

WASHINGTON REPORTS

Clinton Celebrates an 'Era of Unparalleled Promise' Powered by Technology and Driven by Science

No US president before him has used his "bully pulpit" to preach the virtues of science and technology to such effect as Bill Clinton. Of course, no other president has been able to attribute so much of the nation's prosperity to advances in science and technology. The first president elected after the end of the 40-year cold war, Clinton has had the good fortune to preside over the longest economic expansion in US history and to seize on science and technology as "grand challenges" to be explored. He emphasized those themes in two speeches in January: the first before the faculty and students at Caltech, and the second, just six days later, in his State of the Union message before Congress and, by television and the Internet, the American public.

At Caltech, Clinton received rousing applause when he revealed, two weeks before he delivered his budget to Congress, that he proposed to increase R&D funding for fiscal 2001 by \$2.8 billion. The increase would boost his 21st Century Research Fund, which embraces most civilian R&D programs, by 7%, to \$42.7 billion. If Congress accepts Clinton's largesse for R&D, the fund will increase biomedical research funding at the National Institutes of Health (NIH) by more than \$1 billion and give the National Science Foundation (NSF) an added \$675 million, or double the largest dollar increase the agency has received in its 50-year history. NSF's increase would amount to 17.3%, the biggest percentage request since President George Bush asked Congress for 18% in 1992, the final year of his presidency.

In effect, the fund would benefit researchers exploring everything from the Solar System and the gravitational "propagating ripples" in space that Albert Einstein predicted 84 years ago to the development of new materials with ten times the strength of steel, using a bottom-up approach, atom by atom and molecule by molecule.

In his 18-minute speech at Caltech, Clinton emphasized his administration's commitment to basic and applied research. His new budget, Clinton said, "makes research at our



AP PHOTO / NICK UT

CLINTON REACHES OUT for support of R&D, with Caltech's David Baltimore at left.

nation's universities a top priority. . . . University-based research provides the kind of fundamental insights that are the most important building blocks of any new technology or treatment. It also helps produce the next generation of scientists, engineers, and entrepreneurs. We're going to give university-based research a major lift."

Clinton also spoke about an issue that concerns many scientists—the lopsidedness of federal funding for NIH, whose annual budget is nearly \$18 billion, and for NSF, which funds about 50% of all academic researchers on a current budget of \$3.9 billion. "My budget supports increases not only in biomedical research, but also in all scientific and engineering disciplines," Clinton declared at Caltech. He recognized, he said, that advances in one field are often dependent on developments in other disciplines, and he cited advances in computer science that help develop medications more rapidly and in information technology that could shrink all the documents in the Library of Congress into a device the size of a sugar cube.

It so happens that NSF's director, Rita R. Colwell, discussed the funding disparity with news reporters while traveling with Clinton to California on Air Force One. "Scientists and

engineers throughout the country are going to be ecstatic on learning that we are now moving toward addressing what has become an imbalance between investment in biomedical research and the other fields of physics, chemistry, mathematics, biology, and the social sciences," she noted. The imbalance has prompted wide concerns that future discoveries and developments will lag without a sturdy foundation of fundamentals. "From basic research in the physical sciences comes magnetic resonance imaging and drug treatments tailored to an individual, based on metabolism and specific genetic traits, using molecular structure analysis," Colwell told reporters.

On the same plane ride, Neal Lane, the president's science adviser, discussed the two new initiatives that Clinton would unveil at Caltech—nanotechnology and information technology. Lane described nanotechnology as "the whole next generation in manufacturing and applications for a wide variety of societal needs. It's about miniaturization, from computing to medical diagnostics to environmental monitoring—almost anything you can think of that benefits from making things smaller, cheaper, with lower power requirements. Now, the federal government's investment is in basic, long-term research, where

Clinton's Last Hurrah for Physics-Related Science and Technology

	FY 2000 request	FY 2000 enacted (millions of dollars)	FY 2001 request	Percentage increase 2000-2001
Department of Energy	18.1	17.4	18.9	9.1
National Aeronautics and Space Administration	13.6	13.7	14.3	4.8
National Science Foundation	3.9	3.9	4.6	17.3

Information Technology R&D at Relevant Agencies

	FY 2000 current (millions of dollars)	FY 2001 request	Percentage increase 2000-2001
Department of Commerce	36	44	22
Department of Defense	224	350	56
Department of Energy	517	667	29
Environmental Protection Agency	4	4	0
Department of Health and Human Services	191	233	22
National Aeronautics and Space Administration	174	230	32
National Science Foundation	517	740	43
Total information technology	1663	2268	36

National Nanotechnology Initiative at Relevant Agencies

	FY 2000 current (millions of dollars)	FY 2001 request	Percentage increase 2000-2001
Department of Commerce	8	18	125
Department of Defense	70	110	57
Department of Energy	58	96	66
National Aeronautics and Space Administration	4	20	400
National Institutes of Health	32	36	13
National Science Foundation	97	217	124
Total nanotechnology	270	497	84

industry doesn't generally invest. Scientists and engineers have been anxious to do more research in this area. Industry needs the new knowledge and the new technologies. So we're excited about it, and the president is very excited about it." The second initiative, information technology, or IT, requires federal funds, said Lane, "to ensure that America is in the lead in information technology 10 years from now and 20 years from now."

