

request. The House criticized DOE for continuing to spend federal research dollars on technologies that already receive commercial funding. House lawmakers argued that the program should concentrate on more fundamental, peer-reviewed research. Energy conservation R&D was also hit, declining 3% to \$388 million. By contrast, nuclear energy R&D fared extremely well. It was favored with a 19.8% increase, to \$91 million, because of Congress's concern that the department had neglected nuclear energy as a source of abundant power that does

not contribute to atmospheric pollution.

Despite funding increases, DOE's defense programs are likely to be in turmoil in fiscal 2000 as they are reorganized into a new semi-autonomous agency within the department. Last summer, Republican lawmakers crafted legislation creating the National Nuclear Security Administration as a reaction to allegations that China had acquired data and other "secrets" on nuclear weapons from Los Alamos and perhaps other DOE labs.

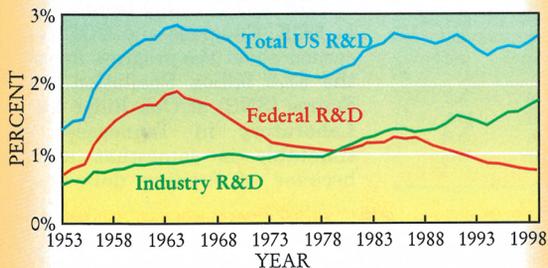
The concept of the NNSA originat-

ed with the President's Foreign Intelligence Advisory Board, which issued a report titled "Science at its Best, Security at its Worst." The board proposed that the weapons labs should be independent of DOE management—in effect returned to the status of the old Atomic Energy Commission. (See PHYSICS TODAY, August, page 49) On 5 October, Clinton signed the fiscal 2000 Defense Authorization Act, which established the new agency. At the same time, he directed Richardson to assume all the duties of the NNSA administrator, who was to

## WASHINGTON BRIEFINGS

**R&D Fuels US Economic Miracle in 1990s.** If the past decade has had a single theme, it has been the transformation of the US economy. The nation's high-tech companies engaged in computers, communications, biotechnology, and pharmaceuticals have set the pace through innovations generated by corporate behemoths such as IBM, Intel, Lucent, and Hewlett-Packard, just to name a few physics-oriented firms, as well as swarms of "dot-com" start-ups that have invested intensively in R&D. Revolutionary technologies and services have driven up the gross domestic product to the highest level since the race-to-the-Moon boom of the 1960s.

### Not All R&D Spending is Rising With GDP



Source: NSF, *National Patterns of R&D Resources*, 1998.

The relationship between investment in R&D and the rise of the GDP is apparent in a new National Science Foundation data brief (NSF 99-357, available on the Web at [www.nsf.gov/sbe/srs/stats.htm](http://www.nsf.gov/sbe/srs/stats.htm)). By NSF's current projections, R&D could account for 2.79% of the \$8.8 trillion GDP this year, up from 2.67% in 1998 and 2.61% in the previous year. The 1999 estimate for R&D's fraction of the GDP is the highest since 1967's 2.80% and continues an upturn that began in 1994 after a three-year downturn—a decline that prompted dire warnings of a loss of US leadership in technological products, productivity, and profitability to Japan and other countries.

Of the projected \$247 billion likely to be spent on R&D by American firms in 1999, \$40.2 billion (or 15.3%) is expected to go to basic research, \$56.5 billion (22.9%) to applied research, and \$150.3 billion (60.9%) to development. In comparison with 1998, R&D this year could achieve a 5.1% real increase (adjusted for inflation) in basic research, a 7.5% boost in applied research, and a 7.6% spike in development.

Since 1980, US corporate activity has accounted for the largest share of support for R&D, says the NSF report. Industry is projected to spend \$169.3 billion for R&D this year (or 68.5% of the nation's total R&D expenditure), a 10.3% increase in real terms over the preliminary 1998 level. Of these funds, nearly all are being spent for R&D performed by

industry itself, and the remainder is going for research at universities and other nonprofit organizations.

