Research and the "Flexible Freeze"

Biomedicine and the physical sciences have enjoyed 8 years of growth in the federal budget. Will George Bush continue the trend or impose a freeze?

AS A CANDIDATE, George Bush said he would solve the nation's fiscal problem with a "flexible freeze" on government growth, and no new taxes. The idea is almost mystical in its obscurity, says one Capitol Hill budget expert: "it reminds me of the Chinese yin-yang symbol." The meaning should become clear when Bush becomes President next month and reveals exactly what he plans to do.

Some agencies may be blessed with a "flex" while others will be hit with a freeze. For federal basic research programs, the question is whether they can continue growing at more than the rate of inflation, as most have done in the past 8 years.

On its face, a freeze implies that every budget will be held to a growth rate equal to inflation, which is forecast by the Congressional Budget Office (CBO) to be 4.1%. But exemptions will be granted, and the Washington game in the coming weeks will be to get and keep those exemptions.

"Obviously, there are ways to get around" the budget rules, a congressional staffer says. "But it's getting tougher and tougher." The players are changing, too, and this makes the game more unpredictable. For example, the chairmen of the House and Senate appropriations committees will be replaced next January. In the Senate, the subcommittee that handles the National Science Foundation, and the National Aeronautics and Space Administration (NASA), is likely to get Senator Barbara Mikulski (D–MD) in place of Senator William Proxmire (D–WI). The House counterpart will get as chairman Representative Robert Traxler (D–MI) in place of Edward Boland (D–MA). They will bring in new likes and dislikes. Will basic science thrive in the changed environment?

The same question arose in 1981 when Ronald Reagan came into office promising to increase military spending, maintain social benefits, cut the deficit, and reduce taxes. "Voodoo economics," George Bush called it during the Republican campaign 8 years ago. It was clear that something would have to give. Many feared the victim would be the "discretionary" programs in the budget, those not locked into place by law or by multi-year contracts. The discretionary nondefense fraction of the budget is now less than 20%, and shrinking. The trend seemed to put basic research at risk. Few expected President Reagan, who followed astrology columns in the newspaper, to be a fan of basic science. But he was.

What gave way instead was public debt, along with some social programs and technology demonstration projects. The annual deficit grew in current dollars from $78 billion in 1981 to $155 billion in 1988. This figure includes the Social Security Trust Fund, which in recent years has been building up a fat surplus, and will continue to do so. This surplus, the product of an earlier tax rise, hides the real trend in public spending. If Social Security funds are left out of the picture, the annual deficit grew from $74 billion in 1981 to $194 billion in 1988, an increase of about 162% in current dollars.

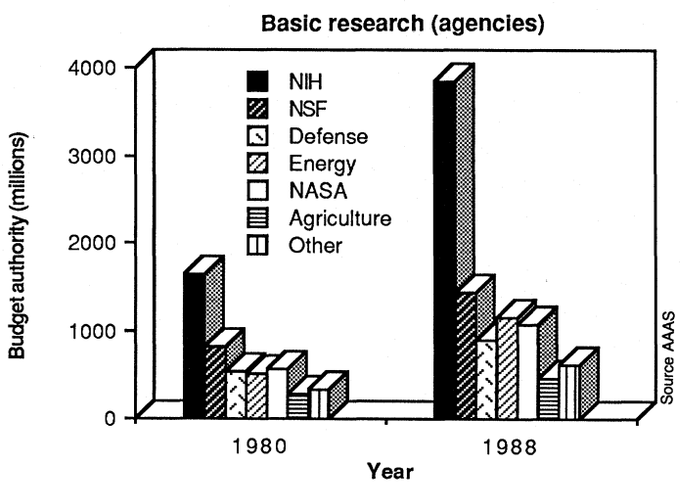
The cumulative public debt now stands at $2,050,000,000,000, and interest payments are running at $152 billion a year. This borrowing has been financed increasingly by foreign investors, a trend that makes the financial establishment nervous about the economy's stability. This concern and a fear that more borrowing will raise interest rates have motivated the budget cutting.

In the White House, the cutting began immediately after Reagan's arrival in January 1981. In Congress, it began in 1985 with passage of the Gramm-Rudman-Hollings bill. This law orders the government to reduce the deficit to zero by 1993 in forced annual steps. In 1989, for example, the deficit is supposed to be no more than $136 billion, plus or minus $10 billion for error, requiring $30 to $40 billion in reductions of spending that would otherwise occur. Even under this harsh mandate, federal science has done well.

