

## Heart findings support hormonal therapy

A woman's chance of developing heart disease rises after "the change of life" — perhaps because the ovaries produce much less of the sex hormone estrogen. It is well-known that estrogen-replacement therapy lowers a woman's risk of getting heart disease. Yet, studies also reveal a dark side of estrogen therapy: It boosts the chances of developing a type of uterine cancer.

To weaken that risk, some doctors advise postmenopausal women to combine estrogen with progestin, a progesterone-like drug that blocks the proliferation of cells in the uterus. Trouble is, some evidence indicates the addition of progestin

cancels estrogen's heart benefits.

A controversial study now offers some heartening news: Researcher Aaron R. Folsom says that postmenopausal women taking estrogen plus progestin may reap even greater cardiovascular benefits than women taking estrogen by itself. Yet, Trudy L. Bush, an epidemiologist at the Johns Hopkins University in Baltimore, warns against jumping to such a conclusion: "I think it's premature to say that estrogen plus progestin is better than estrogen alone."

Folsom, who is at the University of Minnesota School of Public Health in Minneapolis, and his colleagues conducted an observational study of postmenopausal women. The researchers noted that 853 women were using estrogen; 173 were taking estrogen and progestin; and 3,932 were not using any hormones.

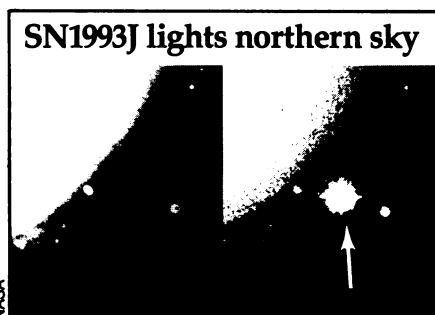
In the April 15 *NEW ENGLAND JOURNAL OF MEDICINE*, the team reports that postmenopausal women following either of the hormone-replacement regimens show a better cardiovascular profile than those taking no such medication. Women who took estrogen alone or estrogen plus progestin had higher blood concentrations of high-density lipoproteins (HDL), molecules that help remove cholesterol

from the body and play a role in preventing heart disease. Hormone users also had lower blood concentrations of low-density lipoproteins, which contribute to the fatty buildup in artery walls.

At the same time, the researchers suggest that women using estrogen together with progestin gained a slight cardiovascular edge over the estrogen-only group. For example, women taking both hormones had lower blood concentrations of a clotting factor called Factor VII. Less clotting factor in the bloodstream may help reduce the risk of a heart attack, Folsom says. In addition, women on the combined regimen had lower blood concentrations of triglycerides, a fat that can boost the risk of heart disease.

The study design contains some built-in flaws, Folsom notes. For example, doctors may be more likely to prescribe hormone therapy to healthy women. Thus the study results may in part be due to an unforeseen selection bias, he says.

Nonetheless, endocrinologist Kathryn A. Martin, at the Massachusetts General Hospital in Boston, is reassured by the finding that the two drugs taken together seem to protect against heart disease. "I think we're on the right track by adding progestin," she says. Researchers still need to conduct a randomized trial that compares both hormone-replacement regimens, she adds. —K.A. Fackelmann



NASA

### SN1993J lights northern sky

Nothing brightens the night sky — or an astronomer's workday — like a supernova, the death of a massive star. On March 28, amateur astronomer Francisco García Díez of Lugo, Spain, discovered a supernova, designated SN1993J, in the galaxy M81. After confirming the finding, astronomers turned a battery of orbiting and ground-based instruments toward SN1993J (arrow), which lies about 12 million light-years from Earth in the constellation Ursa Major.

Though not visible without a telescope, SN1993J is the brightest supernova to appear above the northern hemisphere in decades. A review of previously obtained images of M81 shows that SN1993J was once a red supergiant. After exhausting its nuclear fuel, the star collapsed and exploded. Now, as the ensuing shock wave moves outward, it plows through gas cast off by the star in past centuries. This gas crackles with energetic X-rays bearing information about SN1993J's chemical composition and evolution.

García discovered the supernova around the same time that astronomers activated Japan's new Advanced Satellite for Cosmology and Astrophysics (ASCA). "It's astonishing that we've been this lucky," says George R. Ricker of the Massachusetts Institute of Technology, who helped design one of ASCA's X-ray detectors. Using ASCA and other satellites, astronomers will monitor changes in SN1993J's emissions and perhaps detect the ultradense neutron star that may lie hidden at its center.

