Clinton's final budget proposes a hefty increase for basic research and tackles a growing imbalance between biomedical research and the rest of science. It's a far cry from his first year's budget

Balancing the Science Budget

The mood was bittersweet as Clinton Administration science policy bigwigs gathered on Monday to roll out the president's fiscal year 2001 R&D budget proposal—his last before leaving office. They had the happy job of presenting perhaps the strongest and most balanced basic research proposal in the Administration's history, one that asks Congress to boost civilian research spending by 7%, to nearly $43 billion, and to begin correcting a growing imbalance between biomedical research and less fashionable fields, from physics to mathematics. But their euphoria was tempered by regret among some basic science advocates that the Administration had waited so long.

A combination of factors—from a booming economy to new players at the White House and in Congress—appears to have produced the kind of R&D request that some scientists have been dreaming of since the former Arkansas governor moved into the Oval Office in 1993. Although the previous seven budget proposals had requested hefty increases for an array of R&D programs, many in the science community worried that those budgets too often had emphasized trendy topics over time-tested investments in nitty-gritty basic science. But this year the basics get a big boost, led by a 17% increase for the $3.9 billion National Science Foundation (NSF) (*Science*, 4 February, p. 778). The 2001 budget requests a 4.5% raise for the $17.9 billion National Institutes of Health (NIH) and a 3% raise, the first in years, for the $13.7 billion NASA. Military researchers, however, received a mixed message, with the Department of Defense proposing to boost basic research by 4%, to $1.2 billion, while slashing applied work by 8%, to $3.1 billion.

Unlike many earlier White House science proposals, the 2001 plan is expected to receive a relatively warm reception in the Republican-controlled Congress. "It's not a slam dunk by any means, but the sharp ideological differences" that crippled earlier proposals "seem to be softer now," says Jack Crowley, head of the Massachusetts Institute of Technology's (MIT's) office in Washington. "I've seen a growing bipartisan acknowledgement of the importance of balanced funding in the basic sciences."

Both parties, for instance, seem to agree on the need for greater support of information technology research, although they may disagree on the details of the White House's request for an additional $514 million. Similarly, there is bipartisan fascination with the "small is beautiful" approach underlying the Administration's $495 million nanotechnology initiative, which aims to build sugar cube–sized computers and other miniwonders. Such bipartisan backing could crumble amid the politicking of a presidential election year. But it is already apparent that the president's proposal culminates a shift—in both style and substance—in the Clinton White House's approach to R&D funding.

Indeed, the contrast between Clinton's first and last budget announcements is striking. When then-presidential science adviser Jack Gibbons unveiled the Administration's first R&D budget in 1993, he emphasized the need for applied research to help U.S. companies buffeted by increased foreign competition and the end of the Cold War. Indeed, Gibbons went out of his way at the time to insist that the Administration was not shortchanging basic science. "We aren't talking about taking resources from [basic sciences]," he said at a press conference, "but rather giving greater attention to ... assisting the transformation of science into things that provide us our jobs."

At other 1993 briefings, officials highlighted the need to bring

HIGHLIGHTS FROM CLINTON'S 2001 R&D REQUEST

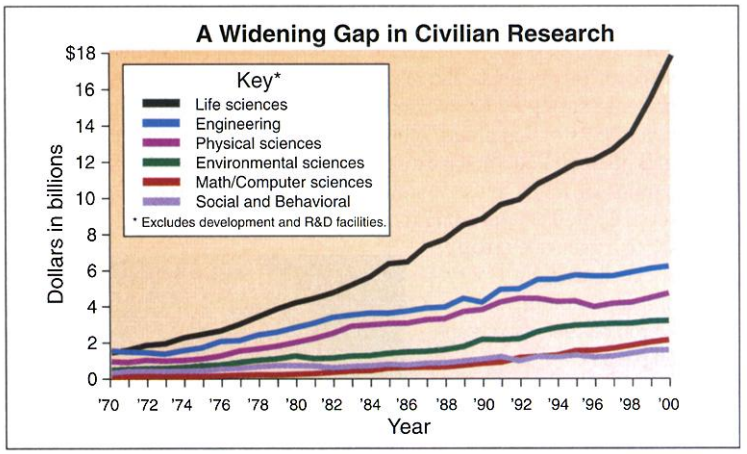
Agency	FY 2000 Spent (in millions of dollars)	2001 Request	% Change
National Institutes of Health	17,810	18,810	+6%
National Science Foundation	3,900	4,570	+17%
Research	2,960	3,540	+20%
Biocomplexity	50	136	+173%
Education	690	730	+5%
Department of Energy R&D	7,100	7,600	+8%
Office of Science	2,790	3,150	+12%
NASA	13,600	14,000	+3%
Space science	2,200	2,398	+9%
Earth science	1,440	1,410	NC
Life and microgravity research	275	302	+9%
Department of Defense R&D	38,719	38,640	NC
Basic research	1,167	1,217	+4%
Department of Commerce			
NIST	636	713	+12%
NOAA	2,413	2,902	+20%
Environmental Protection Agency			
R&D	536	530	–1%
Department of the Interior			
U.S. Geological Survey	813	895	+10%
Department of Agriculture			
National Research Initiative	119	150	+26%
Initiative for Future Agriculture	120	120	NC
Multiagency Research Initiatives			
Nanotechnology	270	495	+83%
Information Technology	309	823	+166%
Global change research	1,700	1,740	+2%
Total R&D	**$82,744**	**$85,333**	**+3%**