Beginning in 1981, according to a report* by Albert Teich and Kathleen Gramp of the American Association for the Advancement of Science, the Reagan Administration "sheltered most areas of basic science from major reductions," giving particular care to the physical sciences, mathematics, and basic engineering research. This led to "a remarkable surge" of federal support, especially for research in the military sphere. Although the President consistently denied increases in biomedical research, Congress just as consistently granted them. The result, say Teich and Gramp, is that between 1980 and 1988, federal spending for research and development grew by 85%. If discounted by the inflation rate, the "real" growth for R&D in this period was 26%.

The pattern was uneven. Defense grew more rapidly than other parts of the budget, and military R&D grew even faster than overall defense, rising by a stunning 169%, or 83% in real dollars. Nondefense R&D fell quite rapidly, dropping 24% in real dollars. The discrepancy between defense and nondefense is more marked in the area of technology development: military technology grew 99% in real dollars while civil projects, like alternative energy demonstration programs, declined 66%.

While R&D suffered overall, the basic research component of



*"R&D in the 1980's: A Special Report," by Albert H. Teich and Kathleen M. Gramp, American Association for the Advancement of Science, September 1988, Washington, D.C.

R&D did not. The biggest single block of research funding went to the National Institutes of Health (NIH), where basic science support grew from $1.6 billion in 1980 to $3.8 billion in 1988—a growth of 59% in real terms. (In total R&D, NIH grew only 34%. Not all biomedicine is basic.) Next came the National Science Foundation, reaching a basic research budget of $1.4 billion in 1988, reflecting a real growth of 17%. Department of Energy basic research, which includes high energy physics, grew 52%. Space research at NASA rose 30%. Defense basic research grew 11%. On average, the real increase for basic research throughout the government was 37%—reflecting the Administration's view that this is an important area in which to invest tax dollars.

Whether this trend will continue under the Bush Administration is anyone's guess. For shock value, though, it is worth considering an analysis put out by the House budget committee on 16 November. The staff took Bush's descriptions of the flexible freeze at face value and plotted out the results for major federal agencies.

Bush's flexible freeze (FF) assumes that economic growth, inflation, and unemployment will continue as they have in the last few years. It also takes for granted that interest rates will fall. This questionable notion rests on a forecast made by Bush adviser Martin Feldstein. He thinks that simply by endorsing a plan to cut the deficit to zero, the President can cool the lending markets and reduce interest rates 2% below the levels forecast by the CBO. This would mean, for example, that the rate for 3-month Treasury bills would immediately drop to 5% or less. If this were to happen, it would greatly reduce the government's annual debt payments and its deficit—with no pain. But that is not happening. Since the election, the average rate for 3-month T-bills has climbed from 7.5 to 8.1%.

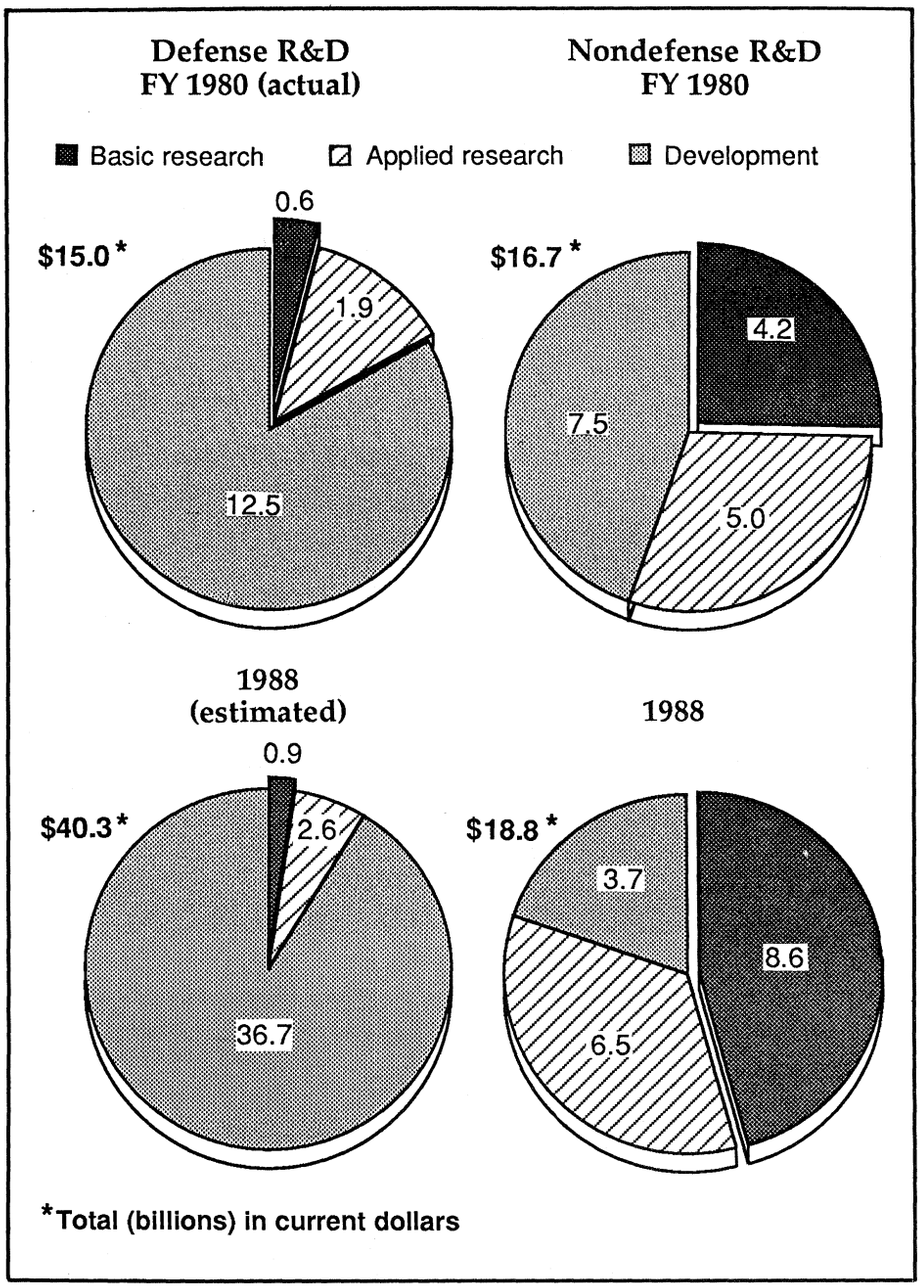
Putting reality aside, the House report attempts to guess what the budget would look like if the FF were implemented. It becomes clear that unless laws and formulas are changed, Medicare, Medicaid, and retirement benefits will quickly crowd aside the discretionary budget. Medicare, for example, is projected to rise 82% by 1993; Medicaid, by 74%. Under the FF, the total budget would be allowed to increase only 22%, so that many programs would have to be sacrificed to let Medicare and Medicaid grow as they are expected to.

