UPDATING VANNEVAR BUSH: ACADEMY PANEL CALLS FOR NEW STRATEGY FOR SCIENCE

Nearly 50 years after Franklin Roosevelt asked Vannevar Bush to create the canon law of scientific research for the "peaceful" era after World War II, a prestigious committee representing the National Academy of Sciences, the National Academy of Engineering and the Institute of Medicine has issued on its own initiative a revision of Bush's testament that would, in the group's own words, "recast the framework in which the US research and development system functions." The result is a fluent 54-page document with the flaccid title of "Science, Technology and the Federal Government: National Goals for a New Era." The title aside, it argues the case for continued Federal support of R&D as forcefully as Bush did in his *Science—The Endless Frontier*.

Following FDR's death, Bush delivered his report to President Truman in 1945. More than any other factor, it changed the government's uncertain relationship to basic research at that time. Prior to World War II the US could label only a smattering of fundamental science as "Made in America." Most basic science had come to US shores, along with many scientists and engineers, from Western Europe. Notwithstanding, American industry was able to boast of its own ingenious inventions and its entrepreneurial spirit. The country had plenty of inexpensive raw materials, several homegrown techniques for assembly line production and, perhaps best of all, rapidly expanding domestic markets. Still, it was Bush, director of Washington's wartime Office of Scientific Research and Development and an MIT electrical engineer, who gave meaning in his report to the interconnections between science research and the national objectives of military strength, industrial growth and a better quality of life. Bush also defined the rationale for the government's support of research at universities as the surest way to enlarge the supply of scientific and technical talent. Once implemented, Bush's plan was the foundation that assured the US would attain world leadership in research and technology, earn a disproportionate share of Nobel Prizes and also emerge the winner of the cold war.

The academies' new report was prepared by the Committee on Science, Engineering and Public Policy and released to the news media at a lunch on 21 June. It is an ambitious attempt to update the Bush document. The report was presented to Congress the next day at a hearing of the Senate Subcommittee on Science, Technology and Space. As explained by COSEPUP's chairman, Phillip A. Griffiths, director of the Institute for Advanced Study in Princeton, the purpose of the report was "to reconcile and rationalize the government's role in scientific research and technology." In fact, said Griffiths, "we seek to shift the debate over science and technology away from absolute levels of resources to performance in support of broader national objectives."

Courageous convictions

Unlike many panels of scientists and engineers proposing new strategies, COSEPUP does not appeal for bigger Federal R&D budgets, which now total about $75 billion per year. Instead, committee members are courageous enough to state that the challenges confronting US science and technology now and into the 21st century have little to do with larger outlays. The real issue, as COSEPUP sees it, is how to make better use of the country's existing leadership in world science to improve the country's technological capabilities and, as a result, to strengthen the economy and ensure the well-being of people.

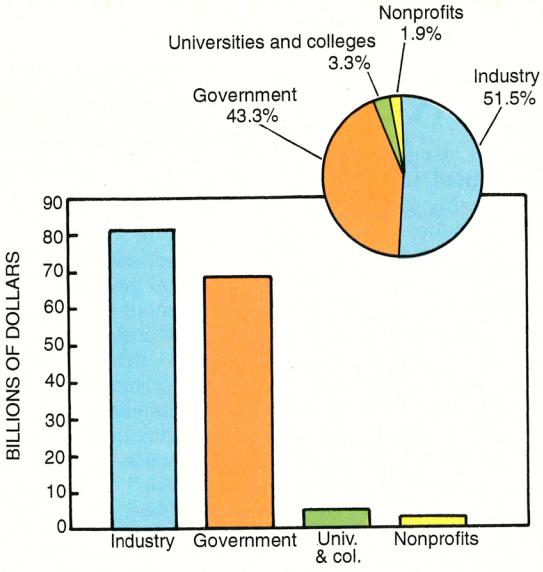
This same issue came up during last year's debate on Federal budget allocations for the National Science Foundation. In particular, two influential members of Congress—namely, Barbara Mikulski, the Maryland Democrat who heads the Senate Appropriations subcommittee that oversees NSF, and George E. Brown Jr, the California Democrat who chairs the House Committee on Science, Space and Technology—argued that research supported by Federal dollars needed to be more closely relevant to social and economic needs and more readily adaptable for technology transfer. (See PHYSICS TODAY, October 1992, page 107; November 1992, page 75; December 1992, page 70.)

COSEPUP's response to these critics appears up front in the report's preface: It "proposes a renewed and strengthened covenant between science, technology and society." The committee says public support of science and technology is justified by the eventual improvements in the quality of life and contends that the principal purpose of technology is to transform scientific discoveries into wealth-generating commercial products and services. COSEPUP says the "nation's economic performance and security depend on . . . a renewed partnership between science, technology and the Federal government [to] quicken the movement of ideas from the laboratory and foster the use of new technologies throughout the economy. The government, with its overarching responsibilities for planning, budgeting and review, is uniquely suited to promote—though not manage—the process."

