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## SCIENCE AND CITIZENSHIP*

THE fundamental principle of scientific work is unbending integrity of thought, following the evidence of fact, wherever it may lead, within the limits of experimental error and honest mistake. On this there can be no compromise; and since science is a universal interest of mankind, recognizing no barriers of race, class, religion or opinion (provided that is honest), a necessary condition of its advance and application is one of friendliness, frankness and equality. Goodwill and integrity, therefore, are indispensable alike to scientific progress itself and its successful employment for the benefit of mankind.

In this connection, the common phrase, "this scientific age" is all too apt to imply, with little justification, that the majority of people, at least in highly developed countries, now think and act scientifically; and, with no justification at all, to suggest that science can replace the older motives of human conduct. It is true that the external circumstances of life have been vastly altered by the applications of scientific discovery and invention, though as yet for only a minority of mankind. The future alone can decide whether natural resources and human ingenuity will prove sufficient, given statesmanship and goodwill, for the same transformation gradually to affect the whole of human society.

The development which has brought most vividly to the public conscience to-day the ethical problems aroused by the advance of scientific knowledge lies in the field of nuclear physics; and groups of scientific people in the free countries of the world are vigorously debating its various consequences, among them particularly the secrecy attached to weapons as devastating as those provided by nuclear fission. Atomic physics, however, is only one of many scientific developments which have brought, or are bringing, a mixture of possible good and evil about which judgments of relative value must be formed; we must not get too excited about one of them. There is no secrecy about most of these developments—they occur gradually and continuously before our eyes, and we tend to accept them without question as though they were natural phenomena; yet, in fact, the consequences of one of them provide the most solemn problem in the world. The dilemma is this. All the impulses of decent humanity, all the dictates of religion and all the traditions of medicine insist that suffering should be relieved, curable disease cured, preventable disease prevented. The obligation is regarded as unconditional: it is not permitted to argue that the suffering is due to folly, that the children are not wanted, that the patient's family would be happier if he died. All that may be so; but to accept it as a guide to action would lead to a degradation of standards of humanity by which civilization would be permanently and

* Abstract of the Presidential Address of Prof. A. V. Hill, F.R.S., to the British Association, 1952.

indefinitely poorer. Conduct usually falls short of principle; but that would be the worst reason for abandoning principles altogether.

In many parts of the world, advances of public health, improved sanitation, the avoidance of epidemics, the fighting of insect-borne disease, the lowering of infantile death rates and a prolongation of the span of life have led to a vast increase of population. Not only is the population increasing, but also in many places its rate of increase is still rising; and these processes will take so long to reverse that for many years to come the shortage of natural resources, particularly of food, is bound to provide increasing deprivation and disturbance.

Referring to India, nobody would dare to say that steps to combat diseases, such as tuberculosis and cholera, to improve rural and industrial health, to increase the supply of drugs and medical equipment and services, should not be taken on the highest priority; but the consequence must be faced that a further increase of a million people a year would result. Thus, science, biological, medical, chemical and engineering, applied for motives of decent humanity entirely beyond reproach, with no objectionable secrecy, has led to a problem of the utmost public gravity which will require all the resources of science, humanity and statesmanship for its solution.

The example of India has been taken because of the sheer magnitude of the problem and because its seriousness is now admitted by humane and responsible men; but the same conditions exist already in many parts of the world and will soon exist elsewhere. It is *not* a question only of food; if a higher standard of life is to become universal, with education, communications, housing, reasonable amenities and public health, a far greater demand will be made on all such natural resources as power, chemicals, minerals, metals, water and wood. One is left wondering how long these can possibly take the strain. Could world supplies conceivably hold out if the present requirement per head in the United States were multiplied in proportion to meet the same demand everywhere—even without any increase of present population; and if so, for how long? There is much discussion of human rights. At what level can these be reasonably pitched? And do they extend to unlimited reproduction, with a consequent obligation falling on those more careful? These problems must be faced not only with goodwill and humanity but also with integrity and courage, not refusing to recognize the compulsion of simple arithmetic.

Co-operation is required, not conflict; for science can be used to express and apply the principles of ethics, and those principles themselves can guide the behaviour of scientific men; while the appreciation of what is good and beautiful can provide to both a vision of encouragement.

It is true that scientific research has opened up the possibility of unprecedented good, or unlimited harm, for mankind; but the use that is made of it depends in the end on the moral judgments of the whole community of men. It is totally impossible now to reverse the process of discovery; it will certainly go on. To help to guide its use aright is not a scientific dilemma, but the honourable and compelling duty of a good citizen.

## SECOND INTERNATIONAL CONGRESS ON RHEOLOGY

THE British Society of Rheology, supported by the Joint Commission on Rheology of the International Council of Scientific Unions, is arranging to hold the Second International Congress on Rheology at St. Hilda's College, Oxford, England, from July 26 to July 31, 1953.

The Congress will cover the whole field of the study of the deformation and flow of matter, except such specialized subjects as have come to be regarded as branches of applied mechanics, *e.g.*, the classical theory of elasticity, aerodynamics.

Papers which must not exceed 2,000 words in length (including space for figures) will be accepted subject to referee's approval and should reach the Organizing Secretary, Dr. G. W. Scott Blair, The University, Reading, England, by December 1, 1952. The Proceedings will be published in book form, and, since it is intended to circulate proofs of the papers at the Congress itself contributions cannot be guaranteed inclusion in the Proceedings, if received late.

Arrangements will be made for excursions, visits to Colleges, etc., during the Congress. The wives of rheologists are welcome. The fee for the Congress, including available pre-prints, and a copy of the final Proceedings, is expected to be about £ 4, payable before May 1, 1953.