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The Moral Responsibility of Scientists

This paper discusses some of the dilemmas which confront scientists who are conscious of and desirous to fulfil their moral obligations to society. These dilemmas might have been less formidable and resolved much more easily if the whole scientific community were socially motivated. Unfortunately, this is not the case. It is a regrettable, but nevertheless a realistic observation that the vast majority of scientists are still not aware of their responsibility to society. There are various reasons for this. Many scientists feel that the task of pushing forward the frontiers of science is nowadays so exacting and demands so much concentration, that it leaves no time for any other activity, no matter how important. To some scientists the subject of their research is truly the only interest in their lives; others want to get on with their career as speedily as possible.

There are many scientists who are conscious of the impact of their work on society, but their concern is chiefly with the impact of science on national interests and security; for this reason they are usually prepared to leave it to their governments to decide on the lines of development and management of science. Thus, the direction and utilization of science are often dictated by national interests, and consequently differ from country to country. In the recent decades many professional institutions began to show concern about the social impact of science, but since their principal task is to look after the interests of their own members, there again emerge policies and codes of behaviour differing from discipline to discipline. The result of all this is a fragmentation of interests, a division along national or professional lines.

This is just the opposite to the requirements of present-day society, since our survival depends on a realization of, and care for the interests of mankind as a whole. The main characteristic of a world in which the tempo is dictated by the progress of science and technology is the ever-increasing interdependence of all members. Each member depends for his survival on the contribution of other members of the community. At one time this dependence was limited to a group which comprised first a family, then a clan, a township, and later a nation. Nowadays, the group comprises the whole world. In the nuclear age - which brought the potential to destroy all life on earth - there is no more room for pursuing partisan policies, ideological struggles, or the exhibition of sovereignty of states. Any economic or political crisis in one part of the world has its repercussions in all other parts; we are all equally in peril, and our civilization will survive only if all of us develop a sense of belonging, of loyalty to the whole of mankind, a responsibility for preserving the human species, whose continued existence is now in doubt.

This loyalty to mankind is particularly demanded of scientists, because it is their work which has the largest impact, and shapes pplicies and destinies of groups in society. Furthermore, scientists can, earlier than other members of the society, foresee the dangers which may result from scientific discoveries, and warn the public about them. However, in attempting to fulfil his obligations to society, the scientist often finds himself confronted with complex situations, with dilemmas for which there is no obvious solution; this may lead to frustration and unhappiness.

Starting from the premise that the scientist should serve the community and that his work should bring benefits to its members, we are immediately faced with the questions: which community? which of its members? In a realistic and competitive world, with limited economic, man-power and energy resources, there can be no universal benefit. Indeed, very often what is beneficial to some members of the community or to some communities, is harmful to others. Research work started with the best and most laudable intentions, and brought to a successful conclusion, frequently results in creating conditions which bring misery to some members of society. A classical example is the achievement of medical scientists to find means to combat infectious diseases, and in the subsequent efforts of WHO to eradicate the agents of such diseases, and raise the standards of hygiene in developing countries. All of this has brought about a dramatic reduction in infant mortality. However, a secondary result was a large increase in population in regions which could not sustain it, with subsequent terrible famine and starvation.

It could be argued that this is only a transient effect, a matter of educating people in family planning, and of redistribution of food resources. But it would take a long time to implement these remedies and they do not remove the misery that is occurring now on a vast scale. Should the scientists - even if they could foresee these dire effects - have stopped their research work, and thus deliberately withheld the search for means of fighting microbes and other agents of infection? Should WHO have kept back their teams and allowed squalor and disease to continue until the long range solutions had been implemented? How would this have conformed with the conscience of the individual scientist and with his social obligations to the community?

If the above questions are largely rhetoric, in that the beneficial work - with its untoward results - has already been carried out, there are many similar problems facing us today. One of these is related to the problem of the utilization of nuclear energy.

Energy is the prime commodity of our material life; with an increasing world population, and near exhaustion of world resources of fossil fuels, it is obviously of great benefit to mankind to develop new sources of energy. One such source, which has the potential to contribute significantly to our needs, is energy based on nuclear fission, but this is associated with a certain hazard arising from the harmful effects of ionizing radiations on living organisms. In this case, the long-term hazards are clearly seen, even if not yet accurately assessable. The hazards may manifest themselves in the induction of cancers in individuals 20-30 years after the exposure to radiation, or in genetic damage to future generations. Nuclear fission will also result in the manufacture of vast quantities of radioactive materials, which will remain dangerous for thousands of years. The awareness of these dangers has made many scientists come out very strongly against fission energy; they have organized lobbies which successfully fought or delayed the building or nuclear reactors. However, other scientists, some of them equally well motivated, point out the immediate benefits of fission energy in raising standards of living, and even in reducing pollution from conventional power plants; for these reasons they are enthusiastic supporters of this new source of energy. Thus, on this vital issue, the scientific community is split right down the middle, and who is to decide which side is right?

A possible approach towards a solution of this problem might be to try to assess the relative benefits and risks, and then agree on a balance between them. But here again we run into difficulties, since the person who incurs the risk is not necessarily the same that reaps the benefits. Moreover, we have here the fundamental problem of weighing human lives against material gains. For example, in order to reduce the radiation hazards from nuclear reactors, one would have to incur a large expenditure in increasing the shielding, or take other safety measures, all of which cost money; attempts are now being made to calculate how much society would have to spend in order to save a human life. This may be a realistic way to establish the balance, but from the moral point of view, attempts to express the value of a human life in terms of dollars or yens would not be acceptable to many scientists.