The House study says that the FF might work if military spending were held to the level of inflation (4.1%) and *every* program outside the Defense Department were cut 2% each year through 1993. If Feldstein's interest-rate windfall did not materialize, the pain would be worse: everything would have to be cut 3% per year. This would mean no space station, no supercollider, a loss of more than 1000 research grants at the NSF, and so on. The general view in Washington is that this will not happen. In effect, the freeze part of the FF has already been tossed out the window.

Instead, the usual process of bartering has begun, and sleight-of-hand budget tricks will be deployed to advance programs with high-political clout and stifle those without it. The following are some items that may be exempted from the freeze, requiring sacrifice elsewhere, or else may be kicked under the rug:

■ **Campaign promises.** In addition to promising no new taxes, Bush said he would reduce old ones. He promised to cut the capital gains tax from 28 to 15%; to grant a new child care credit; and to create a tax shelter for parents saving money for their children's education. No one has calculated what these proposals would cost, but the more than $1-billion annual loss would make it harder to meet deficit targets.

Bush also promised strong action on a number of environmental fronts, including acid rain, water pollution, and global warming. Any substantive action will cost money. The President-elect also wants to build thousands of new prison cells to make credible the war on drugs, and Congress has committed itself to increases in drug enforcement and drug treatment programs.



Another large, unplanned expenditure will be the federal bailout of savings and loans banks. A quarter of the industry is insolvent. The Bush Administration must cope with the crisis quickly, and it could cost as much as $50 billion. Other campaign-year initiatives may have to be trimmed or dropped if this is to be financed.

■ **Defense.** The greatest budget tension may occur at the Pentagon. With 5 years' worth of spending authorized and only 4 years' worth of money available, the Defense Department must cut back sharply. It would be wasteful to stretch out all weapons development; some projects will have to be killed. A debate is under way on whether spending should be held to a flat inflationary rate or to inflation plus 2%. The lower level is advocated by the incoming national security adviser, Brent Scowcroft, and Bush seems to agree. The reductions may be between $100 to $300 billion over 5 years. Projects likely to be affected are the "Midgetman" strategic missile favored by Scowcroft ($35 billion), the MX missile on boxcars favored by the Pentagon ($13.5 billion), upgrading the B-1 bomber ($7 billion), buying a full fleet of B-2 bombers ($70 billion), deploying some version of the Strategic Defense Initiative ($70 billion), launching a full fleet of 25 Seawolf attack submarines ($30 billion), and meeting ambitious but less visible personnel and maintenance objectives.

■ **Health.** Medicare and Medicaid will undoubtedly be trimmed, for the budget will not support the 12% rate of growth projected for them. In research, it is not clear what the new Administration will propose, although Bush said he would support AIDS-related investigations. However, growth in support for AIDS programs may begin to level out. In internal negotiations, the Office of Management and Budget has set NIH funding at $7.136 billion, a decrease of $11 million from the 1989 appropriation. AIDS-related research is set to grow from $1.3 billion to $1.6 billion, but the Department of Health and Human Services is appealing for an increase to $1.9 billion.

