

CLINTON'S HANDS-ON ECONOMIC PLAN: TECHNOLOGY GAINS, BIG SCIENCE LOSES

It was the defining moment. Not even a full month after his inauguration, President Clinton took the occasion of his first State of the Union Message, on 17 February, to explain his strategy for reducing the deficit and for reviving the economy. Up in the gallery of the Capitol, the First Lady, Hillary Rodham Clinton, appeared to have carefully chosen her seat companions—Alan Greenspan, chairman of the Federal Reserve Board, and John Scully, chairman of Apple Computer—to symbolize support for the President's plan from financial forces and industrial circles. In his speech before a joint session of Congress, the President defined his big themes for a new course of activist government in which science and technology will help reverse the nation's lingering economic malaise.

Clinton's economic plan marked the end of the transition from campaigning to governing. Despite his sometimes blithe style during the 61-minute address, Clinton advocated draconian measures, not the least of which is higher taxes. The economic plan is designed to eliminate \$502 billion from the Federal deficit in the next five years—though even then the deficit is unlikely to fall below \$200 billion. The plan also contains a two-year, \$31 billion "stimulus" package divided roughly equally between spending to create jobs almost immediately and granting tax breaks for businesses to invest in plants and equipment so that workers can be hired. The stimulus has been attacked on two fronts: Some business executives complain it is far too small to have a significant effect on the country's \$6 trillion economy, while others contend that the economy is turning up nicely and needs no boost.

Notwithstanding the large personal and corporate tax increases that are called for, both houses of Congress, in a two-week period in March, apparently newly converted to the religion of deficit cutting, approved the plan virtually as written. It contains a supplementary appropriations package amounting to some \$16.3 billion to boost the economy during the

current fiscal year and it releases an additional \$3.2 billion from Federal trust funds for local and regional transportation projects. This mix of public works and longer-range expenditures for science, technology and education carries the imprint of the President but also is endorsed by the Senate Appropriations Committee Chairman, Robert Byrd of West Virginia, who steered legislation for the economic plan though the rocky shoals of his chamber.

Investment for the long term

The plan also includes \$160 billion for new spending, or "investment" as the President prefers to call it, that he claims will improve the economy for years to come. This money would go for public works improvements, urban development, health care, worker training and public education. One of the plan's largest components is \$48 billion for a series of measures called "Rebuild America." Those funds are designated for highways, mass transit and airport expansion, grants for developing technologies like Maglev trains, and money for environmental research, energy conservation and alternative energy projects.

If the plan is put in place, it is expected to reduce spending by \$222 billion over four years, with \$114 billion coming from domestic programs, \$76 billion from military spending and the rest from lower interest payments on the national debt. Failure to act resolutely, Clinton said in his speech to Congress, would be "condemning our children and our children's children to a lesser life than we enjoyed."

The morning after the State of the Union Message, details of the economic plan were issued in a 146-page White House manifesto, "A Vision of Change for America." It makes a strong case for investments in education, science and technology. "American governments at all levels have been spending a decreasing share of our total resources on civilian public investment—including both physical investment and the research and development that underpins future growth. Studies indicate that addi-

tional investment in private and government R&D, and in public infrastructure, could yield substantial economic benefits," the document states. It goes on: "We have also underinvested in education and training. American students routinely score far below their counterparts in other industrial countries on tests of mathematical competence and scientific knowledge. Moreover, recent evidence also suggests that the demand for more highly trained, better educated workers has been outrunning the supply. . . . This evidence suggests that more investment is vital to raising the growth rate of productivity and boosting living standards. We must invest more in business capital, in public infrastructure, and in the skills of our people. . . . We owe it to our children to change course now."

For starters, Clinton's plan proposes spending \$17 billion over four years for technology programs, including national computer and communications networks—"electronic data superhighways," in the parlance of their principal advocate, Vice President Al Gore Jr, who pushed the High Performance Computing Act of 1991 through Congress and onto President Bush's desk for signing (see *PHYSICS TODAY*, January 1992, page 54). The agenda would also extend the R&D tax credit, the capital gains tax break for small businesses and the series of "strategic research initiatives," more or less ongoing programs at some nine Federal agencies that are developing such critical technologies as advanced materials and manufacturing processes to help make American companies more competitive against foreign industries.

