

# Rational Science, Irrational Reality: A Congressional Perspective on Basic Research and Society

George E. Brown, Jr.

Recent attempts by the House of Representatives to eliminate funding for the Superconducting Super Collider (SSC) may have been viewed with pleasure by some scientists. Others may support a congressional cut-off of support for the space station. After all, how can we afford multibillion dollar accelerators and space stations when smaller science projects are being scaled down, stretched out, or even canceled? Isn't it time for Congress to set priorities?

The problem with these arguments is that they ignore the realities of congressional decision-making. If Congress is interested in developing rational priorities, why did it earmark more than \$500 million for unreviewed academic research projects in 1992? If Congress is sympathetic to the principles of individual investigator research, why did it recommend last April to rescind funding for 31 approved, peer-reviewed National Science Foundation projects based on nothing more than the titles of the proposals?

For the past 50 years, U.S. government support for basic research has reflected a widespread but weakly held sentiment that the pursuit of knowledge is a cultural activity intrinsically worthy of public support. Thirty or 40 years ago, this sentiment was given political strength by invoking Cold War rhetoric that linked basic research to the need for military security and preparedness. The U.S. space program was the principal metaphor in this tenuous linkage. Today the rhetoric has shifted to linking basic research to economic competitiveness, either by itself or as a major element of a redefined national security. But the linkage is equally tenuous and equally nationalistic.

Politicians—always on the lookout for miracle cures to sell to the public—have enthusiastically embraced research as the key to a brighter future. Lobbyists for the scientific community have been perhaps excessively willing to bolster this rhetoric by claiming for basic research an exaggerated role in economic growth. This strategy has served the scientific community well, if the sole criterion for success is that research

budgets have grown rapidly over the past several decades.

Today, however, the uneasy alliance between scientists and politicians is beginning to come unglued. Budgetary stress and economic stagnation are forcing political trade-offs and sacrifices that affect a broad range of federal programs, including, of course, basic research. Meanwhile, the research community has locked itself into the rhetoric of economic relevance and tied itself to a pattern of growth. As the U.S. economy continues to falter, and Congress tries to determine which programs it should cut and which it should protect, the message it gets from the scientific community is unhelpful. Every discipline claims that its programs are singularly important for economic growth and a better quality of life. Physicists support the SSC, biologists support the genome project, and astronomers support new telescopes.

Policy-makers and scientists commonly assume an epistemological model in which basic research and the discovery of new knowledge precedes its application. One social consequence of this model is that basic research has been accorded highest status, whereas applied research has been relatively denigrated. Some have suggested that this stratification has led to an excessive faith in the creation of new knowledge as an engine of economic growth and a neglect of the processes of knowledge diffusion and application (1).

Furthermore, we know that in many cases applied research and technology development motivate or precede basic research: Galileo needed a telescope, the development of steam engines stimulated thermodynamic research, and atmospheric modelers need supercomputers. We also know that in some fields, such as biotechnology, practical applications often follow research immediately and directly, whereas in other fields, it is unlikely that there will ever be applications. It may be true that certain basic research done today will enable some future application or innovation, but it is commonly argued that we cannot foresee those innovations and should support basic research on faith. This argument ironically exempts the very process of basic scientific research from rigorous scientific analysis.

A more precise model of the role of research in our culture might portray applied research and development as sources of the technological innovation that fuel economic growth, ease the struggle for survival, and free increasing numbers of human beings to pursue self-realization through endeavors of the intellect and spirit. Such endeavors include the search for new scientific knowledge through basic research, as well as the quest for enlightenment through study and practice of religion, philosophy, history, and the arts. Particle accelerators, spacecraft, cathedrals, and libraries all are essentially similar. They are settings for cultural experience.

Basic research represents a uniquely human quest to achieve intellectual and spiritual insight and growth through scientific inquiry. This quest for individual fulfillment can be broadly supported only by societies that have won the elemental struggle for survival. Before the 19th century, basic research in the Western world was carried out primarily by a few members of the wealthy, educated leisure classes who supported themselves or were supported by sympathetic patrons, sometimes even including autocratic governments (2). Today, basic research has evolved into an activity that can be pursued by virtually any member of our society who possesses the will and the ability to do so.

Since World War II, growth in the number of Ph.D. scientists working in the United States has far outstripped growth of the population as a whole (3). Expansion of the basic research community is essentially a market response to increased public funding for research (4). It is an effect of economic development, a demonstration that an ever-growing number of citizens are sufficiently free from the struggle for existence that they are able to enhance their individual creative potential, satisfy their innate and insatiable curiosity about the universe, and realize their individual social and economic goals. Therefore, if our society now finds itself reducing support for basic research, this may indicate that other, more fundamental societal needs are not sufficiently being met. In fact, there are many tangible and intangible indicators of a decline in the standard of living in the United States today (5), despite 50 years of increasing government support for research.