Clinton was keen on delivering the speech. In it, he outlined parts of his ambitious agenda for his last year in the White House and sought to establish certain policy proposals that, even if Congress is too stingy to pay for them, would remain his legacy. Clinton was in the White House nearly three years before he delivered his first speech on science and technology at the 1995 National Medals of Science and Technology presentation (see PHYSICS TODAY, December 1995, page 57). Since then, he has spoken at the National Academy of Sciences, at an annual meeting of the American Association for the Advancement of Science, and at research universities.

When Clinton agreed to attend Democratic party fund-raising events in Los Angeles in January, his chief of staff, John Podesta, urged him to set aside an hour to speak on science and technology at a nearby university. Caltech was one of the possible choices. But before the itinerary was arranged for the trip, State Department officials asked Clinton to remain in Washington during what seemed to be promising peace talks between Israel and Syria. After those discussions broke off without an agreement,

Clinton's trip to Los Angeles was on again. Podesta approached David Baltimore, the Nobel Prizewinning microbiologist who is president of Caltech, to allow the president to speak at the university, and Baltimore quickly accepted the offer.

The speech itself was the result of a chaotic drafting process over two days and nights, involving Jeff Smith, Lane's intergovernmental affairs assistant at the Office of Science and Technology Policy, and Lowell Weiss, a Clinton wordsmith. It was still being written on the plane ride.

'Engine of economic growth'

In his speech, Clinton said he came to Caltech "to underscore in the clearest possible way that science and technology have become the engine of our economic growth. Consider the impact of information technology. Because of our early investments in developing the Internet, America now leads the world in information technology—an industry that accounts for one-third of our economic growth and generates jobs that pay almost 80% more than the average wage in the private sector." To make sure that the US continues to hold its world lead in the information age, Clinton said he would propose a 36% increase in funding for IT research.

Nearing the conclusion of his remarks, Clinton made a direct appeal to his audience: "For all the extraordinary promise of science and technology, we must never forget the weighty responsibilities that promise imposes on us. The same genetic revolution that can offer new hope to millions of Americans could also be used to

deny people health insurance or clone a human being. Information technology, which helps educate our children and provide telemedicine for rural communities, can also be used to create disturbingly detailed profiles of every move our citizens make on-line. . . .

"Just because we can do something doesn't mean that we should do it. It is incumbent upon us, both scientists and public servants, to ensure that science always serves humanity, never the other way around. For, as Albert Einstein said on this very campus nearly 70 years ago, 'Never forget this in the midst of your diagrams and equations. . . . Concern for man himself and his fate must always form the chief interest of all technical endeavors.'

"Today, as the first light falls on the new millennium, we see illuminated before us an era of unparalleled promise, fueled by curiosity, powered by technology, driven by science. Our restless quest to understand the unknown, a quest that has defined us as Americans since the first explorers set foot on this continent, will quicken. More than any other time in human history, the 21st century will be the century of discovery and science."

Clinton's State of the Union address also celebrated science and technology. Not surprisingly, his last message to Congress was zealous, exhausting (at 89 minutes), occasionally apologetic, and almost always highly effective in seizing the high ground of a legacy-defining agenda. He even managed to paraphrase Theodore Roosevelt when he said, "Tonight let us take our long look ahead—and set great goals for our nation."

The speech was characteristically expansive: "We will make America the safest country on Earth. We will pay off our national debt for the first time since 1835. We will bring prosperity to every American community. We will reverse the course of climate change and leave a safer, cleaner planet. America will lead the world toward shared peace and prosperity, and the far frontiers of science and technology. . . .

"We must also take the right steps toward reaching our great goals. First and foremost, we need a 21st century revolution in education, guided by our faith that every single child can learn. . . . In the new century, innovations in science and technology will be the key not only to the health of the environment, but to miraculous improvements in the quality of our lives and advances in the economy. Later this year, researchers will complete the first draft of the entire human genome, the very blueprint of life. It

is important for all our fellow Americans to recognize that federal tax dollars have funded much of this research, and that this and other wise investments in science are leading to a revolution in our ability to detect, treat, and prevent disease. . . .

"We ought to keep in mind, government-funded research brought supercomputers, the Internet, and communications satellites into being. Soon, researchers will bring us devices that can translate foreign languages as fast as you can talk; materials 10 times stronger than steel at a fraction of the weight; and—this is unbelievable to me—molecular computers the size of a tear drop with the power of today's fastest supercomputers."

At that point in the address, Clinton delivered a pitch to Congress for his R&D budget: "To accelerate the march of discovery across all the dis-

ciplines in science and technology, I ask you to support my recommendation of an unprecedented \$3 billion in the 21st Century Research Fund, the largest increase in civilian research in a generation. We owe it to our future."