## Feds' R&D goals change, no dollar gains

President Clinton sent his first completed budget proposal to Congress late last week. Overall, the \$1.52 trillion federal spending blueprint includes essentially no increase for research and development (R&D) in fiscal year (FY) 1994, which begins Oct. 1.

"When the heavy focus must be on deficit reduction, there is no one [and] no program that fully escapes," explained Presidential Science Adviser John H. Gibbons at an April 8 press briefing.

The President's spending plan constitutes anything but a rubber stamp of the past two administrations' research agendas. For instance, Clinton would have several agencies — notably the Department of Energy (DOE) — dramatically pare long-standing science and engineering efforts to finance new initiatives.

This major tailoring of the nation's spending plan may help explain why Clinton delivered his proposed budget to Congress some four to eight weeks later than customary (even after accounting for a change in administrations). Moreover, many details of that budget proposal remain sketchy. For instance, even early this week Gibbons could not issue budget details for the five major inter-agency research efforts organized under the Federal Coordinating Council for Science, Engineering, and Technology (FCCSET), which he chairs. These pro-

grams investigate such important interdisciplinary problems as climate change, advanced computing, and advanced materials processing.

Under the President's budget, total federal R&D spending would increase \$2.03 billion, or 3 percent, next year — to nearly \$75.6 billion. This increase disappears, however, if one subtracts the 3.1 percent inflation rate that the Office of Management and Budget (OMB) now projects for FY 1994 (see chart).

Indeed, when OMB tallies final, inflation-adjusted R&D outlays for FY 1993, they will probably show a decline of 2 percent from FY 1992, according to a March 17 report by the Congressional Research Service. (Percent changes for all subsequent FY 1994 figures have been adjusted to reflect OMB's inflation estimate.)

In recent weeks, Clinton has described basic research and several technology initiatives as fundamental to his administration's plans to increase U.S. competitiveness in the global marketplace and to create new jobs. In the 1,478-page budget document released last week, Clinton cites increased partnerships between federal researchers and industry as the cornerstone of this proposed compact between science and the economy.

"We have been wonderful in America at creating Nobel prize winners," says Com-

merce Department Secretary Ronald H. Brown. "We haven't been very good at turning that technological innovation into commercialization and therefore into profits for our businesses and industries, and jobs for our people. We intend that to be the focal point in the future."

The President's budget proposes modest shifts in the balance between defense and civilian R&D. Defense spending would decline 2.1 percent, to 58 percent of the total federal R&D budget. Clinton's stated goal is an eventual 50:50 split between defense and civilian R&D. In the coming year, defense spending on basic research would take a bigger hit (13.1 percent) than spending on applied programs (2.1 percent).

**Big science:** Clinton proposes spending \$2.3 billion next year for Space Station Freedom, together with several new technology initiatives within NASA. How much of this will actually finance Freedom's continuing development will remain undetermined until NASA completes a cost-cutting redesign, expected by June 1 (SN: 4/3/93, p.218).

Vying with the space station for that \$2.3 billion kitty, says NASA Administrator Daniel S. Goldin, would be programs that focus on development of advanced launch vehicles, aeronautics technology and flight programs, scientific Earth satellites, and deep-space programs.

Asserts Goldin, "For every nickel we take out of the space station, we will be able to make technology investments [for] the future."

Clinton would give the Department of Defense's Strategic Defense Initiative — the so-called Star Wars defensive shield — a comparatively minuscule increase of \$35 million next year. After inflation, this translates into a 2.3 percent decline from last year's \$3.73 billion.

Other large programs in basic research fared considerably better. The Human Genome Project, funded jointly by DOE and the National Institutes of Health

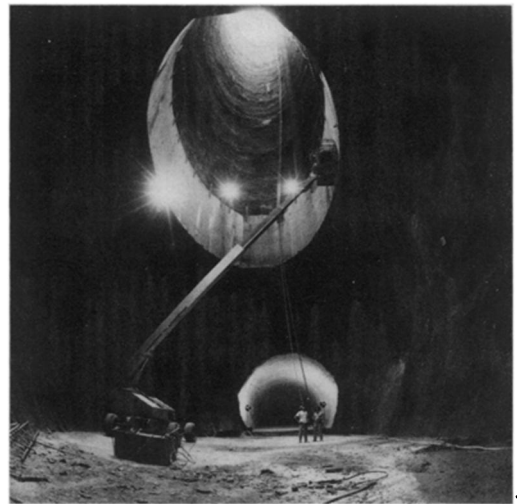
(NIH), would receive an increase of \$36.4 million, or 17.9 percent, in 1994. Funding for the Superconducting Super Collider (SSC), which supporters say will further unlock the structure of matter, would increase by \$125 million, or 21.1 percent. The federal government has already spent \$1.56 billion on this 56-mile-long, magnet-filled particle racetrack (SN: 2/27/93, p.143).