■ **Energy.** Two big issues stand out in the Department of Energy (DOE) budget: the cleanup of old weapons production plants and construction of the Superconducting Super Collider in Texas. There is no upper limit for the amount that could be spent to remove toxic and radioactive chemicals from the defense sites; DOE has estimated that the actual cost could run to more than $100 billion. Under sharp pressure this year to get started, particularly from Senator John Glenn (D–OH), DOE is planning to step up spending. It also may have to begin paying for the design of two new defense reactors, pegged at $6.8 billion in a low DOE estimate. Will there be room for the $4.4 billion supercollider this year? It is too early to say. But in an ominous note, Senator Lloyd Bentsen (D–TX), chairman of the Finance Committee, recently commented: "I'll be working very hard to get it [the supercollider] funded, but it's going to be exceedingly difficult."

■ **Space.** Like the Pentagon, NASA has more projects authorized than are likely to win full funding. Unlike the Pentagon, NASA seems to be riding on a wave of goodwill in Congress, driven by a fear that the Soviet space program is far ahead of the United States'. In internal negotiations, NASA is seeking a 28% growth (current dollars) in its budget. The biggest item is the space station, which is due to grow from $900 billion in 1989 to $2.1 billion in 1990, with a total cost (not counting logistic support) of more than $16 billion. The President must make a decision before June on whether or not to go forward. NASA also hopes to include in this year's budget the Comet Rendezvous-Asteroid Flyby mission and the Cassini unmanned probe to Saturn and its moon Titan. The European Space Agency voted in late November to fund the Cassini mission as the next major joint investigation with the United States. This increases the pressure on NASA to start funding its $1.5 billion share of the project, due to be launched in 1996 (see story p. 1375).

■ **National Science Foundation.** In 1987, the Administration promised to double the NSF budget in 5 years and in 1988 Congress authorized the action. But in the interim, the stock market crashed and new spending restrictions intervened. The boom has yet to arrive. NSF grows about 10% in 1989 over last year's budget. But the increase was made possible in part by cuts or restraints elsewhere in the same budget function—in urban development grants, low-income housing support, in environmental construction grants—which cannot be used again. Meanwhile, NSF is seeking increases in funding for science and technology centers and for a newly authorized "Academic Research Facilities Modernization Program." An unexpected setback occurred when NSF's radio telescope at Greenbank, West Virginia, collapsed, creating a gap in the astronomy program that will not be easy to fill. NSF director Erich Bloch said that replacing it would put "a great burden" on the agency.

Speaking at a AAAS colloquium last April, House budget analyst Michael Telson summed up the situation. "The zero-sum mentality imposed by Gramm-Rudman-Hollings," he said, has fundamentally changed the way budgets are written. As a result, "spending for R&D will become more difficult to increase, and the scientific community will have to work harder to retain its support." ■ ELIOT MARSHALL

NSF Names First 11 Science Centers

The National Science Foundation has ended an extended period of suspense by designating its first 11 science and technology centers and announcing that it will provide a total of about $24.7 million to fund them in the coming year.

Successful proposals for the university-based research centers were chosen from among 323 entries. A 23-member review panel winnowed the competing proposals down to 48 finalists. The winners were research teams from California, Illinois, Michigan, New Jersey, New York, Oklahoma, Texas, and Virginia. Awards for the first year vary in size from $900,000 to more than $4 million; the centers will be funded for an initial 5-year period.

The 11 proposals chosen and levels of funding:

■ University of California at Berkeley. Center for Particle Astrophysics. $1,825,000.

■ University of California at Santa Barbara. Center for Quantized Electronic Structures. $2,100,000.

■ California Institute of Technology. Center for the Development of an Integrated Protein and Nucleic Acid Biotechnology. $3,050,000.

■ University of Illinois, Champaign-Urbana. Center for High-Temperature Conductivity. $4,250,000.

■ Michigan State University. Center for Microbial Ecology. $1,100,000.

■ Northwestern University. Center for Advanced Cement-Based Materials. $1,750,000.

■ University of Oklahoma. Center for Analysis and Prediction of Storms. $900,000.

■ Rice University. Center for Research on Parallel Computation. $4,100,000.

■ University of Rochester. Center for Photoinduced Charge Transfer. $1,650,000.

■ Rutgers University. Center for Discrete Mathematics and Theoretical Computer Science. $1,825,000.

■ Virginia Polytechnic Institute and State University. Center for High Performance Polymeric Adhesives and Composites. $2,124,000.

The science and technology center con-