An example of this is the Administration's commitment to allow Oak Ridge National Laboratory to begin building a \$2.7 billion Advanced Neutron Source to produce rare isotopes for medical diagnosis, treatment and research and to perform applied research using neutron scattering and neutron irradiation techniques. Physicists at Oak Ridge began designing the reactor in 1984 and have tried unsuccessfully to get funds for it from the Department of Energy for the

past three years. When completed, the ANS will have the world's most intense beams of steady-state neutrons.

Clinton's "Vision" also calls for spending \$210 million in the next four years to build the Tokamak Physics Experiment at the Princeton Plasma Physics Lab. It would take the place of the Burning Plasma Experiment machine, which fusion researchers had sought to build for nearly a decade as a forerunner of the International Thermonuclear Experimental Reactor now being designed by a collaboration from the US, the European Community, Japan and Russia.

An exhilarating vision

Some of Clinton's ideas for R&D are as practical as they are prudent. "Vision of Change" calls for shifting military R&D spending to civilian uses and giving businesses easier access to discoveries at government labs. The plan would eliminate all nuclear power systems in space—a decision that would certainly please astronomers and space scientists—and write off most advanced nuclear reactor R&D. Indeed, of the \$54 billion in nondefense discretionary reductions proposed for fiscal 1994 to 1997, less than 2% would affect science and technology, according to an analysis of the Clinton plan by staff of the House Committee on Science, Space and Technology. By contrast, the House committee reckons that funding for all the Clinton plan's proposed additions to the science and technology agencies in the next four years would make up an exhilarating 10% of new investment. "If all of these investments were in fact funded [by Congress], they would probably come close to restoring a 50:50 civil/military R&D ratio by FY 1997," the committee report asserted. The ratio currently stands at about 59:41 in favor of the Pentagon.

The largest R&D beneficiaries of Clinton's economic "booster shot" are, surprisingly, the two agencies with some of the slowest payoff—the National Science Foundation and the National Institute of Standards and Technology (once known as the National Bureau of Standards). NSF would get an additional \$207 million this fiscal year, though most of this amount, or \$112 million, is targeted for programs that were called Presidential Initiatives in the Bush era and are now known as strategic research initiatives—advanced manufacturing, biotechnology, materials research, high-performance computing and global climate change. Still, some \$85 million more would be

Science and Technology Highlights of Clinton's Economic Plan

	FY 1993 supplemental budget (millions of dollars)	FY 1994–1997 increase over current budget (millions of dollars)
WINNERS		
NSF	207	2297
NIST (National Bureau of Standards)	117	1306
"Information highways" pilot programs	64	275 at Commerce
High-performance computing & networks	47	784 at NSF, NIH, NIST and NASA
FCCSET crosscut research initiatives*		1206 at nine agencies
Cooperative government-industry R&D	47	146 at DOE labs
Advanced Neutron Source		420 at DOE's Oak Ridge lab
Tokamak Physics Experiment		210 at DOE's Princeton lab
Cleanup of nondefense sites		220 at DOE labs
Conservation and renewable energy R&D		940 at DOE labs and universities
High speed rail and Maglev R&D		646 at Transportation
Air traffic control modernization		108 at Transportation
Civil aviation R&D		550 at NASA
Dual-use military-civilian technology		1331 at Defense
Permanent R&D tax credit		6437
LOSERS		
Superconducting Super Collider		1770—increase to total cost by stretching out completion to 2003
Space Station		2126—"savings" by redesigning project and delaying operation
Indirect costs at universities		1238—"savings" by reducing overhead rate
Nuclear reactor R&D		820—"savings" by eliminating "unnecessary" reactor programs
Uranium enrichment		1275—"savings" by phasing out program

*Existing interagency R&D programs (formerly Presidential Initiatives) in global climate change, math and science education, materials processing, biotechnology, and advanced manufacturing.

allocated this year to fund individual investigators in basic research fields at the agency. What's more, the plan would give NSF \$2.3 billion more than it would get in a flat budget scenario over the next four years, including funds to help universities pay for sorely needed research facilities and laboratory instruments.