**Technology:** Reflecting the new emphasis on bringing research to commercial development, funding for technology will soar. The administration has slated a \$151 million increase next year, a boost of 36 percent, for the Commerce Department's National Institute of Standards and Technology (NIST), which funds many such programs. NIST's budget would climb even more dramatically in future years — to \$1.4 billion by 1997, more than triple its current annual funding.

Most of this bonanza would go into NIST's Advanced Technology Program (ATP), which provides grants for U.S. companies to experiment with high-risk, big-payoff developments. It's "a bottom-up program with innovation and creativity coming from the private sector and with government serving as a vehicle to encourage that innovation," says Brown.

Indeed, Clinton would double ATP's spending, to \$132 million, next year. That money should triple the 60 projects ATP currently supports. The administration hopes to increase the program's budget to \$700 million by 1997.

The President proposes spending more than \$1 billion next year for development of "information superhighways" — a 23 percent increase over FY 1993. Multiple agencies will receive funding through FCCSET's High Performance Computing and Communication Pro-



SSC Laboratory

Access shaft excavated for SSC tunnel.

gram, which aims to develop compatible computer and telecommunications systems for use in a high-speed network. The National Science Foundation's (NSF) share would climb by \$40 million, or 11.9 percent, and NIST's by \$25 million, or double what it received for the program this year.

Research to develop new materials — such as "smart" materials, nanostructures, and ceramic coatings — would gain support through FCCSET's Advanced Materials and Processing Program. NIST's share would climb \$11.6 million — a boost of 30 percent — next year.

To foster the spread of new technologies, the administration wants another \$12 million — an increase of 63 percent — to create more Manufacturing Technical Centers (MTCs) and to establish new, smaller outreach centers. NIST now supports seven regional MTCs — the industrial counterpart of the Agriculture Department's extension service. Clinton hopes to have more than 100 MTCs in service by 1997 to help small- and medium-size businesses modernize their production processes.

**National Science Foundation:** The President would increase NSF's total budget to \$3.18 billion next year. Exactly how big an increase that represents depends on the outcome of a struggle in the Senate over the President's economic stimulus package; that package would provide NSF with a supplemental infusion of \$207 million this year.

Assuming that NSF receives the full FY 1993 supplemental appropriation — \$197 million of which would flow directly into research — the R&D share of its 1994 budget would rise by 4.2 percent. Without the money in the stimulus package, its R&D budget would rise 15.5 percent over 1993's appropriation. (All subsequent figures on NSF's budget assume the agency will get the total supplement now contained in Clinton's stimulus package.) NSF also plans to strengthen programs

R&D FUNDING				
Budget Authority (in millions of dollars)*				
Department or Agency	FY 1992 actual	FY 1993 estimate	FY 1994 proposed	% Change: 1993/1994**
DOD-military	\$37,418	\$38,793	\$39,301	- 1.8
Health and Human Services (National Institutes of Health)***	10,138 (9,704)	10,378 (9,911)	10,704 (10,191)	0 (- 0.3)
NASA	7,712	8,007	8,667	+ 5.1
Energy	5,954	5,981	5,877	- 4.8
National Science Foundation	1,846	2,069	2,221	+ 4.2
Agriculture	1,335	1,336	1,365	- 0.9
Commerce	545	562	731	+27.0
Transportation	540	656	727	+ 7.7
Environmental Protection Agency	494	508	548	+ 4.8
All other	2,071	2,012	1,953	- 6.0
<b>R&amp;D total without facilities</b>	<b>68,053</b>	<b>70,303</b>	<b>72,093</b>	<b>- 0.6</b>
R&D facilities	3,903	3,259	3,498	+ 4.2
<b>R&amp;D total with facilities</b>	<b>\$71,956</b>	<b>\$73,562</b>	<b>\$75,591</b>	<b>- 0.3</b>

\*Derived from OMB data; figures reflect rounding.

\*\*After accounting for OMB's projected FY '94 inflation rate of 3.1%

\*\*\*Breakout of NIH figures from HHS total

Continued on p.251

in science and engineering education at all levels, including efforts to increase the participation in research of women, minorities, and people with disabilities. For example, a new education initiative would funnel \$3 million per year to each of six institutions attended primarily by students from minority groups.

Reflecting the administration's commitment to paving information super-highways across the nation to stimulate commerce, Clinton proposes increasing NSF's funding of computer science and engineering by \$33.1 million, or 9.5 percent. This is by far the largest increase bestowed on any of NSF's basic-research divisions.