The moral dilemma in assessing the value of human life will loom even larger in problems which may face us in the future. The main tenet of the medical profession is the sanctity of human life, and the major task of medicine is to combat disease and death and to prolong life. With the successful reduction of infectious and other diseases which used to afflict the young and middle age groups, the main effort now is to prolong the life of old people. These are non-productive members of the community and often they are kept alive only by the continuous care and attention of younger members, who could have been employed more productively. As time goes on, the care of the old will become an ever-increasing burden on the community, and this is bound to have deleterious effects on the standard of living of the younger members; sooner or later society will have to face the problem and reach a decision as

to how far one should go in prolonging life; a decision fraught with awesome consequences.

These three examples, from the past, present and future, illustrate the complexity of the problems arising from so-called peaceful, beneficial scientific work.

A different type of problem arises when in the course of such peaceful research work, it suddenly becomes clear that our findings may have military or other anti-social applications. In some branches of science this happens very often, and a question then arises about the publication of the results of the work. Should we publish the findings, or keep them secret in order to prevent the possible misuse of our work?

In this case, the answer to the question is not too difficult, and the majority of scientific opinion will probably be in favour of publishing. The reasoning is that if one of us has made a discovery, it is quite likely that another scientist in another country has either already made the same discovery, or will soon make it. But that other scientist may not have the freedom of choice, as we have, to publish or not; he may be prohibited from publishing this type of work, and the military applications would likely be developed in secret for the benefit of one country, and consequent risk to others. It is, therefore, better that the discovery be made public, so that everyone will be aware of the possible danger, and perhaps steps can then be taken to deal with it. The principle of openness, advocated by Niels Bohr about 30 years ago, is still the best basis for scientific work. There should be no secrecy in science, but there should be an obligation on scientists to inform the public about the possible misuse of their work.

In a different category is the problem of scientific research frankly and deliberately directed towards military applications, such as the improvement of nuclear weapons and the means of their delivery, or work on biological and chemical weapons. Although most of the destructive potentials and uses were discovered as a by-product of peaceful research, the crucial technical innovations came about from research specifically directed towards this end, and clearly much of this could have been prevented if scientists had refused to work on such problems. This applies in particular to the small number of top scientists, whose inventiveness and ingenuity produces the breakthroughs which mark the spectacular progress of weapons technology. An example of the role of top scientists can be seen in relation to biological weapons, where, after discussing the problem at international conferences, the leading microbiologists refused to take part in purely military research, with the result that much less progress was made in this field than in the field of nuclear and chemical weapons.

Bearing in mind the crucial role played by scientists, the question is what steps can be taken to dissuade scientists from working on military projects? One suggestion was to formulate some kind of Hippocratic oath, which would contain a pledge by scientists not to engage in work which may be harmful to society; this oath would be taken by all scientists on their graduation, in the same way as the Hippocratic oath is now taken by medical graduates.

This idea is certainly very attractive, but it poses some difficult problems. The scientific community could be persuaded to adopt a moral code only if a realistic formulation could be found, one which would be meaningful and not just an empty phrase. In this connection, it should be pointed out that the taking of

the Hippocratic oath by medical graduates has largely become a ritual, and in many countries even the act of taking the oath has been abandoned, simply because the wording of the oath is no longer applicable to modern society. In relation to a proposed oath for scientists, it would be extremely difficult to find an appropriate formulation, in view of the practical impossibility - outlined in the earlier part of this paper - of separating clearly the beneficial effects of scientific research from the harmful ones.

Even in relation to work on purely military applications, there may be some doubts about the usefulness of the oath, mainly because it could not be made absolute and conditions may arise when a scientist may not feel able to adhere to it. An example of such condition lends itself from the Second World War, when a number of scientists of the highest moral integrity decided to join the Manhattan Project to produce the atom bomb. Their motivation was to prevent the Hitler regime from using the bomb to win the War, and they argued that the only thing which might prevent Hitler from using it would be the knowledge that we, too, possessed the weapon and would retaliate. In retrospect this reasoning is seen to have been faulty: Germany never made a serious attempt to develop the atom bomb, and far from the idea of the bomb being developed in order to prevent its use, the bomb was actually used against another nation. Nevertheless, should a similar situation arise in the future, when the development of a military weapon would appear to be the only way to save civilization, it is quite possible that some high-minded scientists would feel obliged to violate the oath.

Leaving such exceptional circumstances as the situations may arise - and probably exist now - when scientists would feel obliged to engage on military work because they were convinced that this was necessary for the security of their nation. Most of the scientific community would - quite rightly - repudiate such an attitude, but to ostracize such scientists might be equivalent to an attempt to impose on other people one's own religious or ideological views.

The purpose of this paper is to focus attention on some of the dilemmas which face the scientist with a social conscience and desirous to fulfil his responsibilities to society. Obviously there is no simple solution to these dilemmas, but this does not mean that one should not seek and adopt a more complex solution. There is a great need for detailed studies of these problems in various forums, with the participation of scientists from many countries and disciplines, because only such studies may eventually bring useful and acceptable solutions.