

## Introduction

### Forty-Five Years of National Science Board Involvement with Science and Engineering Data

On May 10, 1950, President Truman signed into law the act that created the National Science Foundation (NSF) “to promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense; and for other purposes.” According to the act, the Foundation would consist of a National Science Board and a director.

As amended, the act calls on the National Science Board to render to the President, every even-numbered year, a report, for submission to the Congress, on indicators of the state of science and engineering in the United States. It also specifies that one of the major functions of the NSF is “to provide a central clearing house for the collection, interpretation, and analysis of data on scientific and engineering resources and to provide a source of information for policy formulation by other agencies of the Federal Government.”

From the beginning, indeed even before the National Science Board and the National Science Foundation were established, a principal purpose envisioned for the organization was to provide the President and the Congress with objective, quantitative information on the status of the Nation’s science and engineering (S&E) resources as a basis for formulating science policy.

In September 1950, with the Korean War only 3 months old and threatening to expand, the Bureau of the Budget commissioned William T. Golden to conduct a study regarding the organizational needs of the United States for science and engineering policy and how the Nation might best mobilize its scientific resources for a possible protracted military conflict. In this advisory report to the President, Golden suggested that the NSF should conduct a number of assessments and surveys including:<sup>1</sup>

- ♦ a comprehensive review detailing the significant areas of basic research now being studied in the United States and showing these areas separately for research supported by universities, by industry, and by the government...and, to the extent practicable...cover work in process in friendly foreign countries and cover the major sciences including the social sciences...

- ♦ a comparable survey detailing the existing support for graduate and undergraduate education in the sciences by the many public and private agencies so engaged...
- ♦ a quantitative study of the scientific manpower resources of the United States. The categories would include scientific and technical specialties, as well as degrees of proficiency, years of experience, age brackets, and the like...
- ♦ a review of basic research activities of the Government agencies....

Many of these activities were incorporated into the NSF Act of 1950. Even before the Congress required it to do so, the Board developed the biennial *Science and Engineering Indicators* report series. The goal for the report was to describe major scientific advances and technological achievements, as well as gauge the contributions of science and technology (S&T) both to specific national goals and to the broad national welfare.

The post-Cold-War era has ushered in the need to reexamine national and international commitments, change priorities, and increase emphasis on accountability in the public sectors. Such change brings an increased need to understand and measure past trends and current levels of effort and capabilities in science and engineering in order to better set priorities and determine a wise course for the future.

### Serving Our Audience Better

It has been more than 2 decades since the National Science Board issued the first edition of the *Science and Engineering Indicators* report series. With each successive report, the Board has refined and improved the indicators presented. Coverage has expanded to include output as well as input indicators and some indicators of the impact and outcomes of science and engineering.

*Science and Engineering Indicators* is both a reference document and a policy document. The report now serves the needs of a wide audience, including decisionmakers in government, industry, academia, nonprofit organizations, and professional societies. *Indicators* data provide a useful benchmark for the efforts now underway to measure the performance of the Nation’s S&E enterprise.

One of the continuing objectives of the Board is to be relevant to its broad audience in the United States and abroad who have come to rely on comprehensive and objective indicators for assistance in fulfilling their responsibilities. One of the purposes and functions of the *Science and Engineering Indicators* reports is to identify and follow changes in the S&E enterprise and its compo-

<sup>1</sup>See *Impacts of the Early Cold War on the Formulation of U.S. Science Policy: Selected Memoranda of William T. Golden, October 1950–April 1951*, edited by William A. Blanpied, Washington, DC: American Association for the Advancement of Science, 1995.

nents over time, and thereby to reveal strengths and potential problems. Additionally, as new issues have emerged, the report has tried to develop related indicators to better understand these phenomena.

The National Science Board and the National Science Foundation, in cooperation with the Organisation for Economic Co-operation and Development (OECD), have continued to provide world leadership in expanding international S&T data coverage, improving S&T indicators worldwide, and enhancing international S&T data exchange. In addition to working bilaterally with numerous countries, cooperation has intensified with multinational organizations, including the European Union (EU), the Asia-Pacific Economic Cooperation (APEC), the Pacific Economic Cooperation Council (PECC), the Organization of American States (OAS), and the North American Free Trade Agreement (NAFTA).

One of the continuing objectives of the Board is to enhance the worldwide dissemination of the data and analysis to those who have come to rely on comprehensive and objective indicators. Thus, the *Science and Engineering Indicators* report is now being made available on the World Wide Web, under the NSF home page or directly using the address <http://www.nsf.gov/sbe/srs/stats.htm>.

### New Developments in this Report

As noted above, the Board has continuously improved and updated *Science and Engineering Indicators* by expanding its coverage, refining the methodologies, and making changes in the presentation and analyses of the indicators.

An important addition in the current report is the inclusion of an exploratory chapter that seeks to explain and provide examples of how S&E research has affected the economy and society. It summarizes some of the major research on economic returns to R&D and finds that while there are differences in the estimates of the S&E contributions (depending on the specific area of the economy and the scientific enterprise examined), researchers in the field agree that R&D investments

have significant positive effects on economic growth and the overall standard of living. Less research has been done on the impacts of S&E research on other aspects of the quality of life. Indeed, even the concept of quality of life is not well understood. As research in these various fields progresses, it may be possible to develop and elaborate new approaches, methodologies, and indicators in this area of endeavor in future reports.

The report also presents a number of new indicators highlighting developing issues and trends. The overview offers a more comprehensive summary, but some of the new topics covered in this report are worth highlighting here:

- ♦ The report provides new data on information industries and technologies and demonstrates that computer availability and usage in the home, industry, and academia is widespread and increasing.
- ♦ Another recent trend documented in the report is the increasing importance of the service sector to science and technology worldwide.
- ♦ The report provides increased international coverage not only of the G-7 countries, but also of the newly industrialized economies, such as South Korea, Taiwan, and Singapore.
- ♦ It also presents new and expanded indicators documenting intensified international interaction and globalization of science and technology and showing the United States as a central focus of much of the international S&E collaboration.

The Nation's science priorities have changed over the past 45 years, but there is widespread consensus in the Congress and in the Administration over the need to support basic research. The National Science Board hopes that *Science & Engineering Indicators—1996* will be useful to policymakers in the public and private sector as they decide on investments, set priorities, and assess performance in order to make the most effective use of our S&E capabilities.