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EDITORIAL

Basic Research (II): Organization

If one concludes that research, both basic and applied, are essential to the improvement of the quality of life in a developed country (see Editorial of 15 January 1993), the questions of priorities, funding level, and organization will inevitably arise. At each of these levels a symbiotic arrangement must be developed between the political structure and the scientific structure in order to maximize benefits and to eliminate friction.

With regard to the strategic goals there is no question that the ultimate arbiter will be the government acting as a spokesman for the citizens of the country, but it would be a poorly advised government that would proceed to establish priorities with no understanding of what is scientifically possible or likely. For example, it is apparent that an automobile that could travel 100 kilometers on a liter of gas and would not release any carbon dioxide would be highly desirable in the current world. Scientists would be needed to convince legislators that such an achievement is not scientifically possible although some increased car efficiency is possible. On the other hand, when AIDS or some other epidemic spreads in the world, the scientific expertise can inform legislators that money for research can be well spent and will hasten cure and prevention of the disease.

An understanding of the successful symbiosis of government and science has no more shining example than the National Institutes of Health (NIH). When the New York Hygienic Laboratory ultimately became the NIH, it was asked by Congress to attack the cancer and infectious disease problems. The NIH officials, as well as officials at the National Foundation for Infantile Paralysis, correctly deduced that massive efforts in hit-and-miss chemotherapy would be ill-advised and decided that because cancer is growth and viruses are a source of infections a basic understanding of both processes was needed. They initiated a program of basic research (investigator-initiated) to understand growth and infectious diseases at a fundamental level. Because some scientists then believed (correctly, as it turned out) that viruses could cause cancer as well as diseases, a program to be able to grow viruses in the laboratory was initiated. That basic research endeavor led eventually to the development of the polio vaccine, recombinant DNA, oncogenes, and retroviruses. That knowledge not only forms a basis for much of our improved treatment of cancer, but the research effort had spin-offs in the treatment of polio and virus diseases in general, an understanding of genetic causes of disease such as cystic fibrosis, and the emergence of a biotechnology industry. Thus, basic research can flourish as part of a strategic target as long as the legislators are patient, that is, receptive to the serendipitous nature of research. When the research advanced to the point that a polio vaccine was possible, that was the time for the applied research aspect. Impatience could have created a world filled with iron lungs instead of healthy people with circulating antibodies.

This research on cell growth and infectious diseases is only one example of unexpected benefits that derive from organized serendipity, and the example can be repeated in many other areas such as transistors, lasers, polymers, and weather prediction. Nothing as tidy as having all basic research in one agency such as the National Science Foundation (NSF), nor anything as short-sighted as having no agency, that encourages basic research in nontargeted areas, such as NSF, is sensible in the modern era. The line between the roles of government and industry in basic research is a blurry one that only individuals who understand complexity can handle, and those who think it can be made simple do not understand the problem.

The key to good science policy is informed assent, in which legislators accept the need for scientific advice on the mechanics of achieving their goal, and scientists recognize that legislators have the right to set the strategic goals based on societal needs. The current debate on converting the NSF to a targeted research agency is an example of inappropriate ideas in which some in the Congress are implying that basic research is not useful for the nation and some scientists are implying that the government has no right to interfere in the research process. The record of the NIH is a glorious example of the expected and unexpected benefits of a system in which the proper mixture of basic and applied research was implemented. The advanced developed nations that are not bent on territorial conquest have no alternative except research to improve the quality of life of their citizens and the citizens of the world. It is vital that research be administered with mutual respect for the responsibilities and expertise of science and government.

Daniel E. Koshland, Jr.