SOURCE: OMB, 2001 BUDGET

civilian and military science spending—long tilted in favor of defense—to parity. They also warned that U.S. scientists were falling behind their counterparts in Japan and Europe. "There was a lot of fear [then] of being overtaken in key technologies," says David Hart, a science policy scholar at Harvard University.

This year, in contrast, the focus is on "restoring the balance in the federal R&D portfolio," noted NSF's Rita Colwell. There was little talk of foreign economic threats or of the relative merits of civilian and defense science. And Neal Lane, the president's science adviser, apparently felt little need to defend the Administration's enthusiasm for basic science. "It's so clear from every study ... that the federal investment in science and technology is about as good an investment as you can possibly make," Lane said last month, as Clinton gave a preview of this year's R&D proposal at the California Institute of Technology (Caltech) in Pasadena (*Science*, 28 January, p. 558).

MIT's Crowley calls that speech "one of the most unprecedented and passionate presentations on science I have ever heard from an American president." Still, one Administration official labels the shift in R&D strategy as "mostly rhetorical." Indeed, White House budget statistics show that both basic and applied research funding have gone up significantly—52% and 32%, respectively—since Clinton's arrival. But they also show that defense and civilian R&D have essentially reached parity from a starting ratio of nearly 3 to 2 in favor of defense. "Times have changed,



Catching up. The 2001 budget would accelerate growth in nonmedical research.

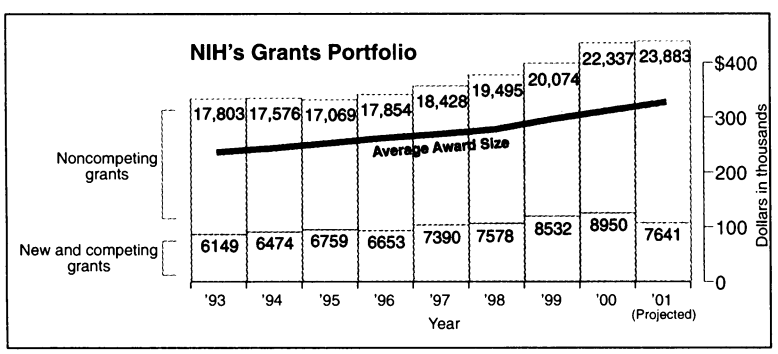
Plan to Reduce Number of New Grants Tempers Enthusiasm for NIH Budget Hike

The Administration's proposed 2001 budget for the National Institutes of Health (NIH) is receiving less than a standing ovation from biomedical lobbyists. But they admit that the 4.5% increase supports their campaign to double NIH's budget between 1999 and 2003, even if it doesn't come close to offering the 15% increase they want this year.

The budget request is "positive," says the Federation of American Societies for Experimental Biology (FASEB), an organization of 60,000 scientists based in Bethesda, Maryland, which acknowledges that it's much more generous than last year's offer by the president of an additional 2.1% that turned into 15% by the time Congress had finished its work. The White House says it wants to give NIH a $1 billion boost, to $18.8 billion, although nearly a quarter of that increase is money that NIH must pass along to other agencies. FASEB president David Kaufman, a pathologist at the University of North Carolina, Chapel Hill, calls the request the "largest dollar increase ever requested by a president," and Richard Knapp, government relations chief for the Association of American Medical Colleges (AAMC), sees this as a "good start."

Although FASEB and the AAMC liked the overall message, FASEB, at least, had "serious concerns" about the fine print. The main problem, according to Kaufman, is that the agency wants to reduce the number of new and competing grants to individual investigators, from 8950 this year to 7641 in 2001. In a prepared statement, Kaufman warned that this could "prove very discouraging to young investigators."

