SCIENCE ●http://www.sciencemag.org

EDITORIAL

Cooperation, Competition, and Science Policy

A recent editorial by Floyd Bloom (*Science*, 2 August 1996, p. 559) raises the specter of competition in science and invites a national debate on this crucial issue. As a member of the Council on Competitiveness, which produced the report discussed by Bloom—*Endless Frontier, Limited Resources*—I want to continue the debate on what is undoubtedly the most important subject facing the scientific community, industry, government, and indeed our entire society.

The whole U.S. R&D system is in the midst of a crucial transition. Its rate of growth has leveled off and could decline. We cannot assume that we will stay at the forefront of science and technology as we have for 50 years. International competition in research will be keen and relentless, just as it has been in the product arena. The growth of computer and information technologies is a key reason for this radically changing R&D environment. These technologies have spawned industries that are dependent only on brainpower, communication networks, and access to global markets—not on natural resources, land, and the accidents of geography, as was the case in the past. A second reason is the emergence of the global market, which deals not only in products and services but also in highly trained human resources. The assembly plant in Malaysia that uses unskilled labor will soon be overshadowed by the software development laboratory in India, or the chip design group in Israel, owned or contracted by multinationals in the United States and elsewhere. Academic institutions such as Taiwan University, Tokyo University, and Hong Kong University of Science and Technology, while not yet rivaling Harvard, MIT, or Stanford, compare well with the top 20 U.S. universities and are rapidly improving.

The most obvious reason for the changes and problems in U.S. R&D is its heavy dependence—over 40%—on federal funding at a time when balancing the budget is a prime goal of both political parties. Because R&D is classified as discretionary spending, it is especially vulnerable to cuts. The geopolitical changes following the end of the Cold War have only accentuated this vulnerability. The threat of the Cold War was a prime driving force leading to the expansion of U.S. science, national laboratories, and academic institutions. This threat is gone. The current policy challenge is to identify social issues requiring continued support of science and technology. Health and medical concerns are important motivators of science funding. Environmental science is another area that should explicitly link science and the public good. Other issues that concern the body politic, such as crime, poverty, and welfare, are not easily linked to public support of science or research, save at the educational level. But where the connection should be obvious—between research, competition in the marketplace, jobs, and the standard of living—we have had mixed success in making the case. This is partially because of ideological concerns and obsolete world views, which confuse cooperation with antitrust concerns, or government support of civilian research with corporate welfare. It is also because new technologies that have improved industrial productivity have made downsizing and layoffs possible as well.

Though we have an understanding of the U.S. R&D enterprise's past and recognize its current state of flux, we now need to concentrate on understanding its future. *Endless Frontier, Limited Resources* hints at such a future, in which we will have to make choices, set priorities, and, above all, prepare for continuous change. Partnerships are just one way to deal with such change. Though they have been explored for about a decade, we should continue and enhance the use of industry, government, and academic partnerships. We also do not need new and narrower classifications such as "strategic research." We must stress to the public, the Administration, and especially to Congress the interdependence of the sciences and technology, as well as that of basic and applied research, so that future use of funds will not be constrained by dividing lines that have always been more political than real. The previous linear model of R&D has been replaced by more complex models, because today's research, design, manufacturing, and marketing processes occur interactively and without clear boundaries between areas. Our policies and organizations in industry, government, and academic institutions need to reflect this new reality.

Erich Bloch

The author is a Distinguished Fellow at the Council on Competitiveness in Washington, DC, and Distinguished Visiting Professor at George Mason University in Fairfax, VA.