8 The Need for a Balanced Science Policy

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This chapter discusses the necessity of a balanced science and technology policy. I will outline this proposition in three steps. First, what is the right mix in funding our nation's science portfolio? There seems to be a growing disconnect between funding in the physical sciences and funding in the life sciences. Second, if we know a reasonable mix, then what is a reasonable funding level? Should not Congress, the holder of the purse, ask itself to explain more thoroughly to the American public why we seek to "double" the budgets of certain agencies? Third, given that we know how to frame the first two issues, who is going to advise Congress and the executive branch on the above decisions?

What Is the Right Funding Mix for Our Science Portfolio?

President Bush announced that he would continue the trend to double the budget of the National Institutes of Health (NIH) from the 1998 level of $13.6 billion to $27 billion in 2003. For FY 2002, the President will increase NIH's budget by $2.7 billion, or roughly 13.6 percent. Such an effort is admirable and essential to the health of our citizens. For example, these increases will double the funding for the Office of Research on Women's Health. The new National Institute of Minority Health and Health Disparities would receive a 20 percent increase to $158 million. The new Institute for Biomedical Imaging and Bioengineering would receive $40 million—up from $2 million just last year. But as Harold Varmus, the former director of NIH, noted some time ago, "Medical advances seem like wizardry. But pull back the curtain and there is a high energy physicist, a combinatorial chemist, or an engineer."

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The Institute for Biomedical Imaging is a perfect example of this statement. Its state-of-the-art medical equipment is designed by physicists, chemists, and engineers.

How did the other sciences fare in the President's 2002 budget? If you exclude the proposed defense increases, the nondefense sciences fell by three percent. Defense research and development (R&D), while receiving an eight percent or a $3.6 billion increase, would see its core basic R&D program rise by only about two percent. That two percent increase is comparable to the increase given to the National Science Foundation. The Department of Energy's (DOE's) Office of Science remained flat, but is actually considered a winner compared to DOE's overall energy supply R&D budget, which declines by 25 percent in 2002 and by 31 percent by 2006. But all the core basic physical science programs lose to inflation. These details indicate to me an imbalance in our nation's portfolio of science funding.

Some claim that U.S. industry is funding an increasing share of today's R&D. Hence, Congress needs to fund less R&D. These proponents cite National Science Foundation (NSF) statistics that indicate that industry funds 68 percent of the total U.S. R&D, or about $180 billion. These proponents claim that we should give R&D tax cuts to further stimulate funding by industry. I support R&D tax credits. But R&D credits stimulate only commercially focused research. Stimulating commercial R&D will only further deplete our pool of basic science. If we want commercially oriented research to flourish, it is imperative that we as a nation maintain the pool of basic science from which industry can draw upon.

This imbalance in our science portfolio is appearing in national trends. Between 1985 and 1995, the Council on Economic Competitiveness reported that the number of science and engineering degrees declined by four percent. In 1999, the National Science Foundation reports that for the first time in 14 years, the number of Ph.D.s in engineering and math declined by 8.5 percent. U.S. submissions to our prestigious physics journals declined to 25 percent while European and Asian submissions increased from 50 to 75 percent. These declines in our work force and intellectual property do not appear immediately. Over time they will erode our world leadership in nanoscience, chip design, advanced computing, bioinformatics and medical imaging. These are the physical sciences that Dr. Varmus would have us see by pulling back the curtain to reveal bioscience's supporting infrastructure.

What Is the Right Level for Funding Science?

What is the right level of funding? That is a hard question because the fundamental sciences are about innovation over the long term, even decades.

If we cannot answer this question, then where does our goal of "double the budget" come from? We are doubling the budget with NIH. Some of my Senate colleagues propose doubling for the National Science Foundation. I have co-sponsored R&D doubling bills in the Senate. I support doubling the budget for NSF and NIH. But I ask the question: What is the relationship between cause and effect? In other words, what does "doubling" give our nation?

I propose that we move one step beyond using the word doubling and define with more specificity the increases we need in a science agency's budget. It could be that certain science areas need more than doubling their budget to achieve their effect on our nation. Some may need less.

