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The Ethical Problems of the Modern Scientist

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The ethical problems of the modern scientist are considerably more difficult to solve than those of scientists of former ages.

Up to and including the 19th century the idea of freedom of research could have passed unchallenged (with some notable exceptions, including Galileo Galilei). The 19th century was a time when science was a gentlemanly pursuit with relatively few pressures on the scientist. In the last century it was often stated that science owed more to the steam-engine, than the steam engine to science. In other words, the world was still sceptical of the relevance of science to technology.

During the 19th century, science belonged largely to those who could afford to practice it in a european society. Moreover the value of human beings living outside that society (making up more than 75% of the world's population) could be conveniently neglected.

In contrast we now live in a world where the major industrial powers are committed to scientific research. It is the results of scientific and technological research which maintains the control system of these powers – political, military and economical.

A number of pressures impinge on the modern scientist with the result that on the one hand his autonomy is threatened, while on the other hand he is made accountable for the use and misuse of science for technological purposes. The autonomy and accountability of the scientist are interrelated and depend on what Ravetz calls the meeting of knowledge and power (1). Because of the power that knowledge can provide, the autonomy of the scientist is threatened by those who want to exploit the knowledge and power provided by the scientist for technological applications. At the same time scientists are regarded by the public as morally accountable for the technological uses and misuses of science. Yet, when a fundamental research problem is conceived and while the research is being carried out, the technological uses and misuses arising from this work are usually not apparent. (Rutherford when questioned on the value of his research on splitting the atomic nucleus, replied that he could think of no useful applications of his work).

Before discussing the relationship between the consequences of the results of scientific research to society and the complex ethical problems confronting the scientist, I shall briefly deal with

some other problems affecting the practice of science in the latter half of the 20th century. There are considerable pressures put on the modern scientist to produce results; these pressures are due partly to the increasing cost of scientific research, and partly due to the financial and psychological rewards that scientific research can produce. The drives to justify the cost of research, to produce results and to satisfy personal ambition probably have been at the core of a number of plagiaries, frauds and money-making activities that have increased in recent years. Some of these are so outlandish as to have good anecdotal value. Perhaps one of the most unusual recent cases led to the conviction of a senior scientist at New York University, who having lost the financial support of the National Science Foundation, turned his department to the manufacture of cocaine, LSD and methaqualone in an effort to provide sufficient research funds to keep expensive primate research projects going (2).

But these ethical problems confronting the modern scientist, while extremely serious, are not the ones which are uppermost in my mind. One problem which concerns me greatly is that of the restriction of the traditionally free, open and cooperative communication between scientists. In my view any restriction on the free flow of information goes counter to the long established ethos of science. The science ethos is characterized by intellectual honesty, universalism, organized skepticism, disinterestedness and wide and public accessibility to scientific knowledge (3). The loss of any of these attributes from the practice of science should be avoided at all costs. Furthermore it is also worth considering that deviations from the science ethos are likely to diminish the respect that the community has for the scientist, as this respect is based on the concept that scientists are involved in a disinterested, universally shared search for knowledge and understanding of nature.

Once it is realized that the practice of science is becoming secretive and profit-orientated, goodwill of the public may well disappear and with it the climate which supports research independent of industry and government interests.

The restriction of free communication between scientists may be imposed from the outside, as in instances when scientists work on classified government and military projects, or in industry when research and development of patentable processes are at stake. Self-imposed restriction on communication due to competition in a "hot" area of research is equally objectionable, particularly if it is coupled with the taking out of patents and formation of companies for financial benefit of either the individual scientist or the institute in which the scientist works (these moral decisions have to be made currently in the fields of cell biology and genetic engineering, 4, 5, 6, 7). When secrecy is imposed on scientific research by governments or industry, the scientist has the problem of divided loyalties – to his government or employer on the one hand and to the science ethos on the other.