According to the NSF report, federal R&D funds in 1999 are expected to total \$65.9 billion, a figure that would be virtually unchanged in real terms from 1998. The federal fraction of support for the nation's R&D enterprise first fell below 50% in 1979 and hovered between 45% and 50% until 1988, plunging from 44.9% that year to a dismal 26.7% this year—the lowest it has ever been since NSF began keeping track in 1953. "The federal government is no longer the major benefactor of scientific research," says Craig Venter, president and chief scientific officer of Celera Genomics Systems, which is dedicated to sequencing the entire human genome by 2001. "It is now high tech and biotech that are on the trail of the Holy Grail."

Steven Payson, who gathers the R&D statistics at NSF, is confident that in 2000 the US will equal or exceed Japan's 2.92% of GDP invested in R&D in 1997 (the most recent year available). The US has already exceeded Germany's 2.3% and France's 2.31% (also based on 1997 R&D statistics). But Payson cautions that US totals include defense R&D. Non-defense R&D as a proportion of GDP was lower for the US than that of Japan or Germany in 1997, and, while Japan's outlays for defense have increased slightly in recent years, spending on defense-related research and technology has generally declined in the US and other Group of Seven countries in the 1990s.

**Fears Recede over Access to Research Data.** After months of fierce debate in academic scientific circles, the new regulations that many feared would make sensitive research data produced under federal grants available through the Freedom of Information Act (FOIA) turned out less alarming than expected. The regulations, published in the *Federal Register* by the White House Office of Management and Budget (OMB) on 8 October, respond to a two-sentence rider slipped into the massive omnibus appropriations bill for fiscal 1999 by Senator Richard Shelby. A conservative Alabama lawyer elected to the Senate in 1986 as a Democrat, who converted to a Republican in 1995, Shelby had amended the bill after a constituent complained that he couldn't find out the scientific basis for a directive issued by the Environmental Protection Agency.

Academic researchers contended that Shelby's amendment would lead to requests for data on incomplete work and possibly hamper the scientific process if scientists had to answer to criticism of preliminary or unreviewed findings. Requests under FOIA might also result in the loss of unpatented intellectual property, they argued. What's more, they said, recruiting participants for medical or behavioral science studies would be difficult if confidential information about them was available for public viewing. But advocates of the proposed law said it would give companies and the public the

have the title of under secretary of energy for nuclear security. The designation of Richardson has angered many legislators, both Republicans and Democrats. NNSA is authorized to begin operating on 1 March, and until then Congress and the administration are likely to continue grappling with the president's attempt to "end-run" Congress's intent for the agency.

▷ **NASA.** The final appropriations bill provides \$13.7 billion for fiscal 2000, just \$12 million, or 0.1%, less than the previous year. R&D was increased by

1% to \$9.8 billion. Legislators apparently robbed housing programs and the international space station to divert some money into space science, which had been shortchanged by both House and Senate bills. In September, the House had approved \$240 million less than the agency's \$2.1 billion request, and the Senate had cut the request by \$120 million. Both actions were loudly protested by White House and NASA officials, as well as by space scientists who sent letters and e-mail to their legislators, arguing for restoration of the budget request.

The science, aeronautics, and technology sector, which funds nearly all of the agency's R&D not related to the space station, received \$5.6 billion, a reduction of 0.8% from fiscal 1999, but \$182 million more than the request. The final bill has \$2.2 billion for space science, 3.1% more than 1999. But Congress reduced funding for future Discovery and Explorer missions, which is almost certain to result in fewer exploratory launches over the next few years and fewer missions to Mars than had been planned. **IRWIN GOODWIN**

right to inspect data used to underpin federal regulations. Such concerns appeared in some 12 000 public comments to OMB after the regulations were first proposed in April. The final version, which went into effect on 8 November, includes several concessions to scientists, who contributed the overwhelming majority of comments on the proposed regulations. To satisfy researchers, OMB narrowly defines data available under FOIA to include "recorded factual material commonly accepted in the scientific community as necessary to validate research findings."

