When Is Research the Answer?

Knowledge can be power only when there are able people to use it.

J. R. Pierce

Recently I unexpectedly heard that a large mission-oriented organization proposes to inaugurate a multimillion-dollar program of "basic" research. Among the reasons given was that their large program of "applied" research has proved ineffective in advancing their field of responsibility.

My violent and continued reaction has been that the organization needs basic research like it needs a hole in the head. My diagnosis is that people have not been doing their daily work well and thoughtfully, that they have not been doing their job better day by day, and that they now think that the magic of basic research will sweep away or supplant their troubles. My prognosis is that if they get and spend the money, and even if good research is done as a result, the organization and its mission will benefit not at all. No one will be in a position to interpret, exploit, and apply valid new findings and to reap new benefits.

This brings to my mind some unfortunate laboratories I have visited, which have no clear, pressing, and challenging obligations and are not making any very important contributions. These are the places most apt to boast that they do research. Often it is shoddy research; but, if it were good, they would be in no position to use it to solve pressing and important problems.

I think also of organizations that spend money for research in universities, but that have no adequate mechanism for recognizing and exploiting any important potentialities that may be opened up. The research may be good work of national importance, but is it of any direct good to the organization which pays for it? If not, how can it be made useful?

The author is executive director of the research-communications sciences division of the Bell Telephone Laboratories, Murray Hill, New Jersey.

I hope that no one doubts that good research is essential to technological progress, along with good and aggressive development, trial, production, distribution, and continual evaluation and improvement. Harvey Brooks has pointed out that whether research is basic or applied can depend on one's point of view. I think the distinction between good and bad research is more meaningful and useful. Good research substantially or usefully increases our understanding of important things or our ability to do important things.

The substantial or useful part is vital. Beyond some point, either polishing or extending results is not worth the effort. Sometimes polishing or extending is important for very practical reasons. Valuable as such necessary work is, it can be justified only by a real need for the results.

Important is more difficult than substantial or useful. Important to what? Research can be important to medicine, communication, music, or to the understanding of the universe, including man. It is difficult to establish criteria that will separate important areas of work from unimportant areas; it is also difficult to establish criteria that distinguish between good and unimportant books, but no one doubts that there are both, and that people can somehow tell them apart, fallibly but well above chance.

Thus, good research should substantially or usefully increase our understanding of important things or our ability to do important things. While understanding for its own sake can be laudable and worthy, society will presumably pay most generously for understanding which leads to doing important things. And we all know how increased understanding can shove things forward.

But, increased understanding can result in better doing only under favorable circumstances. The transistor spurred a vigorous electronic industry which, through development, manufacture, and distribution, was able to bring it quickly and effectively into use. Penicillin and other antibiotics would have been useless without a well-developed pharmaceutical industry and medical practice. New plastics and alloys have worked wonders in a wide range of advanced technology.

From society's point of view, research is useless in a practical sense unless it is exploited. Such exploitation requires some successful, aggressive, forward-looking, satisfactorily organized mechanism for development, trial, production, distribution, evaluation, and improvement.

In this country, bright go-getters fresh from the university can, with energy and enterprise, still get backing and found new businesses that leave older competitors in the background. But large organizations can be enterprising, too. If their development people are up-to-date and imaginative, they are continually frustrated by their lack of understanding and their inability to realize essential functions. These lacks hold them back. They know that only research can provide a way through or around their difficulties. Researchers see the same limitations, and good ones are receptive to both the needs and the ideas of others.

From this glowing picture of the path of progress, as real as it is admirable, let us turn to the organization mentioned in my first paragraph and to its problems and responsibilities. Is it doing well now? Probably not, as judged by its own admission that its applied research has not been successful. Probably, it cannot evaluate things well enough to tell the good from the bad. Is it full of bright people at the end of their tether, doing admirably but needing more understanding or better tools to do outstandingly better? Could it tell a good research result from a useless one? Could it make use of a good result? I doubt it.

If the organization does support basic research, and if by a miracle something potentially useful comes from this research, what then? Perhaps an enterprising outsider will exploit the research to his own profit and society's. That would be gratifying, but it wouldn't cure the organization's problems.

When, then, is research the answer in improving the performance or realizing the aims of an organization? The answer is: when such research is good research, and when effective use can be made of the understanding and inventions which good research provides.

