THE FUTURE OF NIH
THE NUMBERS

NIH Prays for a Soft Landing After Its Doubling Ride Ends

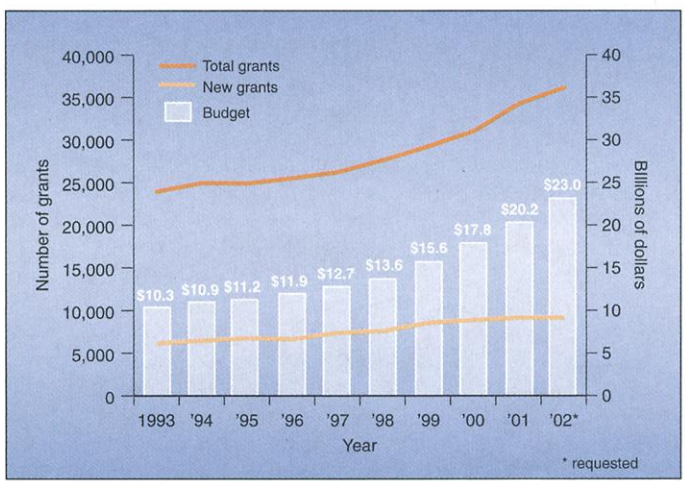
Why won't a $2.8 billion increase buy any more individual grants next year? The answer is keeping researchers and NIH officials up at night

For years the U.S. biomedical community has charted the well-being of its most important benefactor, the National Institutes of Health (NIH), with a single number—how many new and competing research grants the agency awards each year. The number is a proxy for the system's support of individual investigators, and a steady rise was long seen as the best way to ensure the future of academic biomedicine.

No longer. Next year, despite an expected $2.8 billion increase designed to keep NIH on track to double its budget to $27 billion in 2003, the number of competing awards is projected to remain exactly the same as this year (see graph). Ironically, the stagnation in new grants is occurring largely because NIH has already committed much of its new money to paying for more than 25,000 existing grants. The growing size of these grants is also adding to the strain (see graph), as is a rise in spending on "big biology," ranging from expensive equipment and new buildings to clinical trials and research collaborations that involve dozens of institutions and hundreds of scientists. Indeed, virtually every NIH interest group has shared in the doubling bonanza—from patient groups advocating more research on "their" disease to scientists urging greater spending on the agency's intramural program.

But the good times won't last forever. That reality has fueled speculation that the postdoubling years may include cuts in everything from the size and number of grants to clinical research to state-of-the-art lab equipment and databases. One ominous sign is preliminary Bush Administration budget plans that call for NIH to get annual budget increases of only 2% after 2003—a far cry from its recent 13% to 15% annual boosts. Another is the slumping economy, which is expected to trim surpluses by reducing government revenues. Then there's the massive tax cut recently approved by Congress, which will start to take its biggest bites just as NIH's budget growth slows.

"It's a very strange time," says Dave Moore of the Association of American Medical Colleges in Washington, D.C. "We're in the midst of unparalleled success, but we're already worrying about what happens when it ends." Even if Congress provides larger than minimal increases, "the time is coming when we must decide which [projects] will not move forward," says cancer researcher Phil Sharp of the Massachusetts Institute of Technology in Cambridge, Massachusetts, who leads a National Cancer Institute (NCI) advisory panel. Adds Moore: "The math is inescapable."



Throttling back. NIH has increased grant size *(below, right)* and total awards but is holding steady the number of new grants despite budget growth *(above)*.

Officially, acting NIH director Ruth Kirschstein says the agency is ready for slower growth. Last month she appointed a special committee that she promises will work "very hard over the summer" on a plan to ease the pain of withdrawal from NIH's doubling habit. Privately, however, NIH insiders say that the planners face limited options, in large part because of spending commitments and policy decisions made years ago. Nearly 50% of the agency's $2.4 billion budget increase this year, for instance, is already committed to previously awarded grants—which run nearly 4 years on average (see sidebar on p. 1993).

