Letters

Science and Politics

Perl's critical analysis of scientists in the policy-making process, "The scientific advisory system: some observations" (24 Sept., p. 1211), is a laudable effort to shear away some mythology about how effectively scientists and engineers function in the face of hard political facts. Nevertheless, I am troubled by some aspects of Perl's approach. He suggests an analytical framework for evaluating "effectiveness" that is supported neither by data nor by rigorous conclusions. The concepts of "specific effectiveness" and "general effectiveness" are not defined in ways that would allow social scientists to carry out research on them. The results of the work of the Stanford Workshop are reported in far too loose a manner; phrases such as "high effectiveness," "low effectiveness," and "reasonable but not high" tell us very little about how the workshop proceeded, what standards it applied, and why it reached these conclusions. The general determination that by the crucial test of responsiveness to action recommendations "the advisory system has substantially failed on broad technical issues" seems to be an indictment of the Executive rather than of the advisers.

Perl also assumes that the formal advisory machinery is the only machinery that counts. He clearly recognizes the impact on the system from pressure groups within and outside the administration, but apparently he does not consider that scientists are or could be part of this complex of interests. Indeed, Perl discounts most channels of influence outside the scientific establishment. One has only to consider the activities of the Council for a Livable World, the Federation of American Scientists, the Scientists' Institute for Public Information, and some of the young radical groups to appreciate that this has not been true in the past and is not now true. Perl might better have titled his article "The *Formal* Scientific Advisory System." The informal system is remarkably well developd and is increasingly effective as an interest group. To his plea for a complete study of the magnitude and structure of the entire system, I respond by noting Dean Schooler, Jr.'s *Science, Scientists, and Public Policy* (Free Press, New York, 1971), which represents a beginning.

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Perl suggests that the difference in effectiveness of scientific advice on "limited" and "broad" technical questions is paradoxical and unfortunate. I submit that it is both inevitable and appropriate. This is because the broad technical questions have two distinct parts: one is concerned with limited technical questions and the other with the *allocation* of costs and benefits. In the supersonic transport (SST) issue, for example, the limited technical questions included noise effects and aircraft economics. The accompanying allocation question involves a choice between benefits to SST manufacturers and users and benefits (or lack of costs) to taxpayers and those affected by aircraft noise. Any action on broad technical questions hurts some people and helps others. In contrast to limited technical questions, which can be objectively resolved by scientists, questions of allocation have no "right" answer and cannot be objectively resolved by anyone. These issues must be resolved through some sort of political process. The outcome must depend on the relative wit, power, and constitutional representation of the competing interest groups. Perl refers to competition among the various pressure groups as preventing "rational decisions on the environment and public health," but this competition is the only nondictatorial way of resolving the allocation aspects of "broad technical questions."

Before deciding that the scientific advisory system's alleged ineffectiveness on broad technical issues constitutes a "failure," we should determine whether the ineffectiveness is due to the decision-maker's lack of understanding of the strictly technical questions or due to his lack of agreement with the technical adviser's opinions about allocation of benefits. This distinction is a difficult one for the adviser to make, since he will probably consider the only valid indication of a decision-maker's understanding of the limited technical issue to be agreement with his own allocation-laden recommendations. The degree to which the scientific advisory system should be more effective in having its broad recommendations implemented is itself an issue of allocation of political power. As with other questions of allocation, the answer cannot be determined by appeal to scientific reason.

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Perl's examples of the ineffectiveness of the scientific advisory system are taken largely from very recent history (problems not yet solved). He ignores the fact that for 25 years scientific advisers have played a critical role in the nation's history. During these years, largely under government auspices, scientific knowledge has been enormously advanced, the national defense has undergone a technological revolution, fantastic achievements have been recorded in atomic energy and space technology, the biomedical sciences have entered a new age of enlightenment, and the "green revolution" in agriculture has staved off starvation for millions of people throughout the world. To assert that the scientific advisory system has not played a key role in all this is to ignore well-established facts.

