

Prof. Dr. Arthur Bienenstock

A fundamental dilemma is evident when nations consider planning research for the future. There is broad recognition that research can contribute very significantly to meeting societal goals. With planning, this process can be accelerated, yielding great benefits.

On the other hand, there is also broad recognition that no government bodies, no matter how wise and knowledgeable, can predict the important discoveries of a healthy scientific community. These unanticipated discoveries may have enormous positive, but unplanned, impacts on society. The laser is one example.

Recognizing this dilemma, the United States pursues what I'll call a hybrid approach in which many different government agencies fund research. Some of these, like the National Science Foundation (NSF) and the National Institutes of Health (NIH), primarily support unplanned, scientist-initiated, basic research. Other agencies support research as part of a broader societal mission. These include the Departments of Commerce, Defense, Energy, Health and Human Services, and Justice as well as the National Aeronautics and Space Agency. Within these agencies, there is considerable planning of research in order to achieve their missions. In addition, however, there is usually significant funding of mission-related, scientist-initiated, basic research.

When special opportunities or needs arise, these various agencies work together in their planning. Such interagency coordination is often led by the White House Office of Science and Technology Policy, working with the Office of Management and Budget. Examples of such multiagency programs are the U.S. Information Technology and Nanotechnology Initiatives.

The funding of basic research by many different agencies with different missions has an important effect that is not broadly recognized outside the U.S. The peer review processes employed by NSF and NIH may deter funding of high risk-high payoff research. Often, however, an agency recognizes that a high risk program, if successful, could benefit its mission markedly and funds the program. The Department of Defense's Advanced Research Projects Agency, for example, has funded many important advances in this manner, such as the ARPA-net, voice-to-text and computer translation programs, superalloys and carbon-based composites.

President Obama has supported this hybrid approach strongly, as evidenced by examples from his proposed fiscal year 2012 budget. He urges a 13% increase in the National Science Foundation appropriation, which would take it to \$7.767 billion. At the same time, as described by OSTP, he emphasizes support of "...research into and development of clean energy sources, including \$550 million for DOE's Advanced Research Projects Agency-Energy (ARPA-E) and sufficient support to double the number of Energy Innovation Hubs from three to six to further catalyze synergies between industry and academia."