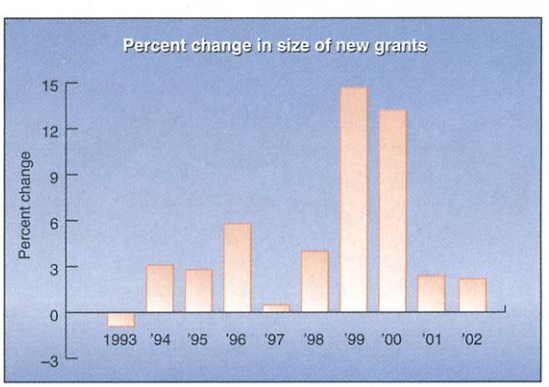
Still, the directors of NIH's 27 institutes and centers don't appear flustered. "We saw this coming and prepared for it from the beginning," says Anthony Fauci, head of the $2 billion National Institute of Allergy and Infectious Diseases (NIAID), the third-largest member of the NIH fleet. Some of the cost-containment strategies used by Fauci and other institute directors—from restraining the number of new grants to emphasizing one-shot spending on infrastructure—are certain to be featured moves in NIH's postdoubling dance.

But that doesn't mean they will be popular with rank-and-file scientists. Some NIH officials are bracing for the laborious task of explaining why, in the midst of apparent plenty, the agency is showing restraint in grantmaking. Exhibit No. 1 is holding the number of new grants steady at about 9150 in 2002 despite a proposed 14% budget increase. "We need to think about how we align the expectations of the grantees with what we think we can do," says Richard Klausner, head of the NCI.

Former NIH director Harold Varmus contributed to those expectations by predicting a few years ago—optimistically, in retrospect—that the number of new grants would reach 12,800 in 2003. Indeed, lowering the expectations of researchers "may be *the* challenge facing a new director," another senior NIH official predicts. One soothing thought: Under virtually any likely scenario, the postdoubling NIH will still be making more and larger grants than at any other time in its history.

Spending spree

Boom-and-bust cycles aren't new for NIH. In the 1980s and early 1990s, the agency had to reduce grants and trim



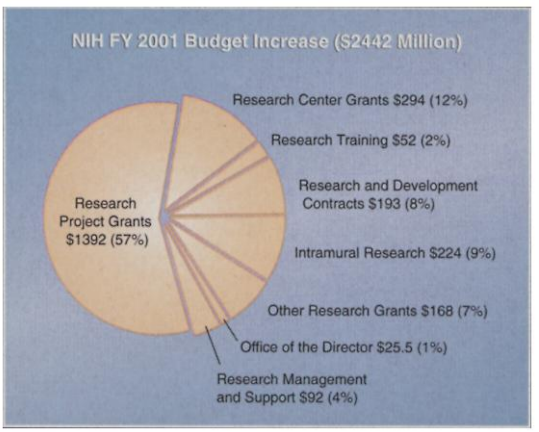
spending in response to slow-growing budgets, putting researchers on a financial roller coaster. But the current doubling sprint—the agency's budget historically has taken 7 to 9 years to double—has poured so much money into the system so quickly that it may have permanently altered the perceptions of re-

SOURCE: NIH

NIH Stays the Course in Choosing How To Spend Its Growing Budget

The National Institutes of Health (NIH) is in a groove—or a rut. Two recently released reports* examine how it has spent its huge annual budget increases, and what it would do with the rest of a projected $14 billion infusion over 5 years. The short answer: Its decisions largely mirror existing budget priorities. But a bigger budget has caused some management problems.

In particular, more than half of recent increases have gone to increasing the number and size of extramural grants (see pie chart). That is just fine with many researchers, who believe that allowing deserving academic scientists to follow their instincts is an idea that never goes out of style. "I would be disappointed to see [NIH] retreat from individual investigators ... or not sustain their purchasing power," says cancer researcher Phil Sharp of the Massachusetts Institute of Technology in Cambridge, who leads a National Cancer Institute advisory panel.



Big eaters. Grant seekers get the largest slice of NIH's 2001 budget increase—and of the agency's overall budget.

The big budget boosts have also allowed growth in NIH's other funding mechanisms, from R&D contracts to its intramural program. Although the reports don't detail exactly where the dollars flow, they do provide a laundry list of nearly 150 new and planned initiatives. Not surprisingly, many of the featured projects target diseases or issues that are both medically important and politically popular. In a bow toward drug control, for instance, one current initiative promises to fund efforts to warn physicians about the dangers associated with an increasingly popular "club drug" called gamma hydroxybutyrate (GHB) and to help toxicologists and pharmacologists study GHB's biological and behavioral effects. Others push to accelerate the development of vaccines against Alzheimer's disease and AIDS, or employ gene chips—which can tell researchers which genes are active in certain cells—to study the role of genes in everything from alcoholism to arthritis. Other projects focus on translating basic research into practical treatments. One set of clinical trials, for example, will test—often for the first time—the efficacy of different approaches to treating drug addiction, from counseling to medications. Another is developing a database that will help cancer investigators more quickly identify when candidate drugs are ready for clinical trials. One other promises to develop an artificial salivary gland—a tube filled with saliva-producing cells—that could be implanted in patients with swallowing problems.

