CHAPTER THREE

MAJOR FINDINGS AND ISSUES

The Board's findings are based on an intensive two-year study including review of the literature on Federal budget coordination and priority setting for science and engineering research, and invited presentations from and discussions with representatives of OMB, OSTP, the Federal R&D agencies, congressional staff, high level science officials from eight foreign governments, experts on data and methodologies, and industry, the National Academies, and academic spokespersons. Discussions focused on research priority setting as it is practiced within government organizations and suggestions on how the process might be improved. After considering this information, the Board finds that:

- Federal priority setting for research occurs at three levels:
  1) establishing Federal goals for research,
  2) the budget allocation processes for research within the White House and the Congress that in the aggregate produce the Federal research portfolio and
  3) Federal agencies and departments in achieving their missions and in accord with the President's priorities for research.

- The allocation of funds to national research goals is ultimately a political process that should be informed by the best scientific advice and data available.

- A strengthened process for research allocation decisions is needed. Such allocations are based now primarily on faith in future payoffs justified by past success, but are difficult to defend against alternative claims on the budget that promise concrete, more easily measured results and are supported by large and vocal constituencies.

- The pluralistic framework for Federal research is a positive aspect of the system and increases possibilities for funding high-risk, high-payoff research. An improved process for budget coordination and priority setting should build on strengths of the current system and focus on those weaknesses that can be addressed by improved data and broad-based scientific input representing scientific communities and interests across all sectors.

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- There is a need for regular evaluation of Federal investments as a portfolio for success in achieving Federal goals for research, to identify areas of weakness in national infrastructure for S&T, and to identify a well-defined set of the top priorities for major new research investments.

- Additional resources are needed to provide both Congress and the Executive Branch with data, analyses, and expert advice to inform their decisions on budget allocations for research.

APPROPRIATE SCIENTIFIC ADVICE

The scientific community can contribute to the Federal budget process as it now does within departments, agencies and programs, by providing:

- Reliable data and expert opinion on the most compelling major opportunities and needs for science and engineering, in the form of a well-defined set of top research priorities for substantial additional Federal investment;

- Effective processes for priority setting across fields of science and engineering, including multidisciplinary research and emerging areas;

- Estimated costs and benefits of various proposals, as well as overall funding levels, as input to decisions;

- Consensus across broad fields of research on the highest shared priorities for advancing Federal goals for science and technology—through mechanisms of Federal agency advisory bodies, expert scientific staff, the National Academies, and private and non-profit organizations of the research and education communities—to inform Federal allocation decisions.

At the Federal level, advice on priorities for major research facilities is an area for particular attention. Facilities costs must be estimated and include long-term commitments for operation and maintenance. In addition, consideration must be given to tradeoffs to enable funding for priority facilities.

Advice, analyses and data must be coordinated with the Executive Branch and congressional budget processes if they are to be useful for informing research budget allocation decisions.

IMPROVED DATA AND ANALYSIS

Allocation decisions should be informed by available data and should employ a range of methods of analysis and data sources. Over the long term there is a need for improvements in data, methods, and analyses that track Federal funds and measure the costs and benefits of research. Needs include:

- Improved theoretical understanding of the relationship between publicly supported research and innovation;

- Improved measures of economic returns to research investments, as well as non-economic returns in improved quality of life;

- Improved understanding of the relationship between research investments and the S&T workforce;

- Broadly acceptable definitions of "research" especially at the field level—though admittedly difficult to establish—to enable unambiguous, self-consistent tracking of Federal funds and benefits across departments, agencies and sectors;

- Improved data for international comparisons, including both relative and absolute measures; and

- Improved databases and other tools for tracking research funds and measuring outputs.

Toward an Enhanced Process

The analytical and expert support available to inform research budget decisions need to be strengthened in both the Congress and the White House. A primary resource that would provide immediate benefits to decision makers is a broad-based, continuous capability for expert advice to both OMB and Congress during the budget allocation process. A longer-term need is the regular, systematic evaluation of the effectiveness of Federal investments in achieving Federal goals for research through OSTP, drawing broad-based input from scientific experts and organizations in all sectors. Complementing both are improved data and analysis on research opportunities and needs that trace Federal research investments through the budget process and beyond.

Strengthening the Federal mechanisms to inform research budget allocation decisions in the White House would add an important dimension to current mechanisms for scientific advice, which feature agency- and department-based external and internal scientific input as part of their budget deliberations. It would require additional resources in OSTP. Additional resources might also be needed to strengthen Congressional mechanisms to inform research budget decisions. Furthermore, investments in data systems and academic research on the relationship between publicly funded research and economic and social benefits would enable improvements in methods for measuring and estimating returns on public investments. The payoff would be a more effective system for allocating Federal research funds to contribute to national goals, and improved tools for measuring and communicating the benefits of Federal investments to policy makers and the general public.