

Science and Morality

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THE issues that have been considered in this symposium are clearly ethical issues. I shall attempt to place these issues within the context of planning for the future of science.

What I want to say is fairly simple. We have heard that the scientist is disturbed because the public does not fully understand what science is. But public confusion on this matter is hardly remarkable. Scientists themselves don't understand what "science" is. Specifically, what is science trying to accomplish? I want first to show that a rather obvious reply to this question simply will not meet the demands of good planning. The obvious reply is that science is trying to develop systematic, objective, verifiable knowledge about the natural world. If this reply were useful, one ought to be able to discern an ethical code of scientific behavior which would maximize the chances of accomplishing science's aim. But it is at present virtually impossible to determine such a code for science. Hence, if science wishes to be "understood" and to guarantee future success relative to its objectives, it needs to define its own objectives in far more precise and comprehensive terms than "the increase of knowledge." We ought to be just as concerned with teaching ourselves what science really is, as we are with teaching the public.

To begin: Suppose we say that what science *is* is to be determined by what science is trying to do, and the way in which it accomplishes its objectives. This definition is important in the argument that follows. It asserts that the definition of a social institution is to be given in terms of its real aims. This means

that science is to be conceived in terms of a plan of action. The members of the institution of science are those who try to carry out the plan. Presumably, the members are also those who in some undetermined way specify what results the plan is supposed to accomplish. The plan is good to the extent that it maximizes the chances of attaining the desired goals.

The subject of planning has attracted considerable attention in recent years. An example of this increasing interest in planning is the "new" field of Operations Research. It is safe to say that recent work has shown that rational or optimal planning is a very difficult concept to define, and even if we are ultimately successful in defining it, it will be an extremely delicate matter to apply the concept to the planning of social institutions. Even so, the recent endeavors do satisfy certain standards of rigor and accuracy, and many feel satisfied that man is finally coming to understand the problem of rational planning and will in a generation or so be able to place such planning on sound, objective foundations.

Suppose we consider now the problem of the planning of the institution of science. Such a question may seem almost indecent to propose, because planning suggests restriction of conduct to some norm, and we all know the benefits of permitting scientists as much freedom as possible. But of course the amount and kind of freedom we feel desirable is part of the plan, so that the question is really not inappropriate. But the question is difficult because only a few people have really tried to spell out what science is trying to do and how it is trying to do it. To say that science is trying to increase knowledge by the accumulation of careful and "objective" observations is analogous to saying that business is trying to maximize profits by legal and shrewd transactions. Neither description is nearly definite enough to enable us to judge whether particular plans of action are rational or not.

But for the sake of this discussion we can concentrate on just one aspect of the aims of science. Suppose for the moment that we can identify the products of science—we can say that an incre-

ment of knowledge has occurred and we can evaluate the increment in terms of its worth for the whole enterprise. It does not seem too difficult to discern a plan which the institution of science tends to adopt in its attempt to guarantee a continuing output of these increments of knowledge, i.e., to guarantee the immortality of the institution of science. Such a plan of action can be called the moral code of the scientist.

The moral code of science can be briefly described as follows. Within the conduct of their scientific work scientists are expected to behave as they ought to behave outside of their work. It is morally inexcusable to kill human subjects no matter how well this serves the aim of gathering information. Similarly, people ought not to be deprived of their dignity, their possessions, or their health as a result of scientific investigation. Of course, everyone knows that this moral code is somewhat vague. Some feel that animals must be similarly respected. Some feel that a little human dignity or welfare may be sacrificed if the gains to the rest of humanity warrant it.

Curiously enough, the institution of science seems to be quite ambivalent about the moral conduct of scientists outside of their work. Indeed, in estimating the worth of a scientist, we often seem inclined to ignore the fact that he was a murderer, thief, or adulterer, although administrators of academic institutions do on occasion try to deprive such persons of their opportunity to continue their work. But the reason why murder within science is morally wrong, and outside of science is irrelevant, seems easy enough to give. Murder for the sake of science cannot be condoned, because society will cease to tolerate the institution of science—the immortality of the institution is threatened. But murder outside of science can be ignored, because presumably the public will differentiate between a person when he acts as a scientist and a person when he acts otherwise—as long as scientists in general do not indulge in extracurricular immorality.