Among the data exempted from FOIA requests: preliminary analyses, drafts of scientific papers, communications with colleagues, trade secrets, and personal and medical information. OMB's original proposal would have required researchers to hand over any data that supported or bore on federal policies and rules. The final revision restricts FOIA requests only to those data cited by a federal agency in an "action that has the force and effect of law." But the regulations still leave many kinds of research potentially open to public scrutiny. The final version, unlike the earlier one, accedes to Shelby's demand that the regulations should allow access to data behind all types of government action, not just rules set by federal agencies. It also removes the existing limitation on FOIA requests to projects expected to exceed \$100 million. Though the definition of research excludes personal and medical information, it allows researchers themselves to determine which data may be exempted on the grounds of confidentiality. In addition, the regulations, in the context of OMB's Circular-110, defines published research as research findings that have appeared in a peer-reviewed scientific or technical journal or that a federal agency publically and officially has cited in support of actions that have the force of law.

"We believe OMB has gone a long way in protecting the rights of researchers," said William Colglazier, executive officer of the National Academy of Sciences, which had vigorously opposed the use of FOIA to gain access to research data. Even so, some researchers remain concerned. In a recent report, the Association of American Universities, a Washington, DC, organization representing 59 leading US research universities, contended that the vagueness and imprecision of Shelby's statute may lead to extensive litigation. If this occurs (and it could take months or years for that to happen), it is relevant, the AAU report states, that OMB's general counsel is now apparently asserting that the legal effect of Shelby's amendment expired at the end of fiscal 1999 on 30 September.

Shelby disagrees with that interpretation and sticks by his original concept. In a statement issued by his office, Shelby declared the OMB regulations to be "a good first step. . . . If properly implemented by the agencies, this new provision will serve to enhance public accountability and provide a

higher level of transparency in government. This is a great victory for regulatory reform."

▶ **White House Defines Scientific Misconduct.** Science has a huge stake in the way the rest of society perceives its ethical standards. Past revelations of manipulating research results or of stealing ideas or data from other scientists have given all of science a black eye. The definition of scientific misconduct, and the handling of allegations of and investigations into such behavior, has long been a contentious issue among researchers, federal agencies, and the news media (see PHYSICS TODAY, April 1999, page 62). On 14 October, after more than three years of discussions, the White House Office of Science and Technology Policy (OSTP) issued a policy statement in the *Federal Register* that defines scientific misconduct as "fabrication, falsification, or plagiarism in proposing, performing, or reviewing research, or in reporting research results." OSTP's proposed definition and the accompanying guidelines, which emerged from lengthy deliberations by the National Science and Technology Council, a high-level group of government officials representing cabinet and agency heads, would replace a variety of definitions that have been adopted over the years by federal agencies. Publication in the *Federal Register* began a 60-day comment period, after which the final guidelines will come into force.

The definition and guidelines would extend the enforcement of misconduct beyond that of the federal agencies with the most experience in dealing with the problem—namely, the National Institutes of Health (NIH) and the National Science Foundation (NSF)—to other agencies that support research. The proposed policy, said Neal Lane, OSTP's director and President Clinton's science adviser, "provides needed consistency and clear guidance to the research community about the government's interest in the integrity of the research record." The 18 federal agencies that sponsor research have all agreed to the definition and guidelines.

For several years, NIH and NSF had included the phrase "other practices that seriously deviate from those that are commonly accepted in the scientific community" as part of their misconduct protocols. Deciding whether to include this phrase was the biggest stumbling block to reaching consensus on the new definition, according to Anne Eisenstadt, NSF's assistant general counsel. Despite the obvious vagueness of the phrase, NSF had argued in favor of the wording. The agency had invoked a similar clause in at least one case—to discipline a professor accused of sexually harassing several students. In the end, however, the phrase was dropped from the OSTP definition, though agencies and universities would still retain some flexibility to investigate and prosecute other transgressions of ethical scientific behavior.

**IRWIN GOODWIN ■**