Acting NIH director Ruth Kirschstein defends the decision, saying that the total number of grants supported in 2001 would be the largest in NIH's history, topping 33,000. "NIH has built up a very large commitment base," she says, so the number of new grants must be reined in until the base stabilizes. Another problem is the sharp rise in the average cost of an NIH grant, from $227,000 in 1992 to a projected $327,800 in 2001. As one House appropriations committee staffer said, "We've reached a point where we have to have a $1 billion increase [in the NIH budget] every year just to stay even." To avoid a crunch, NIH managers plan to hold down annual increases in the size of new and continuing grants to no more than 2%.



Going down? NIH's 2001 budget would curb new grants.

While NIH is trying to apply the brakes to the cost of grants, its latest budget contains two major new initiatives—one at universities around the country, and the other on its Bethesda campus. Kirschstein confirmed that NIH is planning to spend $110 million in 2000 and is seeking $147 million next year to fund an interdisciplinary program to create academic centers of excellence in biocomputing, known as the Biomedical Information Science and Technology Initiative (BISTI). National Cancer Institute director Richard Klausner has already been working with the National Science Foundation to help set up new BISTI training centers. Meanwhile, six NIH institutes involved in brain research are joining forces to fund a new, 18,500-square-meter neuroscience lab on the NIH campus. This budget contains the first down payment of $73 million to plan a project whose total cost is still up in the air, Kirschstein says.

Congress begins the process of chewing over NIH's budget with a House hearing on 15 February, with lobbyists hoping that lawmakers will be as generous as in years past. Republicans and the White House have already agreed to raise mandated spending limits on the overall federal budget. That move is expected to allow NIH to spend $3 billion this year that Congress has previously delayed until 2001 in a maneuver designed to stay within those limits.

–ELIOT MARSHALL

SOURCES: (TOP TO BOTTOM) NSF; NIH

and we've changed with them," says the official. For instance, the 1994 Republican takeover of Congress, the arrival of an unexpectedly strong economy, and the recent appointments of Lane and White House Chief of Staff John Podesta have all changed the dynamics of the science funding debates, observers say. They also cite increased pressure from research groups concerned about stagnation in nonbiomedical research budgets (see graph on p. 953).

Back to basics. Clinton emphasizes long-term investments.

The fierce battles that followed Newt Gingrich's arrival as House Speaker in January 1995 "were highly distracting because it put [the White House] on the defensive," recalls an Administration official who worked in the Office of Science and Technology Policy at the time. "There was a lot less time to promote a science agenda." Indeed, some science policy watchers remember Clinton's 1995 State of the Union speech—whose only mention of science was a one-sentence attack on Congress for appropriating "$1 million to study stress in plants"—as a low point. "I spent way too much time ... answering indignant letters and e-mail from irate plant physiologists," remembers Rick Borchelt, a White House press aide at the time who now works on a NASA project to boost public literacy in science.

White House officials bounced back from that embarrassment, however, putting muscle behind initiatives ranging from global change to supercomputing and this year's darling, nanotechnology. Those efforts helped forge bipartisan working relationships with key pro-science Republicans, such as Senator Pete Domenici (NM), chair of the Senate Budget Committee, and Representative John Porter (IL), chair of a House Appropriations subcommittee that oversees the NIH budget. At the same time, lawmakers worried about the growing imbalance between spending on life sciences and that on other fields—including Senators Bill Frist (R–TN), Connie Mack (R–FL), and Jay Rockefeller (D–WV)—crossed party lines to sponsor several bills calling for a doubling of federal R&D spending in all areas. In 1997, the heads of 23 research societies—along with a few executives from high-tech industries—put their weight behind the concept, asking politicians to recognize the "interconnectedness" of scientific progress and to ensure that engineers, chemists, and other nonbiomedical researchers had the necessary resources. Today, Gingrich—a fellow at the American Enterprise Institute in Washington and an energetic campaigner for boosting basic research—says such developments "helped create an environment that was very bipartisan when it came to science."

