy of world affairs in which the elements of competition among principalities or powers are brought into a more intelligent and coordinated scheme, which preserves man's moral and intellectual freedom while administering to his material needs. All that is noblest in the tradition of science should be used in an endeavor to bring order into the present chaos of man's activities and preserve for mankind as a whole the great heritage of truth, justice, toleration and liberty cherished as principles of scientific inquiry.

Science News Letter, December 24, 1938

GENERAL SCIENCE

Group of Scientists Issue Anti-Fascist Manifesto

Three Nobel Prize Winners, 64 Academicians, and 85 College Presidents Among the 1,284 Signers

COUNTING among its 1,284 signers three Nobel prize winners, 64 members of the National Academy of Sciences and 85 college presidents, a ringing denunciation of Nazi and Fascist attacks on scientific freedom was issued by a committee of distinguished American men of science.

"We publicly condemn the Fascist position toward science . . . . In the present historical epoch democracy alone can preserve intellectual freedom," the manifesto states.

Citing ruthless Nazi persecution of scientists—1600 teachers and scientists had been driven from their posts by the fall of 1936—the manifesto asserts that "any attack upon freedom of thought in one sphere, even as non-political a sphere as theoretical physics, is in effect an attack on democracy itself."

Persecution of Jews and "racial" theories of science, publication of one of which furnishes the occasion for this document, are condemned in no uncertain terms. "The racial theories which they (the Fascists) advocate have been demolished time and again."

The three Nobel prize winners who are among the signers are Dr. Irving Langmuir, associate director of the General Electric Research Laboratory and chemistry prize winner in 1932; Prof. Robert A. Millikan, director of the Norman Bridge Laboratory of Physics, California Institute of Technology and 1923 physics award recipient; and Prof. Harold C. Urey, Columbia University physical chemist honored with the 1934 chemistry prize for the discovery of heavy hydrogen.

The signers, who represent 167 universities and research institutes throughout the country, pledge themselves to bend their efforts to prevent themselves or America from suffering a similar fate.

The sponsoring committee and the list of signers itself are studded with the names of the noted figures of American science, including many present and former presidents of leading scientific societies. Among the signers and a member of the sponsoring committee is Prof. Wesley C. Mitchell, Columbia University economist who is president of the American Association for the Advancement of Science.

Prof. Franz Boas, former president of the AAAS and the dean of American anthropologists, is a member of the sponsoring committee, as is Prof. Urey. Others on the committee are Prof. Karl M. Bowman of New York University and director of the division of psychiatry of the New York City Department of Hospitals; Dr. John P. Peters of Yale University and secretary of the Committee of Physicians which has been battling the American Medical Association on behalf of group medical care. Dr. Henry E. Sigerist, director of Johns Hopkins University's Institute of the History of Medicine; Prof. D. J. Struik, Massachusetts Institute of Technology mathematician and editor of "Science and Society"; and Dr. Milton C. Winternitz, professor of pathology and former dean of the Yale Medical School.

Besides those named above, some of the prominent signers include Dr. Karl T. Compton, president of the Massachusetts Institute of Technology; Prof. Anton J. Carlson, University of Chicago physiologist; Prof. Clark Wissler, Yale University anthropologist and curator-in-chief of the department of anthropology at the American Museum of Natural History; Prof. Edwin G. Conklin of Princeton, past president of the AAAS and president of Science Service; and Prof. Walter B. Cannon of Harvard, co-chairman of the Medical Bureau and North American Committee to Aid Spanish Democracy.

Science News Letter, December 24, 1938

MINERALOGY

Sodium Bicarbonate Found As a Natural Mineral

SODIUM bicarbonate, solace of dyspeptics and raiser of biscuits, has been found in thick deposits as a natural mineral, at depths below 300 feet under Searles Lake in California. The soda deposits are inter-layered with clay.

This is the first time that this chemical compound has been definitely identified as a naturally occurring mineral, states Dr. William F. Foshag, curator of mineralogy at the Smithsonian Institution. Hitherto it has been known only as a product of chemical manufacturing plants.

It is not regarded as very likely, for the present at least, that the new-found deposits will be commercially exploited.

Science News Letter, December 24, 1938