Although biomedical research advocates say these and other projects are good investments, some worry that the growth may be taking a toll on NIH program managers. Institute directors report that frontline project managers are juggling more grants—sometimes hundreds at a time—and burning out more quickly. At the National Cancer Institute, for instance, the average grant manager now has less than 3 years of experience and turnover is approaching 20% per year.

But help may be coming. NIH wants money for more staff to manage the grants, and Congress, which in recent years has held down growth in this area, seems supportive of increases that would keep pace with NIH's expanding research portfolio. **–D.M.**

* "NIH FY 2001 Investments" and "NIH Investments, Progress, and Plans: FY 1999–2003." (Both are available at www.nih.gov/news/BudgetFY2002/index.htm)

searchers. It's certainly been a balm for such recurring sensitive issues as improving intramural research or tinkering with peer review. In 2002, for instance, NIH officials expect to fund a record 36,143 grants—up 34% from 1997, the year before doubling began, and up 51% since 1993. The average grantee also will be getting more money than ever, about $367,000 a year—a $25,000 jump over this year and 36% higher than in 1998.

At the same time, the agency has launched a vast array of initiatives and extended its reach into fields where it once had a limited presence. Several institutes have stepped up their support for clinical research in response to concerns that NIH wasn't doing enough to move basic research findings into medical practice. The agency now pours nearly $6 billion a year into clinical studies, including those at 80 major centers, which sponsor 9000 investigators and involve tens of thousands of patients. There are also new loan repayment programs to pay off the education debts of scientists who agree to get involved in clinical research.

The arrival of big biology has meant spending hundreds of millions of dollars to buy specialized machines, build massive shared databases, and assemble research consortia—such as the one that is unraveling the human genome—that involve dozens of players. "The classic image of the lone scientist making great discoveries in a small laboratory is a faded image of the past," Judith Vaitukaitis, director of NIH's National Center for Research Resources, recently explained to a House spending panel looking at NIH's growing support for infrastructure. By 2003, for instance, NIH will have spent tens of millions of dollars to double the number of synchrotron beamlines available to biologists studying the structure of everything from proteins to tissues. Another $20 million will have gone to developing a nationwide network of mouse-breeding facilities that provide specialized mutant mice to scientists.

Sustaining this cornucopia of grants, clinical trials, and infrastructure won't be easy. Informally, NIH officials say that preliminary studies project that some institutes would need annual budget increases of 7% to 12% after 2003 to sustain existing programs and keep pace with expected inflation. But with key lawmakers already signaling that they are "going to take care of NIH, then move on to other priorities, I don't know how [we] could pull off those kinds of increases," says Moore. "The scientific rationale may be there ... but the politics are very difficult."

Eyes on the future

Given such predictions, many institute directors—including those of the big three—have already trimmed their sails. At NIAID, for instance, Fauci notes that he and his advisers long ago made the "somewhat unpopular decision" to hold down the number of new grants to individual investigators, choosing instead to focus on increasing the size of grants and building infrastructure that often has low carrying costs. As a result, he says, NIAID's new grant numbers will decline slightly next year, to 985, from 1004 this year.

At the second-ranked National Heart, Lung, and Blood Institute, director Claude Lenfant outlined similar choices in an April letter to grantees, explaining why the number of new grants awarded by his institute in 2002 will decline by nearly 10%, to 911, compared to last year. "The generous increase in our budget does not translate into

SOURCE: NIH

an ever-increasing number of successful competing grant applications," Lenfant wrote. At the same time, he noted that the average grant has gotten bigger.

At the $3.74 billion NCI—the largest member of the NIH family—Klausner notes that the cost of grants has risen faster than the institute's budget in recent years, steadily eating into the pool of money available for new projects. The amount of money for new initiatives is shrinking fast, from $262 million in 2000 to $176 million this year, with a continued drop forecast for 2002. "Next year will be the most difficult by far," predicts Klausner.

In response, NCI is capping the increases that can be requested by investigators seeking renewal of their 3- and 4-year awards and ordering a special review for grants larger than $500,000 a year, a category that's growing rapidly. By 2003, however, Klausner predicts that enough existing grants will have expired to ease the transition to slower growth rates.