Perl discredits this system because we have not stopped the nuclear arms race, nor the deterioration of the environment, and because we have not solved the difficulties of the underdeveloped countries. But who, more than the science advisers, has worked more energetically and for a longer time on the technical aspects of these problems? And who would assert that the difficulties that have stood in the way of their solution are principally scientific or technical? These and many other important human problems involve enormous economic, political, international, and social issues that no amount of good scientific advice can overcome.

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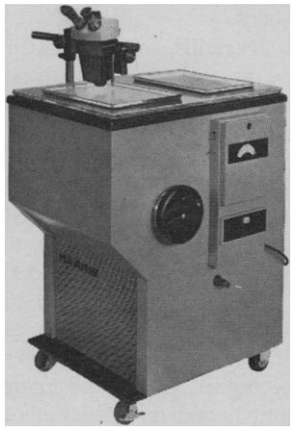

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have consistently and forcefully set forth the technical aspects of these problems so that when decisions are made by the appropriate officials they will not be made in ignorance. This is all that any science adviser can hope or expect. Scientists advise on scientific matters; they do not (and are not competent to) decide on issues in which nonscientific elements may be overriding.

In his summary, Perl blames the lack of "effectiveness" in certain areas on the "multiple functions" of the scientific establishment. In fact, this is one of the great strengths of the advisory system. How could its functions be other than "multiple" in view of the growing multiplicity of national problems that have some scientific content? They should be more multiple and be extended into areas such as transportation and housing.

Perl expresses his greatest concern about environmental problems, which are serious and which, by their nature, cannot be solved by scientists alone. Yet many scientists are working hard on the technical problems. Responsible groups have not attempted to advocate impractical panaceas—such as prohibiting the use of the automobile, of DDT, or of phosphates in detergents. On each of these issues there are many pros and cons—scientific as well as economic. There is no known nonpolluting substitute for the motor vehicle, although the new ones are getting better every year. DDT, many scientists think, has done far more good than harm in the world, and there is no general substitute for it, as there is none for phosphates in detergents.

Our nation faces many different problems—as does the whole world. Shall we blame only the scientists? What about economists, political scientists, lawyers, businessmen, labor leaders—and the *people?* We all share the burden and the responsibility. To discredit one group, who are, and have been for a long time, working on advancing our knowledge and promoting its more humane use is only to impede, not accelerate, progress.

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In Clark's letter and in much of DuBridge's letter just the first two-thirds of my article are discussed. Generally they agree with my conclusions that the scientific advisory system is effective on limited technical questions but ineffective on broad technical questions. Their criticisms are either that it is inappropriate to judge the scientific advisory system on broad technical questions, or that the scientific advisory system should not be expected to be effective on such questions. In studying the scientific advisory system, I did not concern myself with what was appropriate or with what was to be expected, but only with the behavior of the advisory system and the response of the executive branch. Certainly the broad technical questions should be included in such a study.

More important, Clark and DuBridge ignore the last third of my article, where I concluded that "the advisory system, as presently constituted, combined with the multiple functions of the scientific establishment, is detrimental in important ways to the process of technical decision-making in this country." This conclusion does not depend upon whether one agrees with my evaluation of the effectiveness of the scientific advisory system on broad technical questions. Obviously, if one agrees with that evaluation, this conclusion is more distressing.

DuBridge, in the latter part of his letter, suggests that I was criticizing all of science or all scientists. This I was certainly not doing. I do not lay the failures of the scientific advisory system on all of the scientific community.

With respect to Long's letter, I am in general agreement—there is more work to be done. But I see no value in describing as an informal scientific advisory system the groups he mentions, groups which I also indirectly referred to in my discussion of the scientific community. These groups, when they are effective, are usually acting as pressure groups or as political groups, not as advisory groups. When they act only as advisory groups, they are usually ineffective.

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Pregnant Baboons

I am engaged in automobile safety research. I am designing and testing the most appropriate restraint systems for pregnant occupants of motor vehicles. This research has utilized pregnant baboons in different stages of pregnancy. At the present time, our