I would start this process of redefining doubling by asking ourselves what areas of science do we, the United States, want to lead the world in? These leadership roles should be in general areas such as electronic materials or proteomics. In my area of jurisdiction—energy policy—I would ask what amount of energy R&D funding could reasonably achieve a certain percentage reduction in energy consumption. Such a methodology is not unreasonable; it has been done before through the President's Council of Advisors on Science and Technology (PCAST). Indeed, the PCAST Energy Research and Development Panel, led by John Holdren of Harvard University, helped determine energy R&D funding levels that could reduce energy consumption by one-third in the year 2020. This PCAST study and its funding recommendations are the basis for the R&D authorizations in the Senate Democratic energy policy bill.

If we ask these questions and come up with reasonable answers, then Congress should fund science in a bipartisan long-term fashion.

Who Will Advise Us on the Above Science Policy Decisions?

The final question is the most important: Who is going to assist Congress and the President in making the above decisions?

The answer in the executive branch has been clear for many years now. This function has been exercised by the Office of Science and Technology Policy (OSTP). Over the last eight years, OSTP has developed or

sustained national initiatives on nanoscience, global warming, and information science. The leadership of a presidential science advisor helped maintain a White House commitment to these initiatives that facilitated interagency cooperation and provide a coherent long-term focus.

I am concerned that this capability has been eroded. As of today, President Bush has yet to announce the name of his presidential science advisor. By the corresponding date in most previous Administrations since the re-establishment of the Office in the 1970s, the President's choice for a science advisor was known. (President Jimmy Carter announced his intent to nominate Frank Press on March 18. President Ronald Reagan announced his intent to nominate George Keyworth on May 19. President George Bush announced his intent to nominate Allan Bromley on April 20. And President Bill Clinton announced his intent to nominate Jack Gibbons on January 2, early enough to allow Gibbons a significant role as Clinton formulated his first budget.)

It is not as if the new Administration has put issues with significant technical content on the back burner for later review. For example, the Administration highlighted its view that the arsenic drinking water standard was not based on sound science when they withdrew it earlier this year. But major policy shifts in climate change, national missile defense, and energy all were decided upon with little or no apparent input from the scientific and engineering community.

One striking example of how the lack of a science advisor has led to confusion in this Administration was the unexpected announcement in the President's budget blueprint that he was considering shifting NSF's astronomy research to the National Aeronautics and Space Administration, without the advise of a science advisor. The result is that now the National Academy of Sciences is convening panels to resolve this ill-informed suggestion, which is a costly use of taxpayers' money.

I strongly encourage the President to make filling this critical position a real priority.

Congress also needs help in obtaining high quality science advice and objective long-term assessments on science and technology. At one time we had an entity to do this in the legislative branch—the Office of Technology Assessment (OTA). OTA had a distinguished bipartisan and loyal congressional advisory board, evenly divided between Members of the Senate and the House. Six years after it was abolished, the OTA technology assessment report is still used by Members of Congress and staff.

Today, the effect of technology in our policy debate is even more pronounced. I believe that it is time for Congress to reexamine how to re-

establish some form of an OTA within the legislative branch. Three years ago, in the legislative branch appropriations bill, I offered a proposal to set up a scaled down version of the OTA. I do not believe that our only option is to reconstitute a 200-person staff organization, such as the OTA was at the time it was abolished in 1995. It could be a smaller, focused organization located in the legislative branch. But we Members of Congress are not fulfilling our oversight responsibilities in today's technology-dominant world if we do not have the learned bipartisan advice of an entity such as the OTA.

I believe that these issues—our disciplinary mix of federal R&D funding, the overall level of federal R&D funding, and the mechanisms to ensure that both the President and Congress have the best in-house talent they can muster to understand both R&D budgets and the technical dimensions of broader policies—will be of crucial importance to the future of the scientific and technical enterprise in this country. They are issues on which I would like to work with the scientific and engineering community. To the extent that this community can make its voice heard, either through individual interactions with Members or through organizations like AAAS, we may be able to make real progress on these issues.