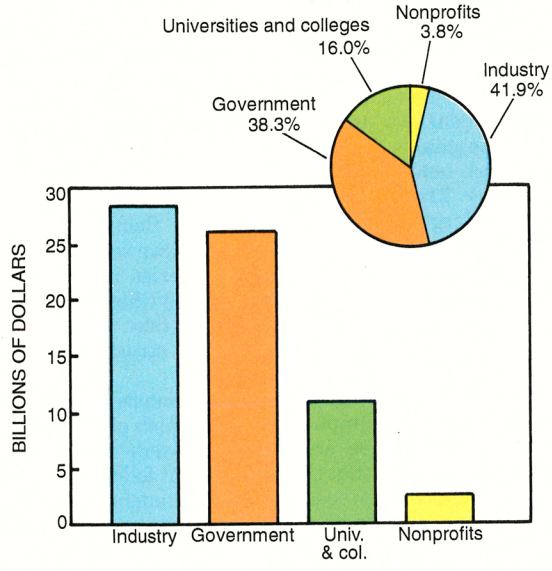
But as Frank Press, the outgoing president of NAS, told members of the Senate subcommittee, "The current process for allocating R&D funds is complex and chaotic." COSEPUP's solution is forthright: The US should be among the world leaders in all significant fields of science and clearly ahead in several of those fields likely to contribute substantially to such national objectives as economic growth, public health, environmental protection, military security and intellectual progress. Being world-class would allow American science to participate in discoveries and developments occurring anywhere and would enable industry to take advantage of new technologies struggling to be born.

To determine which fields should be emphasized and which ones need not be world-class, COSEPUP recommends that the government follow a rigorous procedure: Independent panels of leading scientists—some from inside the field under examination, some from outide and others from abroad—would compare each field with its counterparts in major countries. Each panel would use more or less objective measures, such as journal papers, citation indices and research equipment, along with judgments about the most exciting and promising ideas and whether the field is attracting talented students.

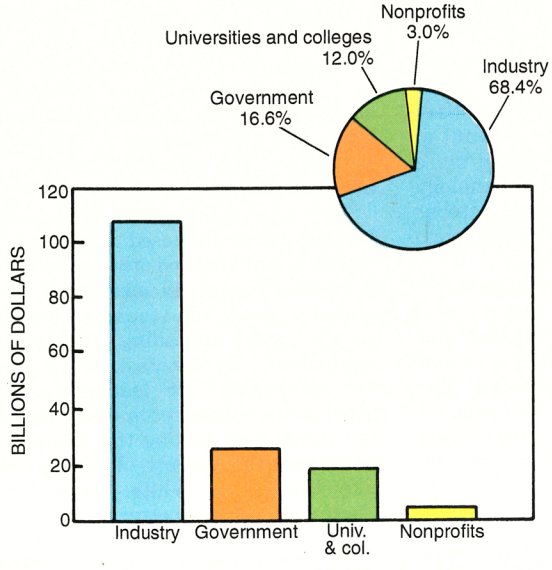
Thus if a panel concludes that US leadership in condensed matter physics has slipped behind other countries, it could recommend increasing support for graduate students, for instance, and upgrading laboratory equipment. By contrast, for a field not marked for US leadership, another panel might recommend reducing funds and moving the money to fields needing support. With ratings like these, the White House and Congress would be better informed to make budgetary decisions.



Total R&D expenditures in 1992 shows industry funded more than half, worth about $80 billion, mostly for development work. Government outlays went mainly to national and industrial labs and colleges and universities. Included in university and college funds are allocations provided by states and localities budgeted specifically for R&D.



Federal R&D outlays in 1992 were directed mainly to corporate labs, which worked principally for mission agencies like the Defense Department, NASA and the National Institutes of Health, and to Federally owned laboratories managed either by the government or by contractors. Colleges and universities accounted for 16% of Federal R&D or about $12 billion.



R&D performance, determined by combining corporate and Federal support, indicates that industry accounted for 68.4%, or some $108 billion, in 1992. Government labs, including those run by industry, universities and colleges and other nonprofit organizations, are secondary performers of R&D, with 16.6% of the total. (Source: National Science Foundation)

In fields of technology, COSEPUP also urged the government to ask the experts to make comparisons with applications and developments in other countries. The academy has some experience with this process, having issued reports on advanced materials and microelectronics that made such evaluations.

In a section of the COSEPUP report on technology goals, the committee concludes that "present conditions warrant a reexamination of the Federal government's policies toward technology development and adoption." It proposes that the government "adopt the goal of maintaining a leadership position in those technologies that promise to have a major and continuing impact on broad areas of industrial and economic performance. These technologies should be in areas where US firms have demonstrated their ability to convert technology into marketable products or should be based on national strategic considerations." The report is somewhat fuzzy in suggesting what the government ought to do to ensure world leadership in technologies. It speaks of "a new partnership between the Federal government and the private sector," incorporating "a responsiveness to market signals, stable support and long time horizons."