If all goes according to plan, NIST's budget will really take off. From the current level of \$393 million, spending at NIST would reach a total of \$1.37 billion in fiscal 1997. The Advanced Technology Program, initiated under the Commerce Department in the Bush years to provide matching grants to industry, would leap from this year's \$68 million to \$758 million in 1997. In addition, the Manufacturing Extension Center Program, conceived by Commerce along the lines of the highly successful Agricultural Extension Service, would go up from \$19 million to \$92 million in the same period so that small businesses in particular could benefit from state-of-the-art technologies.

Accord at Camp David

This is not to say that all research programs were well treated. The budget-cutting exercise took an exacting toll. Much of the nuclear weapons research at DOE laboratories would either be eliminated or consolidated. In addition, the sails of some widely known projects were trimmed. The Administration is proposing to

stretch out the completion of the Superconducting Super Collider by four years, to 2003, but by doing this the cost of the gargantuan proton-proton machine, now being built 150 feet underground in Ellis County, Texas, would increase by \$1.77 billion to a new estimated total of \$10 billion. NASA's space station is a problem of a higher order. Clinton is demanding still another reconfiguration of the troubled space station, whose cost went up this winter to \$31 billion after its principal contractor, McDonnell Douglas, billed an extra \$500 million for hardware—a cost overrun that budget watchers in Congress have termed, with some pique, the "December surprise."

Both the SSC and the space station came up in discussions of the economic plan last January at Camp David, the Presidential weekend retreat in Maryland's hills. Leon E. Panetta, who gave up his seat in Congress from California and his chairmanship of the House Budget Committee to become director of the White House Office of Management and Budget, proposed jettisoning both projects, as he had voted to do when he was a member of Congress. The space station, like the SSC, is being assembled mainly in Texas. So it wasn't surprising when Lloyd Bentsen, who resigned from his Senate seat representing Texas to take over as Treasury Secretary, leaned close to Clinton at the Camp David session and reminded

the President that he had made promises during his election campaign in Texas and during an interview on the PBS-TV "MacNeil/Lehrer News-hour" to support the SSC.

At the end of the day the Clinton planners agreed to give the SSC a total of \$640 million next year—\$70 million short of DOE's target for 1994, but still \$108 million more than the current funding. The space station would be redesigned and scaled back, saving some \$2.13 billion over the next four years; about one-fourth of that money would be used to support R&D in materials and technologies for applications in civil aviation.

"Vision of Change" devotes only a few paragraphs to the SSC and the space station: "The Administration is committed to the development of the Superconducting Super Collider as a major contribution to scientific information for the future," says the plan. "The Administration believes, however, that in order to ensure that all the components of this project are technologically effective, the project should be extended." Interviewed soon after becoming Clinton's science adviser, John H. Gibbons expressed concern whether the SSC's 8600 dipole magnets and 2000 quadrupoles can be manufactured in such quantities with consistently reliable quality. He also thought the stretch-out would give foreign countries more time to come up with contributions to a truly international SSC partnership. At a news conference at the meeting of the American Association for the Advancement of Science in Boston last February, Gibbons was questioned about slowing down construction of the SSC. His reply that there was "no reason why we have to find the Higgs boson by the turn of the century" sent many particle physicists to the trenches in defense of the original schedule for completing the machine.

As for the space station, "Vision" says: "The Administration is committed to a cost-effective space station program. To control serious cost overruns in the present program, the Administration recommends restructuring the space station. Employment associated with the program would be maintained, and additional funds would be directed to other NASA space missions." This statement resonates with outcries from the space research community that NASA is shortchanging planetary exploration and robotic technology so that the station can be built.

"Vision" reveals a great deal about the Clinton Administration's budget request for fiscal 1994, which begins on 1 October. After the President

submits his budget to Congress during the week of 5 April, Congress is bound to squabble over the SSC and space station, each of which is already the subject of bills that would scuttle the projects this year.

Meetings at the White House

In the month between the Inauguration and the State of the Union Message, the plan was debated at marathon meetings in the Roosevelt Room, near the Oval Office, by Cabinet officials and White House advisers operating on very little sleep. The plan is intended to enlist many special interests in Clinton's cause—environmentalists, research scientists, technologists, teachers and consumer advocates. Clinton is by instinct and inclination a technocrat and a true believer in the value of science and education.