The effective application of understanding and invention requires the effective and interrelated carrying out of many functions other than research, including development, trial, production, distribution, and continual evaluation and improvement. Good research may —or may not—find use through various fortuitous mechanisms of society. But unless the other functions necessary for its exploitation are provided and organized in a satisfactory way, even good research is unlikely to be the answer to the problems of an organization.

Indeed, unless these other essential functions are satisfactory, research carried out by or for an organization is not only unlikely to be effective, it is unlikely to be good research. Under unfavorable circumstances, research is a distraction from the urgent problems of an organization rather than a solution to them.

NEWS AND COMMENT

Scientists' Travel Abroad: 25 Percent Cutback in Federal Funds Imminent

Federal funds for scientific travel abroad will be cut back sharply—perhaps by 25 percent—as a result of President Johnson's drive to curtail foreign travel as a means of reducing the U.S. balance-of-payments deficit. The pinch will be felt by scientists who work directly for the government, by persons who hold federal grants and contracts that involve funds for overseas travel, and by some holders of federal fellowships. As a result of the cutback, future applicants for federal support will find it more difficult to obtain travel money, while persons who have already been awarded travel funds but have not yet expended them may find that their awards are canceled.

The cutbacks are being made in accord with a presidential memorandum, issued 18 January, that directed all federal departments and agencies to "reduce U.S. official travel overseas to the minimum consistent with the orderly conduct of the government's business abroad." The directive particularly stressed the need to reduce travel to international conferences held overseas. It did not specify how much of a cutback was necessary, nor did it define precisely what was meant by "official travel overseas." But on 14 February the Bureau of the Budget issued amplifying instructions that established a 25-percent reduction in employee travel as the "objective" for each agency, and that further directed agency heads to "take additional appropriate steps to restrict overseas travel by persons under contracts with or grants from their agencies."

No percentage reduction was specified for travel by grantees and contractors, but a Budget Bureau official told *Science* that the "spirit of the directive" is that agency heads should "come as close to 25 percent as they can" in reducing such travel. The reduction is to be made from the dollar amounts budgeted for overseas travel for the second half of fiscal year 1968 and the whole of fiscal year 1969. Overseas travel is defined as "all travel outside the United States and its territories, including travel to and from Canada and Mexico," with the exception of travel that can be financed from available excess foreign currencies. Countries whose currencies have been designated as excess are: Burma, Ceylon, Congo (Kinshasa) (1968 only), Guinea, India, Israel, Pakistan, Poland, Tunisia, United Arab Republic, and Yugoslavia.

The problem of determining how to make the cuts will be resolved at the agency level. At this writing agency plans are by no means firm, but it appears that there will be some significant differences in approach, particularly with respect to the treatment accorded grantees, contractors, and fellowship holders. All agencies say they plan to apply at least a 25 percent cut to overseas travel by their own employees.

The Department of Health, Education, and Welfare (HEW) has directed its constituent agencies, including the Office of Education and the Public Health Service (PHS), to withdraw all authorizations for foreign travel, whether granted on a "blanket" basis or included as part of an individual grant or contract. Prior approval will be needed before any further overseas travel is allowed. The PHS is already notifying all grantees and fellowship holders that all authorizations previously granted for foreign travel are canceled as of 11 March. If the principal investigator believes foreign travel is "urgently required for the successful prosecution of a project," he is invited to seek reapproval by submitting a special justification that will be reviewed by a central committee in the Surgeon General's office. However, PHS officials expect the initial notice to discourage most grantees from even submitting a request for reconsideration.

Though no precise figures indicating how many recipients of PHS funds will be affected by the new travel restrictions are available, it appears that the number will be substantial. The National Institutes of Health (NIH), a constituent part of PHS, gives a "very rough estimate" that travel funds are included in perhaps 1500 research grants, 75 training grants, and 225 fellowships. Before the cutback was imposed, NIH anticipated spending roughly $2.75 million on travel by grantees and fellowship holders in the current fiscal year.

The National Science Foundation (NSF), another source of travel funds, is pursuing a slightly different policy. NSF is not withdrawing any travel authorizations previously granted. But the agency does intend to cut its grants for travel to international meetings by about 25 percent from the previously budgeted annual levels of $595,000 in fiscal years 1968 and 1969. The cut for the remainder of fiscal 1968 will total about $120,000, while