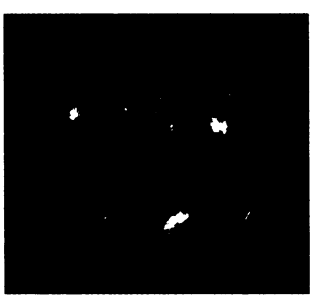
Such efforts, however, ran headlong into financial constraints, especially legislated budget caps designed to restrain federal spending and pay off the budget deficit. "The caps provided very little wiggle room for brash science initiatives," notes a Republican Senate aide. But a surprisingly strong economy—and an array of accounting tricks that allowed Congress to spend more than the caps allowed—opened the door to some unexpected research gains. In 1998 and 1999, to the delight of biomedical lobbyists, the big beneficiary was NIH, racking up $2 billion increases in both years.

NIH may be forced to share the wealth this time around. Armed with data showing the widening gap between the biomedical sciences and other disciplines, Lane, Colwell, and science society heads hit the streets last fall, reminding anyone who would listen of the need for "balance" in the federal R&D portfolio. One important ally, lobbyists say, was Podesta, who last year took the lead in criticizing congressional efforts to cut some science programs. His and Lane's fingerprints, outsiders say, are all over a speech that Clinton gave last December that signaled this year's focus on balance. "I would like to make this point very strongly, because it's one that I hope to make more progress on next year: It is very important that we have

Solar Missions Brighten NASA's Hopes For Space Science Research

This year, for a change, NASA gets to share in the budget wealth. The White House request for a $435 million increase, to $14.04 billion, marks the first time that the Clinton Administration has granted the space agency a significant increase.

Nearly half the boost—$206 million—would augment the current $2.2 billion for space science projects, including Mars exploration and a bevy of small missions. The centerpiece is a $20 million down payment on "Living With a Star," a sun research program that aims to use a flotilla of spacecraft to track solar storms and coronal mass ejections, which can interfere with communications and electric power grids. Some of the satellites would unfurl solar sails, using the solar wind for propulsion rather than chemical or nuclear sources. NASA space science chief Ed Weiler hopes to receive more than $500 million for the program over the next 5 years.



Hot science. New satellites will expand knowledge of the sun.

NASA is also seeking $78 million on top of this year's $248 million for Mars exploration. Part of the money would build a system of communications satellites that could help prevent a repeat of last year's devastating loss of two Mars spacecraft. And Weiler says he is open to a review of the entire Mars effort, including whether it is wise to focus primarily on a mission that would collect and return martian rock samples. "Maybe we shouldn't put all our eggs in that basket," he says.

The agency also is setting aside nearly $200 million—a $42 million boost—for the next series of Discovery micromissions chosen through peer review. And it will beef up work on instruments to detect life on other planets and moons. It also wants to restart work on missions devoted primarily to pushing technology rather than science. The effort, called "New Millennium," was deleted last year by the White House and Congress.

NASA is requesting 10% more for its $275 million life science program, with the increase spread equally between biomedical and microgravity research. But earth science funding would remain roughly flat at $1.4 billion, with the bulk of that money going for the Earth Observing System constellation of satellites.

At NASA's budget roll-out, Administrator Daniel Goldin emphasized ties between the agency and the National Science Foundation as well as with the academic community. A planned study of the agency's interaction with academia is intended to lead to greater participation by researchers in NASA projects.

–ANDREW LAWLER

CREDITS: (TOP TO BOTTOM) AP PHOTO/RICK BOWMER; SOHO/EIT 304Å CONSORTIUM/NASA

Up, Down, and Sideways: How Other Research Agencies Fared

Washington resembled a three-ring circus on 7 February as each agency put the best face on its 2001 budget request. Here are highlights from those presentations:

• **NSF:** The National Science Foundation's 17%, $675 million increase includes a 20% boost to its $3 billion research account and 5% more for education, although director Rita Colwell emphasized that the agency's total investment in people—students and teachers as well as researchers—would rise by 11%. NSF's new facilities account soars by 45%, to $139 million, led by $17 million to kick off a $75 million mobile seismic array and $12 million to begin a $93 million network of high-tech ecological observatories. But NSF declined to request anything for a $75 million high-altitude research plane despite a $6 million appropriation last year from Congress. Funding for biocomplexity jumps by 172%, to $136 million, and NSF's portion of the information technology initiative leaps 160%, to $326 million. (For a look at how NSF's budget request came about, see last week's issue, 4 February, p. 778).

• **Energy:** After a year of being battered by allegations of espionage at the national labs, Department of Energy (DOE) Secretary Bill Richardson said "it's time to return to science." The agency's $18.9 billion budget request includes an 8% boost, to $7.6 billion, for DOE's R&D programs. The core Office of Science would get a 12%, $337 million hike, to $3.2 billion, with basic research and computing programs getting the lion's share of the new riches. Biology, fusion, and physics research budgets would rise slightly. Richardson is also requesting $10 million for a Scientific Recruitment Initiative, saying that DOE will have to work harder to attract talent, as hiring at national laboratories has "suffered because of the espionage issue."