Of all the moral virtues, honesty is regarded as the most sacred by scientists. You shall not declare to be true or false, *as a scien-*

of tomorrow's inquiry is scientifically immoral? I think not. But the thought drives me back to a further reflection on the existing moral code of science. One thing stands out as a result of this reflection. Guaranteeing future science is not something that can be accomplished by adhering merely to the existing moral code within science. Something is wrong. The "within" and "without" distinction will not stand up under reflection. An honest scientist may well threaten the future of science by his discoveries. A cautious scientist may similarly cause damage because he made his assertions too late. The "ethics of science's business" is everyone's business.

The point is so simple one almost hesitates to make it. Which is better: a great discovery today and no tomorrow or no discovery today and plenty of tomorrows?

This is a theme with which you are all familiar, but I have tried to give the knife a twist that will hurt you more. Because I am not concerned with the way in which the morality of religious and political institutions conflict with science. I am concerned only with the morality of science. Its morality is faulty if it endangers its own future.

But what's the point? Are we really recommending that scientists tell lies and hold back discoveries? Is prudence to replace proof?

One answer is that of course prudence has already replaced "proof." We recognize that no facts are ever established; the moral code of honesty in science cannot be telling the scientist to tell the truth. He doesn't know the truth that such a code instructs him to tell. The moral code is vaguer than that. It tells him not to assert as true that which his peers could to their satisfaction establish to be false. But there is clearly a line of some kind on which the areas of probably true and probably false are to be marked out.

Therefore one important need is a closer examination of the risks entailed in scientific assertions relative to the long-range plans of science. This is a problem for research itself—and not

a problem that can be answered now. Differences of opinion as to the way in which this question would be answered by research have been apparent at this meeting.

But a more general need is also clear. Science wants to increase knowledge. To accomplish this, science must try to guarantee its future. Hence science wants to guarantee the future of man. But this is a goal of every major institution. And an institution is defined in terms of that which it tries to do. Hence science does not differ from other institutions in this respect. We almost seem driven to conclude that the troubles with present-day science lie in the fact that science wants on the one hand to maintain itself as a distinct institution, while on the other hand it cannot want this if it is to survive. "Science" is, after all, a young term, and the institution of science is a young one. It is not too late to reconsider both the suitability of the term and the abolishment of the institution.

Too drastic? Perhaps. But the fact that science shares a common aim with politics, industry, and other social institutions suggests that we as scientists need to be careful in the way we express ourselves and in our attitudes toward certain matters. For example, a discovery today based on certain tests may increase knowledge, and yet be of dubious value as a scientific contribution because it threatens the future of science. We do not see anything very odd in saying that a company that makes a large profit in one year may have been very badly managed, for it may have threatened its future by trying to maximize present earnings. On the same grounds, "scientists" who make tests which result in very significant increases in knowledge may be very poor scientists, if the tests threaten the future of the scientific enterprise. It will take us some time before we can learn whether the development of nuclear energy was a great scientific discovery or a fiasco.

We should have a committee on the social impact of "science" on science. We should never say that it is "beyond" the powers of science to weigh the risks of the loss of thousands of lives against a present gain in knowledge, unless we are willing to

admit that certain types of scientific problems are completely unanswerable. This weighing of risks is a scientific problem, because its proper answering is required in order to carry out the long-range plan of science. We should, of course, stop making the almost unforgivable error of distinguishing between the physical and the social sciences, or referring to the "more exact" sciences.

What we seem to need is a discipline to study the planning of science. Such a discipline would study the consequences of certain types of scientific activity and evaluate these activities in terms of the long-range objectives of science. The allocation of research effort to the many problems that face us is an example of such a study. A significant start in this direction has been made by the National Academy of Sciences, the National Research Council, the AAAS, and others. Such a discipline requires the highest respect of scientists. If scientists don't do their own planning, somebody else will do it for them.