done to develop new technologies for constructing the physical map and determining the sequence of all the nucleotides in the DNA of the human genome. The latter may be a particular concern since the human genome is estimated to contain 3 billion nucleotides, raising questions about whether sequencing methods will be up to the formidable job of determining their exact order. To bolster research in this area, Collins will seek additional funds for people with novel ideas. Sequencing by mass spectrometry and DNA hybridization are among the technologies that deserve a deeper look, he notes.

The political challenges

Of course, the new genome head will face political as well as scientific challenges. And the project has had its share of high-profile political problems. Take the patent controversy that became one of many sore points between Watson and his boss, NIH Director Bernadine Healy. The trouble started when NIH filed for patents first on hundreds and then on thousands of gene fragments identified by former NIH researcher Craig Venter. Watson, like many other biomedical researchers, strongly disagreed with the filing and subsequently departed from the project.

Collins takes a middle-of-the-road approach to this issue. The original application was turned down, and he has no objection to NIH appealing that decision: "Having gone this far, it would be unfortunate to just let the issue lie there unresolved." But he hopes that when a definitive resolution comes, it will hold that what he calls these "snippets of sequence with no known biological function" are not patentable. He does not object, however, to the idea of obtaining patents on full-length genes with known biological functions and thinks that the genome project ought to be a plus for the biotech industry.

And last, but definitely not least, there are the politics of funding. Even though the intramural program fared well in the Clinton Administration's first budget, the extramural program suffered the same fate as other NIH units, and Collins says, "we are getting into a crunch." The original intention was eventually to ramp up the annual NIH genome budget to $173 million, but the scheduled increases have plateaued prematurely. The budget for the FY 93 was supposed to be $146 million, but it is $106 million. That's scheduled to rise to $135 million in FY 94, but almost all the increase is for starting the intramural program. "This truncation of the ramp-up is going to create some difficulty for technology development and sequencing," says Collins, noting that these are already underfunded. Collins will try to make the case that more funding for technology development will save money in the long run by making mapping and sequencing easier—and therefore cheaper. But whether he will prevail in the current climate of budget cutbacks remains to be seen.

–Jean Marx

FEDERAL BUDGET

Clinton Asks for a Greener DOE

In an ordinary budget year, agencies marshall funding plans and release them in a package. But in this disheveled year, with the government still reeling from the change of administrations, funding plans aren't released—they dribble out. Last week, the National Science Foundation informed Congress that President Clinton would favor the agency with a big increase in his 1994 request, while the National Institutes of Health (NIH) found out he would not do the same for NIH. This week's budget preview comes from the Department of Energy (DOE), whose fortunes appear to lie somewhere between those of the other two scientific players.

When Clinton makes his formal budget request this week, he will ask Congress for a 7.2% rise (to $4.75 billion) in DOE's general science and energy supply research programs. Reflecting Clinton's—or perhaps Vice President Al Gore's—green streak, the big winners are solar and other renewable energy sources (up 27% to $327 million) and biological and environmental research (up 17% to $416 million). Losers include some accounts that were expected to suffer—such as nuclear energy research, whose $345 million 1993 budget is to be cut almost in half—as well as some that were not, including basic energy sciences, which would drop 7% from its $861 million 1993 budget. This means that the defense labs will shrink, a blow only somewhat softened by a 68% ($624 million) increase in lab technology transfer programs.

In basic research, most of what appears to be a healthy increase is eaten up by new construction, leaving core science programs with little more than a cost-of-living rise of about 3%. Clinton's 1994 request will include $20 million to start work on the Tokamak Physics Experiment at Princeton, $26 million to kick off an Advanced Neutron Source at Oak Ridge National Laboratory, and $36 million to establish a "B-factory"—an accelerator to produce a high-intensity beam of particles known as B mesons—at either the Stanford Linear Accelerator Center (SLAC) or Cornell University.

DEPARTMENT OF ENERGY

Selected Research Programs	Appropriated 1993 (million dollars)	Request 1994 (million dollars)	Percent Change
Solar and Other Renewables	257	327	27.1
Nuclear Energy	345	184	-46.8
Biological and Environmental	357	416	16.6
Fusion Energy	340	348	2.3
Basic Energy Science	760	861	-6.8
High-Energy Physics	613	628	2.3
Nuclear Physics	309	322	4.3
SSC	517	640	23.8
Total, General Science & Energy Supply R&D *	4434	4754	7.2

*Total includes selected categories and other programs not listed.

In this era of budget pinches nothing happens without a tradeoff, however, and the tradeoff for this growth is that some other projects would slow. Fermilab, which wanted $100 million for work on its Main Injector upgrade, may have to settle for the $25 million in Clinton's 1994 request. The Superconducting Super Collider would have to wait an extra 3 years to power up its first beam under Clinton's plan (assuming Congress does not kill the machine outright). Construction would also slow on the Relativistic Heavy Ion Collider now under way at Brookhaven National Laboratory.

Other labs have it even worse. Los Alamos National Laboratory's venerable Meson Physics Facility (LAMPF) is slated for elimination, with just $1.5 million of close-out costs in the budget. But LAMPF's 800-strong user community isn't rolling over. They've started a letter-writing campaign to get 2 more years out of the machine to complete experiments that have been in the pipeline for years.

Clinton's budget is likely to change considerably before it gets out of Congress this fall. The numbers aren't likely to go much higher, and at the end of the appropriations process, when money gets tight, some projects are likely to get cut. One candidate likely to go this year, say insiders in the budget game, is Clinton's B-factory request. But it's still early in the year, and there's a lot of politics to be played between now and the time when the winners are separated from the losers.

–Christopher Anderson