Any scientific research for the defence of one's country was in the past considered as an incontrovertible virtue, whether one's country was right or wrong. During the 2nd world war scientists still identified science with the service to the war effort of their nation. Probably the best examples are Leo Szilard and Albert Einstein, both pacifists, who convinced President Roosevelt at the time that it was imperative to have an atomic bomb before Germany obtained it. Since then the moral norm has changed and all patriotic acts are not necessarily accepted as moral. Many scientists believed that particularly the Vietnam war involved perversions of science (chemical and biological warfare and the use of napalm especially against the civilian population) and as such demanded the dissociation of the use, or misuse, of science-based technology and the scientific ethos.

Science generally had popular support until the Vietnam war, but then the confusion between the responsibilities of the scientific community in safeguarding the integrity of the scientific enterprise as well as the political responsibilities of scientists as citizens, led to conflict. Those scientists who opposed the war on political grounds thought that the perverted use of science-based technology was incompatible with the scientific ethos and thus required the breaking of all links between the military and the scientific community. This led to the formation of Societies of Social Responsibilities in Science in many countries including Australia, and pledges by scientists NOT to engage in war work. Many senior, influential scientists (e.g. Linus Pauling) were very vocal about this. It was suggested that scientists who consistently used their skills in the service of killing should not be asked to attend scientific meetings and should not be recognized as members of the scientific community.

On the other hand those scientists who supported the war against the communists, considered the opponents of war as enemies of freedom, including the freedom of science. Thus the science ethos could provide no guidance for conduct in this situation of moral conflict.

Lastly I want to deal in more detail with the impact that science has on technology and the role that scientists can and should play in a technological society. This is not the venue to make an extensive list of all the problems generated by technology; obviously environmental problems, such as pollution, whether from the petrochemical industry, mining or nuclear reactors are foremost in one's mind. The production of toxic substances by industry (heavy metals effluents, organochlorines such as chlorinated biphenyls, vinyl chloride) are other examples. In addition, while before, the use of technology increased the opportunities for employment, the situation now is reversed, and science-based technology (such as the silicon-chip, robots and monoculture in agriculture) is leading to increased unemployment. Thus there seems to be a conflict between the technological application of science and the general good. The scientist is often caught in the middle of this confrontation.

There is little doubt that if it is left to the special interests that operate through the state or in the market place, some of the consequences of applied science or technology will assuredly be difficult or impossible to monitor, let alone control. The examples of nuclear weapons, nuclear reactors, micro-processors and more recently the development of the molecular biology industry should be a clear warning that more of these problems are to follow.

Additional difficulties arise when the involved scientist tries to investigate such technologies with the aim of minimizing their possible harmful effects. The science "expert" is called in and it is usually found that he is dealing with future contingencies on the basis of inadequate evidence and data. The scientist is then forced to choose between different uncertainties, invoking values and probabilities which really cannot be presented in completely objective, quantitative terms. In other words, scientists are called in as "experts" to make choices which under the circumstances are not amenable to evaluation using the scientific approach. The problems have become sociological and political ones and often the scientist is asked to make value judgements under the guise of scientific expertise. The neutrality and objectivity of science therefore seems to be lost under these circumstances. This also illustrates the dichotomy of the accountability of the scientist, one political to the community, the other moral to the scientific ethos.

It might be, that in the consideration of such problems, when it becomes extremely difficult to disentangle objective data from subjective value judgements and choices, the scientist is out of his depth, as he is no better educated or trained in this sphere than the average citizen. It is my contention that the proper approach in making such value judgements (e.g. rainforests for future generations? – unemployment now?) is by a team. This team should include – apart from natural

scientists – also one or more moral philosophers and social scientists who are better equipped to make the value judgements that are required to solve the problems which arise from the impact of the science-based technology on society. In his role as a private citizen the scientist should be encouraged to make value judgements. In his role as an "expert" called in to solve problems arising out of the impact of technology on society the value judgement of the scientist should take second place to his objective and neutral evaluation of the problem according to the science ethos.

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