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The following is a synopsis of a lecture presented in April 1964 at a seminar on physics, history, and society (Physics 520-D) of the Physics Department of the University of Washington, Seattle. The author is professor of physics at the University of Virginia.

## ethical problems of scientists — a summary

*By Lawrence Cranberg*

The relationship of ethics to science has long been discussed as a theoretical problem by a few specialists. In recent years ethical problems associated with activity in science have acquired for many scientists a major importance on the practical level, often without having been tagged explicitly as "ethical", or, in many cases, without having been brought above the threshold of awareness as problems worthy of serious attention. Ten such problems are identified below.

(1) The "selling" of research and development proposals whose fate may strongly affect the scientist's career, or even the economy of a whole section of the country, must be reconciled with the traditional responsibility of the scientist to evaluate the defects as well as the virtues of his hypotheses, and with recognition of the need for a balanced development of science within its different branches and in relation to the other demands on the resources of society.

(2) Increased intensity of scientific work creates a setting of personal competitiveness and temptations of self-aggrandizement which must be reconciled with traditions of courtesy, of open communications, of full opportunities for expression of dissident views, and of primary dedication to science itself.

(3) Demand for rapid marketing under competitive conditions of an increasingly wide range of technically novel materials and devices must be reconciled with maintenance of standards of workmanship and care in determination of the consequences of rapid introduction into general use of those materials and devices.

(4) The increasing specialization of science and the demands for highly visible research productivity in highly specialized areas, must be reconciled with the aspiration of science to infuse a spirit of reason into all the affairs of men, and with the obligation to secure a competently trained, properly motivated citizenry and scientific posterity.

(5) Increasing managerial and administrative power in the hands of scientists unfamiliar with the uses of such power creates opportunities and temptations for arbitrary wielding of authority which must be reconciled with traditional emphases on appeal to reason and on courtesy among colleagues.

(6) Increasing attention and respect accorded the advice of scientists on a wide range of policy ques-

tions generate temptations of self-assertion which must be reconciled with the traditional obligation to furnish evidence and carefully weighed limits of error with every prediction.

(7) The advent of expensive large-scale research activity imposes obligations for economical use of large resources which must be reconciled with the demands of flexibility and freedom which are intrinsic to research.

(8) The increasing importance of group effort in science, which carries with it an obligation for coordination and appreciation of contributions at many levels of skill, must be reconciled with the continuing importance of distinctive contributions by highly talented and motivated individuals.

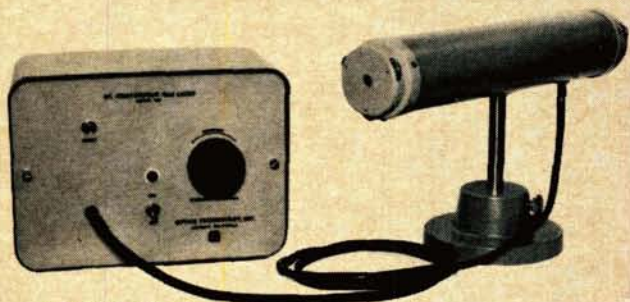
(9) The increasing importance of science is reflected in the assumption of new roles of social and scientific importance by the professional organizations of scientists. The effectiveness of these organizations in their new roles is a responsibility of the many, which must be reconciled with a long-standing tendency in the scientific community to delegate authority heavily to a few, with a minimum of surveillance or interest on the part of the many.

(10) The continuing tension of international relations requires that scientists reconcile the demands of national security and prestige with the openness of communications required for scientific progress, and with recognition that the essential function of science is to serve as a mechanism of adaptation to the requirements of survival of the human species.

These are some of the problems of decision, frequently novel in difficulty if not in kind, which many scientists face today. Relating as they do to choices which involve the balancing of short-range personal advantage against social interests, or national against international interests, they are conventionally designated "ethical" when there is no question of violation of law. Aspects of these problems are sometimes characterized as "conflicts of interest".

A common element in many of the areas of decision identified above is the inherently low visibility of the situations in which the decisions are often taken, and the absence of a consensus with





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respect to the norms which should govern the decision-making process. Prompt and full exposure to public scrutiny via publication, which is one of the most effective devices in science, as elsewhere, for inducing the correction of error, is often precluded. It seems prudent, therefore, to examine the need for clarification of norms and for means of detecting and dealing with "error" in these frequently novel, low-visibility situations. Interests of scientists, scientist-educators, professional associations of scientists, and of society as a whole are vitally involved.

Problems having similar ethical and, sometimes, similar substantive content have long been encountered by members of other occupational groups—for example, lawyers and engineers. After study and trial—and often under public pressure—these, and many other occupational groups, have adopted special administrative and educational devices to observe and improve ethical performance in their occupational domains. Despite the widespread occurrence of these devices, little is known about their effectiveness, about how they may be improved, or about their relevance to the needs of scientists. Scientists now have a personal interest in encouraging research in these areas of ignorance; they offer direct challenge to students of behavioral science—in particular to the disciplines of rationalized decision-making, conflict resolution, and descriptive sociology, and are clearly of interest to scientists generally.

Concern with ethical problems can itself produce ethical problems. Among these is the possibility of infringing on the privileges of privacy. Another is a temptation toward overemphasis on the ethical aspects of intrinsically complex questions whereby ethical argumentation becomes a means of question-begging, oversimplification, or intimidation. These possibilities illustrate the need for great care and alert self-criticism if ethical problems are to be studied and dealt with in a competent manner.

Many of the ethical problems of scientists clearly parallel those of other occupational groups. When scientists examine ethical problems with their own investigatory tools, however, those problems become part of the unfinished business of science itself. The nature of the relationship between science and ethics has long been a subject of speculation and controversy. Systematic empirical study of operating systems of ethical self-regulation may contribute to the clarification of this relationship. Such study should furnish a basis for evaluating and possibly extending and improving those systems.

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