Among his greatest allies in defense of basic research, environmental protection and high technology were Gore and Gibbons. "The focus was always on teamwork," Bruce Reed, deputy policy adviser to the President, told an interviewer recently. Clinton's goal is to tear down the walls between agencies, thereby allowing for more flexible and effective government operations. "Bill Clinton believes there has been far too much interagency warfare in previous administrations." That is a main reason why Gore and Gibbons endorse the way the interagency Federal Coordinating Council on Science, Engineering and Technology functions. In the Bush Administration it became a useful apparatus under the guidance of D. Allan Bromley, who was Bush's science adviser and director of the Office of Science and Technology Policy. The Clinton Administration intends to use it to even greater effect, placing Cabinet secretaries and research directors in the power loop.

Of all the new policy making arrangements in the Clinton Administration, the most powerful appears to be the National Economic Council, headed by Robert Rubin, the former investment banker at Goldman, Sachs. As the counterpart of the National Security Council, which deals with military problems, the economic council, for obvious reasons, dominated the economic planning exercise. Gibbons, a member of the economic council, brought along a wide knowledge of science and technology in Federal agencies by virtue of his 13 years as director of the Office of Technology Assessment, the principal study group for Congress on issues involving science and technology. Though Gibbons was a practicing

nuclear physicist at Oak Ridge National Laboratory and taught at the University of Tennessee, his years on Capitol Hill have separated him from any scientific constituency he might otherwise represent. He is most frequently viewed in the Clinton White House as an "honest broker" for science and technology.

Clinton's economic plan was not the first shot in his battle to improve science and technology. During the election campaign last September, he and Gore visited California's Silicon Valley in a show of solidarity with high-technology corporate executives. The telling part didn't come until 22 February, when Clinton released a 36-page pamphlet, "Technology for America's Economic Growth, A New Direction to Build Economic Strength." Those who followed Clinton's campaign did not find much that was particularly startling in the document. It fills in the details of Clinton's national technology policy.

The policy document, like the paper distributed last September in Silicon Valley, proposes to reverse years of White House opposition to a formal US industrial policy. The centerpiece of Clinton's policy is encouragement of government-industry partnerships in developing new technologies. Accordingly, the technology plan includes financing several government-industry projects in advanced manufacturing, high-performance computer networks and environmentally "clean" automobiles. It calls for continuing to provide matching funds to Sematech, the semiconductor manufacturing consortium organized by the industry, and for expanding the Defense Advanced Research Projects Agency to develop more civilian and dual-use products. Indeed, true to its promise to drop "Defense" from the DARPA title, while broadening the scope and style of the agency, the Pentagon announced on 12 March that henceforth the organization would be called ARPA, thus restoring the title it was known by before 1972.

Fears for basic research

In spirit and substance, the initiatives that emerge represent a repudiation of the economic philosophy of the Reagan and Bush Administrations, which argued consistently that the free market was better than government industrial policy in setting research priorities, identifying hot new products for the future or determining the fate of various companies or whole industries. Although Clinton Administration officials carefully avoid using the phrase industrial policy, there is little doubt about what

they have in mind. "The sound you hear is of the door finally being shut on *laissez faire*," says Lester Thurow, an MIT economist who was among the first to call for US industrial policy more than a decade ago.

A policy that promotes technology transfers and manufacturing consortiums and that propels the Commerce and Energy Departments into the nation's industrial affairs leaves a sense of unease among many scientists about the continued support of basic research. In an obvious effort to assuage such fears, Gibbons told a group of reporters hastily assembled in the Indian Treaty Room of the Old Executive Office Building on 23 February that the Clinton Administration promises to ensure strong and stable funding for basic science. To achieve this, says the technology paper, the Administration intends to set "clear priorities." No longer will research agencies be allowed to "spread the pain" rather than to cancel some outworn or outclassed projects. The Administration will improve and toughen the management of basic science so that high-priority programs and facilities receive sustained support while low-priority ones are terminated.

Since universities play dual roles of research and teaching, the long-term scientific and technological vitality of the US depends upon adequate and sustained funding for university research grant programs at NSF and the National Institutes of Health in particular, which together support nearly 80% of academic research, the paper states. "We will ensure that Federal laboratories continue their key role in basic research and will encourage more cooperative research between the laboratories and industry and universities. And we will develop new missions for our Federal labs to make full use of the talented and experienced men and women working there in today's post-cold-war era." The fields of high-energy and nuclear physics, biomedical science, materials research and aeronautics are specifically named in the paper for improved cooperative arrangements. Indeed, 10% to 20% of the budgets of the Federal labs will be devoted to furthering such cooperative programs, says the paper.