If we are to maintain long-term growth in support for basic research, we must foster those general societal conditions that encourage individual growth and self-realization. For the United States, advancing these conditions may require structural changes in our educational system, our health and welfare systems, our system for achieving social justice, our manufacturing sector, and even our government. It does

The author is a member of the House of Representatives (D-CA) and is chairman of the Committee on Science, Space, and Technology.

not necessarily require an immediate increase in funding for basic research.

I am suggesting that basic research, as with many other activities, plays an abstract but ennobling role in human culture. Does this offer any useful guidance for lobbying Congress in times of economic stress? Perhaps not. It may indicate, however, that the polarized nature of science lobbying today—which pits discipline against discipline, big science against little science, basic research against applied research, universities against federal agencies—will at best yield short-term, tactical gains for particular interest groups, while failing to achieve a net gain for the entire research enterprise.

The scientific community must accept the inconvenient fact that freedom of scientific inquiry can flourish only within a larger system of often chaotic and seemingly irrational pluralistic government. This system may be intrinsically unsatisfactory to an individual discipline or researcher seeking special treatment, but it does maintain some balance among participants in the system and discourages an unhealthy dominance by any particular participant.

We know of no reasonable alternatives. In the absence of pluralistic democratic institutions, science and technology can promote concentration of power and wealth and even autocratic and dictatorial conditions of many kinds. An excessive cultural reverence for the objective lessons of science has the effect of stifling political discourse, which is necessarily subjective and value-laden (6). President Eisenhower recognized this danger when he stated that “in holding scientific research and discovery in

respect, as we should, we must also be alert to the equal and opposite danger that public policy could itself become the captive of a scientific-technological elite” (7). Paradoxically, such conditions can even stifle freedom of scientific inquiry, as we saw in the Soviet Union.

It is well to keep in mind that the U.S. government will spend about \$12 billion on civilian basic research this year. This is by far the greatest expenditure of public funds expressly devoted to the pursuit of scientific knowledge that has ever been made by any nation in history. I would like this number to be much higher. Yet the oft-documented gloom within the basic research community (8), and continued divisive lobbying strategies over research funding, seem to me to call for genuine self-examination by the scientific community as a whole (9), not for honing political tactics. This self-examination first requires a reconsideration, by the basic research community and its advocates, of the role of science in human culture.

As part of this effort, we must test the hypotheses that link economic and societal benefits directly to advances in research. All research is not the same. What kinds of research offer the greatest probability of improving the quality of life of humankind throughout the world? Should not applied research, and policy research, be recognized as essential elements of the fabric of research? If scientists are not willing to rigorously and fearlessly confront—and answer—these types of questions, then they cannot claim, and surely will not achieve, a stronger grip on federal purse strings than other special interest groups.

The fundamental challenge for all of us is not to increase funding for research, it is to enhance the societal conditions that permit research to thrive: educational and economic opportunity, freedom of intellectual discourse, and an increased capacity for all human beings to achieve their individual potential within a just and humane global society.

## REFERENCES AND NOTES

1. L. M. Branscomb, *Harvard Bus. Rev.* 24 (March–April 1992).
2. J. E. McClellan III, *Science Reorganized: Scientific Societies in the Eighteenth Century* (Columbia Univ. Press, New York, 1985).
3. *Science & Engineering Indicators—1991* (National Science Board, Washington, DC, ed. 10, 1991).
4. Office of Technology Assessment, *Federally Funded Research: Decisions for a Decade* (Government Printing Office, Washington, DC, 1991).
5. For example, see data on salary trends for U.S. workers in: Office of Technology Assessment, *Competing Economies: America, Europe, and the Pacific Rim* (Government Printing Office, Washington, DC, 1991).
6. For an eloquent discussion of the role of subjective values in a technological society, see V. Havel “The End of the Modern Era,” *New York Times*, 1 March 1992, p. E15.
7. D. D. Eisenhower, “Farewell Radio and Television Address to the American People, January 17, 1961,” *Public Papers of the Presidents of the United States, 1960–1961* (Government Printing Office, Washington, DC, 1961).
8. This gloom was documented in “Science: The End of the Frontier?” a report by L. M. Lederman to the Board of Directors of the American Association for the Advancement of Science, January 1991. An interesting analysis of the Lederman report was presented by R. Schmitt in a paper presented at the National Academy of Sciences–National Academy of Engineers–National Science Board Symposium, Irvine, CA, 15 February 1991.
9. The process of developing a strategic plan for the National Institutes of Health may represent one approach to this type of self-examination.