• **Environment:** "It's basically a stay-the-course budget" for the Environmental Protection Agency's Office of Research and Development, says ORD assistant administrator Norine Noonan. The 2001 request totals $530 million, $6 million below this year but an increase of $38 million after congressional earmarks are subtracted from the 2000 budget. The total includes a $5 million increase for research on the health effects of endocrine disrupters and a $7 million boost for epidemiological studies of soot's health effects. The office also wants to complete a report on the state of U.S. estuaries next year. The agency's extramural grants program would rise 13%, to $101 million.

• **Defense:** Military research advocates got mixed news from the Department of Defense, which has requested a 4% jump in basic research and an 8% reduction in applied studies. The basic research account would rise $50 million to $1.2 billion, with much of the increase devoted to biowarfare defense and cybersecurity initiatives. Applied research funding would shrink by $271 million to $3.1 billion. But if last year's pattern holds true, Congress probably won't go along with the overall cut, which would put the defense research budget 10% below its 1993 level.

• **Agriculture:** The department proposes growing its National Research Initiative by $31 million, to $150 million. The agency is also asking for $120 million for a second year of a separate extramural grants initiative for applied research (*Science*, 21 January, p. 402). But the congressional outlook is uncertain. House appropriators blocked new funds for the extramural grants program last year and may do it again. "We're going to try to ... convince them that it's an appropriate expenditure," says the agency's budget chief, Steve Dewhurst. And the Agricultural Research Service would get a $50 million boost to $956 million, including increases for research on everything from emerging diseases and invasive species to climate change and crop-based fuels.

• **USGS:** The U.S. Geological Survey's national mapping program would be the main beneficiary of a requested 10% increase, to $895 million. It hopes to add $29 million to the $127 million it will spend this year on the mapping effort, which collects and distributes data on everything from coastal wetlands to historical trends in urban growth. The survey is also asking for a $22 million boost for biological research, $2.6 million to buy 150 new seismographs for earthquake-prone San Francisco and other cities, and $4 million for new real-time stream gages for flood forecasting.

• **NOAA:** While its overall budget soars by 20%, the National Oceanic and Atmospheric Administration's research spending sticks closer to sea level, inching up just $5 million to $303 million. Overall, the agency is requesting $489 million more than last year, half of which would go toward marine sanctuaries and estuary reserves. Spending on climate and air-quality research would jump $25 million, with virtually all of that going to overhaul the agency's storm monitoring and reporting systems. Spending for research on the oceans and Great Lakes, however, dives by nearly $20 million.

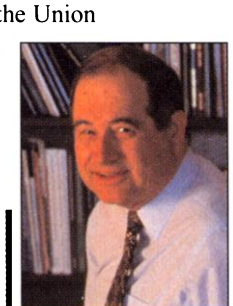
• **NIST:** The biggest chunk of the 12% increase for the $636 million National Institute of Standards and Technology, some $50 million, would establish an Institute for Information Infrastructure Protection to foster public-private partnerships aimed at keeping computer data secure. The agency's core science laboratories would also get a 20% boost, to $332 million. The Advanced Technology Program, long a target of Republicans, would rise by $33 million, to $175 million.

Reporting by Adrian Cho, Jocelyn Kaiser, David Malakoff, Jeffrey Mervis, Charles Seife, and Erik Stokstad.

a balanced research portfolio," Clinton said at the 3 December 1999 address on economic growth. Last month Clinton offered some details at Caltech, and a week later mentioned it in his State of the Union address—to bipartisan applause.

Indeed, the Administration has in some ways come full circle on R&D policy, says Harvard's Hart. "It's come around to emphasizing the conventional wisdom that drove R&D policy for a long time," he says, adding that basic research has traditionally drawn broader support from lawmakers than have applied programs that favor a particular industry or sector of the economy.

So far, the back-to-basics approach is drawing favorable reviews from science groups. And Gingrich says he is happy to see his one-time political opponent "finally get religion when it comes to science." Although current Republican congressional leaders have been noticeably gentle in their reactions to Clinton's proposals, their acquiescence doesn't necessarily mean the request will glide through Congress, notes MIT's Crowley. President George Bush, he recalls, tried to double NSF's budget over 5 years. "But that idea never got out of the blocks," he says.



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"Science and technology is about as good an investment as you can possibly make."

—Neal Lane

–DAVID MALAKOFF