Despite the vows made for basic science, the Clinton technology paper makes it plain that the new Administration will "accelerate the development of civilian technology with new criteria." Accordingly, the Administration will make sure that the government supports technologies critical for long-term economic growth,

but not getting what it believes to be adequate backing by commercial firms, either because the returns are too far off or because the level of funding is too great for individual companies to bear. It will also come to the aid of American businesses that are willing to share the cost of research for new technologies and it will help provide access for US companies to developments in foreign research and technology.

Clinton expects to spend \$1.7 billion in the current fiscal year to retrain defense workers, to encourage the producers of military equipment to convert to civilian production and to invest in communities hard hit by base closings. The bulk of the funds, some \$1.4 billion, was allocated by Congress for defense conversion last October, but went unused by the Bush Administration. An additional \$225 million is aimed at creating government-industry partnerships to develop so-called dual-use technologies, which have both military and commercial applications. And \$300 million would go to information sharing programs and to assisting small businesses. At a Westinghouse plant in Baltimore on 11 March, Clinton announced a \$20 billion, five-year plan to help workers, communities and industries engaged in military work to adapt to the post-cold-war economy.

Highlights of the Clinton plan for specific problems in science are:

NSF: The additional \$207 million that Clinton proposed in the stimulus package would bring the agency's budget to just about the 14% increase over fiscal 1992 that the Bush Administration requested before Congress made its cuts. It also is the first installment of a \$2.3 billion increase that Clinton holds out for NSF over the next four years. NSF officials indicate that about \$112 million of the 1993 supplement would go to four strategic research initiatives—advanced materials, biotechnology, high-performance computing and manufacturing—to bring these up to the budget request for fiscal 1993. Some \$5 million would go to salaries, though NSF officials insist this would not enable the agency to hire more scientific staff. Another \$5 million would be added to the facilities program, which was cut back by Congress last fall. The rest will go to NSF's core program for individual researchers, who were hit hard when the foundation was forced to satisfy a Congressional demand for more strategic research. Rather than fund many more grants with the money, NSF intends to concentrate on aug-

menting existing grants, thereby enabling investigators to complete all the research they had planned.

NIST: For reasons that are steeped in domestic politics more deeply than in economic ideology, the Administration decided to make the Commerce Department its launching pad for boosting the nation's technological competitiveness. Only a few years ago, when NIST was still the National Bureau of Standards, it operated on a puny \$300 million per year to maintain the measurement standards of government and industry. Now as the darling of Vice President Gore and Commerce Secretary Ron Brown, NIST is seen as a pragmatic institution that can do in short order for technology what NSF does for basic research. The new Administration apparently intends Commerce's Advanced Technology Program to be the centerpiece of its civilian technology operations over the next four years. The ATP, which provides grants for research and development of "high-risk, precompetitive, generic technologies" is now funded at just \$68 million—one sixth of NIST's \$381 million budget in fiscal 1993. By the 1997 budget, according to "A Vision of Change," ATP would grow to about \$750 million. Since its launching in 1990, ATP has funded 60 projects involving about \$400 million in research spread over the next five years. (See Opinion, page 55.)

NASA: The agency will need to lop off \$2.1 billion from the space station over the next four years. While doing this the Clinton White House is asking for still another redesign—the fourth in as many years. One possibility under consideration is to adopt a less ambitious station. Instead of being permanently inhabited by a crew of four, astronauts would tend experiments during periodic visits. Administration officials and members of Congress have had acrimonious sessions with NASA managers over station cost overruns.

University overhead charges: The Clinton Administration proposes to set new limits on the administrative overhead rates that universities can charge for Federally sponsored research. Clinton's economic plan stated that the government would save \$1.2 billion over the next four years by adopting "an upper limit on overhead charges" consistent with "a concerted effort to shift national spending from overhead to funding research." The Administration has not revealed what the rate will be, nor would officials at OMB, NSF or NIH speculate about the rate.

—IRWIN GOODWIN ■