Although the report of the special post-doubling committee isn't due until fall, the agency's 2002 budget request offers some clues about the strategies it might recommend for spending future budget increases wisely. One is to continue investing heavily in infrastructure. For instance, NIH officials are touting plans to spend tens of millions of dollars over the next few years on high-end equipment—specialized electron microscopes, supercomputers, and other machines costing $500,000 or more. There is also talk of making a dent in an estimated $6 billion backlog in needed construction and renovation projects at universities and research hospitals. Both types of spending are attractive because, unlike grants, they can be paid for in a single budget year.

Last year, similar ideas led Representative David Obey (R–WI), the senior Democrat on the House panel that oversees NIH's budget, to ask whether such spending "really was the way the science is going, or a way to move larger sums of money now that you are getting these increases?" This year, however, there were virtually no such challenges at a House hearing on NIH's infrastructure proposals. And in the Senate, Tom Harkin (D–IA), the new head of the spending panel that oversees NIH's budget, encouraged officials to think about giving more cash to grantees who need bigger labs and better equipment.

Researchers are seconding that idea. Last week, for instance, an advisory group led by William Brody, president of Johns Hopkins University in Baltimore, Maryland, recommended that NIH boost construction and renovation grants to $1 billion a year—from $75 million this year. But Kirschstein deferred the idea until December.

Another issue likely to be aired in committee discussions is the impact of "modular" grants. Under the streamlining policy, a legacy of former director Harold Varmus and implemented in earnest last year, all grants of $250,000 or less have been awarded in increments of $25,000. The idea was to reduce the amount of paperwork for smaller grants. But it has had the unintended side effect of boosting overall spending: Lured by the lack of paperwork, more investigators appear to be requesting funding levels closer to the ceiling, and renewal grant amounts are routinely rounded up.

In his letter, for instance, Lenfant noted that his institute limits renewal grants to a 10% increase, so a $100,000 grantee can ask for up to $110,000 the second time around. Under the modular grant approach, however, the grant is rounded up to $125,000. The development is "one noteworthy cause" of rising grant costs, Lenfant wrote.

Klausner would also like to see peer reviewers take a closer look at the costs of proposed research. The thousands of scientists who review proposals to NIH are currently instructed to focus on scientific merit, and Klausner says that most study sections routinely recommend funding levels very near the investigator's request. But those budgets are "often far in excess of what we can realistically provide," says Klausner. The process of negotiating lower amounts has "become an enormous stress on program staff," he says.

Resolving these issues to everyone's satisfaction, however, still won't solve NIH's budget crunch. Observers say that only a miracle will prevent stagnation and slumps after 2003 in the number of grants, infrastructure spending, and clinical research. Doubling has "given everyone a little something to celebrate," notes one NIH official. But the bill is rapidly coming due. **–DAVID MALAKOFF**

THE FUTURE OF NIH

▶ THE WINNERS

Even in a Time of Plenty, Some Do Better Than Others

"Fat cat" basic researchers, directors of large trials and surveys, and genomics Pooh-Bahs top the list of scientists with the most NIH funding

With a 25-person lab and eight grants from the National Institutes of Health (NIH), virologist Joseph Sodroski of the Dana-Farber Cancer Institute in Boston has a lot going on. "There are people from all over the world here," he says, "and keeping everybody fulfilled and happy is a challenge." And his research keeps sprouting in new directions, from how HIV envelope glycoproteins help the virus enter cells, to their cytopathology, to their possible role in vaccines. Federal funding is the food that nourishes those ideas, so even though his plate is full already, Sodroski says, "if an idea comes along that looks fundable, I'll probably write a grant [proposal]."

That drive netted Sodroski $4 million in NIH funding last year, putting him in the upper echelons of the agency's basic research grantees and at the very top in terms of number of grants. A leading AIDS researcher and skilled proposal writer, Sodroski has benefited from an exploding NIH budget that has allowed the agency to award more and larger grants (see p. 1992). In this time of plenty, NIH grant administrators early this year examined what they call the "fat cats"—principal investigators (PIs) with six or more grants—to make sure that NIH's 27 institutes and centers are not funding duplicative work and PIs aren't overextended. Extramural research chief Wendy Baldwin concluded that "there was nothing to be concerned about" for the 30 or so people on her list.

Science decided to take its own look at the people at the top of the funding heap, examining the total amount of money received and number of grants. Recipients were divided into three groups—those who do mostly basic research, clinical and social science researchers, and genomics centers. The leaders receive $3 million or more a year, eight times what the average investigator receives. At the same time, the portfolios of most of the top investigators include grants shared with other labs. Identifying the top-funded researchers from an NIH list of grants

CREDIT: DANA-FARBER CANCER INSTITUTE

Purring. AIDS researcher Joseph Sodroski made NIH's "fat cats" list of investigators with six or more grants.