The reaction on Capitol Hill was markedly different from the often scathing responses to Clinton's previous appeals for support of his programs and philosophy. "I am confident that together we can make fundamental research and development a real priority this year," declared James Sensenbrenner Jr, the Wisconsin Republican who chairs the House Science Committee, although he added that he hoped the budget priorities aren't "merely promises within the context of a larger spending spree." Representative Nick Smith, a Michigan Republican and chairman of the House basic research subcommit-

tee, said he found much to admire in both of Clinton's speeches on science and technology, and he would endorse the proposed initiatives as long as they are compatible "with other priorities, like strengthening Social Security, paying down the debt, and providing tax relief for working families."

Others threw such caution to the winds. Clinton's Caltech talk was "just fantastic," said Richard C. Atkinson, president of the University of California system and former director of NSF. "It means . . . more ideas from academic researchers that will transfer into the private sector and launch whole new industries like those in Silicon Valley." Wyatt R. Hume, an executive vice chancellor of UCLA, called the speech "right on target. It's a phenomenally exciting time." **IRWIN GOODWIN**

WASHINGTON BRIEFINGS

► **R&D TAX CREDIT EXTENDED FIVE YEARS** After weeks of bickering and dickering, budget negotiators from Congress and the White House agreed just before midnight on 17 November to accept a muddled deal that wrapped up 5 of the 13 appropriations bills into one, thereby enabling the government to formally begin fiscal 2000 at last, six weeks late. But before the lawmakers could adjourn the first session of the 106th Congress, they needed to enact one more measure—the so-called tax extenders bill, which included, among a handful of tax breaks, the R&D credit.

The credit had expired at the end of June, and lobbyists for the nobility of America's corporations had been beating the drums for months that the R&D credit had to be extended. The big R&D spenders—the pharmaceutical, biotechnology, telecommunications, semiconductor, and computer companies—proposed that Congress would make the credit provision permanent in the US tax code, but if that wasn't possible the next best action would be a multi-year extension.

For more than a decade, the credit had avoided extinction from year to year. That, corporate lobbyists argued, led to uncertainties that inhibited companies from performing long-term research. For many firms, the credit covers about 20% of their R&D costs above a fixed average. The credit saves the companies about \$2 billion per year in taxes. The government, for its part, makes up much more than \$2 billion in taxes from company profits, high paying jobs, and increased sales.

So the extenders bill was passed overwhelmingly by the House on a vote of 418–2 on 18 November and the next day by the Senate, 95–1. It provides for a five-year extension, to 30 June 2004. But there's a hitch: Businesses cannot claim their credits until 1 October 2000, an act of creative budgeting in the House to make the measure more affordable to conservatives in Congress.

Even so, the government, as well as the entire country, is certain to benefit from greater R&D spending. Corporate spending on R&D is likely to increase to about \$187.2 billion this year, a 10.6% boost over 1999, according to the most recent annual forecast by Battelle Memorial Institute and *R&D* magazine. If the R&D spending estimates hold up, it will be the second year in a row that industry has exceeded 10%. Last year, corporate spending on R&D was figured to be \$169.3

billion, a 10.3% increase (adjusted for inflation) above 1998 (see *PHYSICS TODAY*, December 1999, page 48). American industry's higher R&D budgets continue a rebound that began in 1997, after several years of sluggish growth. By contrast, the federal government's funding of R&D has steadily declined, but is destined to rise in fiscal 2000 to \$66.4 billion, an increase amounting to less than 1% (after accounting for inflation).

► **IT'S RESCISSION TIME FOR FEDERAL AGENCIES** Since the days of the Nixon administration, the White House and Congress have squabbled over rescissions—a term meaning reductions in already allocated funding or already existing programs. In early January, the White House Office of Management and Budget (OMB) issued a complicated plan for carrying out the across-the-board cut that both sides agreed to impose on all federal agencies as a condition for enacting the Consolidated Appropriations Act for fiscal 2000. The reduction of 0.38% was negotiated in an eleventh-hour compromise crafted during the weekend before the massive appropriations bill was passed by the House on 17 November. The trade-off for Republican leaders was their grudging acceptance of some of President Clinton's priorities for education and the environment: funds for hiring 100 000 newly trained, highly qualified teachers over the next six years, for enlarging the Head Start and Gear Up programs to improve student preparedness, respectively, for grade school and college entry, and for a Lands Legacy that is intended to preserve and protect green swaths in local communities.

To make sure Clinton's initiatives didn't dip into the Social Security trust fund, Republicans had first proposed a 1% across-the-board reduction. But with stricter arithmetic applied to the programs, they settled for 0.38%, resulting in cuts totaling \$2.3 billion.

OMB's plan instructed the agencies on how to make the cuts and gave them some leeway in making the reductions. The appropriations act allowed OMB some discretion. So OMB declared that \$1.7 billion would be taken from general programs. About \$1 billion would come from mainly acquisition programs at the Pentagon, and \$478 million would be rescinded from selected congressional earmarks (more familiarly known as "pork") that the Clinton administration hadn't