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EDITORIAL

Global Competition

Uncertainty abounds concerning future U.S. federal support of science and technology. One certainty is that global industrial competition will be one of the major considerations when setting policies. Excellence in technology is a necessary condition for that competitiveness. In meeting the challenges of the Cold War, U.S. technology and its interaction with the procurement needs of the military forces were excellent. But will a system that was created to meet defense needs function well in a global civilian economy? Most of the huge federal expenditures for research and development (R&D) have been devoted to government missions in defense and space. The government has been the market for items procured for those objectives. Federal procurement usually proceeds at a cautious bureaucratic pace involving rigid, slowly changing specifications. On the other hand, the global commercial marketplace is fast moving and highly competitive.

Correspondingly, technology must evolve. But excellent technology alone will not guarantee success. This is emphasized in a book edited by Lewis M. Branscomb:*

> A leadership position in a technology, however exciting and important, does not, of itself, assure prosperity, a strong defense, or a clean environment. First, technologies must be mastered, reduced to practice, supported by cost-effective production processes, and introduced to the market. Then that market position must be sustained by appropriate complementary assets, by effective channels of distribution, and by responsive customer service. Even that, however, is not enough, for many innovating products have found strong initial markets, only to see other firms—sometimes in other nations—capture the lion's share of market growth through incremental functional improvements, cost reductions, quality superiority, and better marketing and service....

If the United States is to compete globally, private enterprise must have a key role. Many companies have shown eagerness for transfer of technology from government laboratories. The 700 government-funded research and engineering laboratories have valuable R&D capabilities. Many are now seeking new missions. Among them are the three major nuclear weapons laboratories: Lawrence Livermore, Los Alamos, and Sandia. Each employs a staff of about 8000 and has a budget of about a billion dollars. These laboratories necessarily fostered a culture where secrecy was preeminent. They were provided with virtually unlimited facilities of computers and other equipment. They developed great competence in technologies and teamwork needed to achieve large-scale goals. What is their future? In a world in which fanaticism and savagery abound, this country would be foolish to destroy them. However, some down-sizing of military R&D seems indicated.

The Clinton Administration has proposed that the Department of Energy (DOE) accelerate transfer of technology from its laboratories to industry. The potential already exists. During the 1980s Congress created a mechanism called the Cooperative Research and Development Agreement. This enables federal laboratories to cooperate with companies, with the latter providing part of the support. Will the DOE laboratories make significant contributions to the civilian economy? Much will depend on the quality of leadership provided by Secretary of DOE Hazel R. O'Leary. She was impressive at a recent congressional hearing.

Among the 700 government-funded laboratories, the need to improve the intensity of transfer of technology is variable. The National Institutes of Health (NIH) has interacted very well with medical schools to transfer new knowledge to them and thus to improve medical technology and practice. The continuing evolution of biotechnology owes much to work conducted at NIH or by its grantees. Beyond that is a universal desire for improved health and the tendency of the media to feature stories about biomedical discoveries.

What will be the future roles of the research universities? Their direct participation in global competitiveness is likely to be limited. But they fill an essential role in educating scientists and engineers. Some of them may make a useful contribution by participating in extension services to small or medium-sized companies.

The matters discussed above and many others are covered in good detail in the book edited by Branscomb. He brings to a discussion of technology a rich fund of experience.

Philip H. Abelson

*L. M. Branscomb, Ed., *Empowering Technology: Implementing a U.S. Strategy* (MIT Press, Cambridge, MA, 1993).