Though the report also speaks about entering a "new era" with the collapse of the Soviet Union, the end of the cold war and the start of a truly "global village" using electronic communications, it does not acknowledge the difficulty of being an identifiable world leader in science and technology. There is virtually no purely American R&D any more. A recent report by the NSF found that 28% of all full-time graduate science students and 48% of all full-time graduate engineering students in 1991 were foreign nationals—with about two-thirds of them from Asia. More than one-third of them expect to return to their own countries when they get their degrees.

What's more, many of the US's largest corporations are global not only in the sense that they export their products but also in that they have research, design and manufacturing facilities, subsidiaries and suppliers abroad. In addition, foreign firms such as Philips Electronics NV, Glaxo Pharmaceuticals and NEC Corp have established research labs in the US. Strictly speaking, then, national science and technology may be a relic of the age that Vannevar Bush wrote about, not what COSEPUP would like to see happen.

—IRWIN GOODWIN ■

FRANCE AND GERMANY BRING NEW BLOOD TO RESEARCH MINISTRIES

Perhaps Matthias Wissmann would like to paraphrase US Senate Minority Leader Bob Dole, who once quipped, upon nomination of his wife Elizabeth to head the US Department of Transportation, that he regretted he had but one wife to give his nation's transportation infrastructure.

Wissmann, a legal expert named Germany's research minister just months ago (PHYSICS TODAY, April, page 51), now is taking over the transportation ministry in a cabinet reshuffling. Wissmann has been replaced at the Ministry of Research and Technology by 43-year-old Paul Krüger.

Wissmann was barely known in Germany's science communities when Chancellor Helmut Kohl picked him last winter to replace Heinz Riesenhuber as Minister of Research and Technology. Riesenhuber, a PhD industrial chemist who had served as research minister for ten years, was well respected if not deeply loved in the world of research.

Wissmann's successor, Krüger, is even more of an unknown quantity than Wissmann was. A native of East Germany, Krüger entered politics only a few years ago, and while his rise in the governing Christian Democratic Party has been meteoric, his only real qualifications for the research ministry would seem to be two years of service on the parliamentary science committee, an advanced degree in mechanical engineering and some experience as a software development manager.

In France, *plus ça change, plus c'est la même chose*—the more things are the same as in Germany, that is. The new French research minister, 38-year-old François Fillon, also is a relatively unknown politician who takes the place of a scientist who has been a big name in science policy, the physicist Hubert Curien.

Youth would seem to be the hallmark of the new French government, at least to judge from those positions bearing upon Europe, industrial policy and research. Alain Lamassoure, the minister of European affairs, is 48. Gerard Longuet, minister of industry, the postal service and communications, and foreign trade, is 46; Alain Madelin, minister of enterprise and economic development, is 43.

Fillon is a political scientist with a specialization in military policy who apparently had his eye on the defense ministry. But his views on defense—and perhaps Europe as well—were deemed too incompatible with those of President François Mitterrand for him to get such a senior cabinet position. (He favored a professional army and was considered a Euro-skeptic.)

The landslide victory of the conservative coalition over the socialists in France's national elections last March, which ushered in a second round of "cohabitation" in which a conservative parliamentary government has to share power with a Socialist president, contained many mysterious elements. The main victor, Jacques Chirac's neo-Gaullist party, has been split between pro- and anti-European factions, and so the results could be interpreted either as a repudiation of European unification or merely as a rejection of the way the Socialists were handling the integration process.

The selection of Eduard Balladur as

German–American Council

Acting at the initiative of Germany's Chancellor Helmut Kohl, Germany and the US are establishing a US–German Academic Council to further scientific and scholarly projects of mutual interest.

The principal emphasis of the council will be to promote interdisciplinary work in the humanities and social sciences, with the objective of rectifying what Kohl sees as decreasing mutual interest in the two countries. But the organization also will sponsor projects in the hard sciences, acting from a perception that traditionally strong ties between the two countries' scientific communities have deteriorated too.

Thus the council will support programs for outstanding young scientists in both countries, for example by organizing interdisciplinary meetings and establishing joint research projects. A program of meetings might build on the "Frontiers of Science" scheme initiated by Frank Press, the past president of the US National Academy of Sciences.

The German–American Academic Council will be funded initially by Germany's Ministry of Research and Technology while sources of money are identified in the US. The council's budget is to go from $2 million in 1993 to $6 million in 1996.

The council's establishment goes back to 1991, when Kohl and former President George Bush reached agreement in principle to set up such an institution; initial planning work was done in 1992 by the former German Research Minister Heinz Riesenhuber and by Bush's science adviser, D. Allan Bromley. Further work was done by a 12-member committee that included Press, Reimar Lüst, the former head of the European Space Agency who currently is president of the Alexander von Humboldt Foundation, and Henry H. Barschall, an emeritus physics professor at the University of Wisconsin.

The headquarters of the council will be in Bonn but a branch office will be maintained in Washington, DC. For more information, contact Reimar Lüst, President, Humboldt Foundation, Jean–Paul–Strasse 10–12, 5300 Bonn 2, Germany; (49-228) 833-0 (phone) or 833-199 (fax).