**Biomedicine:** NIH would receive \$10.7 billion, an increase of 3.2 percent over this year's spending, under the proposed Clinton budget. This total includes spending on R&D and improvements of the institutes' facilities. While continuing to support core programs of general biomedical research, Clinton's request places new emphasis on several key areas, says Donna E. Shalala, secretary of the Department of Health and Human Services, which oversees NIH.

For instance, with AIDS increasing among women, children, and teenagers, Clinton proposes spending 21 percent more on AIDS research in FY 1994, for a total of \$1.3 billion. He would also budget \$421 million for breast cancer research next year, more than twice this year's \$205 million. Asked why the big increase, Gibbons said: "All you need to do is look at the mortality figures." The American Cancer Society estimates this cancer now kills 46,000 U.S. women each year.

Finally, the new budget proposal would give higher priority to a scourge health officials thought they had conquered: tuberculosis. A resurgence of TB, caused especially by drug-resistant strains of bacteria, has alarmed public health officials (SN: 2/6/93, p.90). The \$46 million slated for research on TB would increase current NIH spending on this disease by 27.8 percent.

**Space sciences:** What looks like a 5.1 percent increase in NASA's 1994 R&D budget would actually represent a belt-tightening for the space agency, NASA officials say. Referring last week to five-year projections contained in last year's budget request, Goldin pointed out that his agency has now slashed \$23.8 billion from those figures. One-third would come from cuts in the space station's budget through 1998.

As part of its priorities shift, NASA plans to increase the budget for applied research in aeronautics by almost 15 percent in FY 1994 – to \$1.02 billion. The revised plan would support more technology development in high-speed supersonic transport; subsonic, long-haul aircraft; and remotely piloted craft.

Space program researchers will be asked to seek more terrestrial spin-off technologies that might help boost U.S. economic competitiveness. In the future, says Goldin, spin-off technologies will be "just as important as the basic mission."

NASA has even revised some basic-science projects. Once planned as a single spacecraft, the Advanced X-ray Astrophysics Facility will now consist of two spacecraft – one for imaging and one for performing high-energy, high-resolution spectroscopy. Goldin says the change should save \$300 million on the project's estimated \$2.1 billion price tag.

**Energy:** "For the past 15 years, [DOE's] major function has been to produce nuclear weapons to defend our national security," DOE Secretary Hazel R. O'Leary told reporters last week. But with the end of the Cold War, DOE must undergo a restructuring – indeed, "re-inventing" – she said, "to mirror the priorities of a changed world."

Weapons activities will be redirected toward programs that focus on dismantling warheads and cleaning up wastes at facilities that formerly made bombs. Not surprisingly, last week's budget proposal would cut DOE's 1994 defense funding by 22 percent – or \$1.3 billion.

While the administration would continue R&D to support today's commercial nuclear plants, it would end development of the next generation of reactors, including the "inherently safe" Integral Fast Reactor project (SN: 1/26/85, p.60) that a National Academy of Sciences study last year designated as DOE's most important nuclear-research priority. By May 1, DOE plans to begin shutting down all three experimental reactors at Argonne National Laboratory's Idaho site, together with fuel-manufacturing and hot-fuel-examination facilities there.

Argonne's only Idaho nuclear program slated to survive is a facility being renovated to produce fuel rods containing actinides, which would test whether these heavy elements from spent fuel could be "burned" to yield power (SN: 3/20/93, p.186). Because it will lose its facility for burning the experimental fuel when it shuts down the Integral Fast Reactor work, DOE now plans to fly fuel rods to Russia for testing in one of that nation's plutonium-burning reactors.

Though DOE's budget for solar and renewable-energy R&D would climb 27 percent, that increase comes almost entirely from a 29.4 percent hike slated for solar research. Solar programs would then account for more than three-quarters of that division's \$327.2 million in activities. R&D on energy efficiency and conservation would climb 32 percent next year – to \$788.6 million. The fusion program's projected increase of \$7.9 million would not keep pace with inflation. And coal R&D would fall \$47.3 million – a drop of more than 31 percent.



Men assembling a device for separating actinides from used reactor fuel. This program is the only phase of DOE's advanced reactor R&D that would survive under Clinton's budget.

**Global change:** Since its establishment in 1990, the U.S. Global Change Research Program has enjoyed a steadily increasing budget. Next year would continue that tradition; Clinton proposes increasing its funding 13 percent – to \$1.5 billion. The program conducts and coordinates research among 10 federal agencies and the Smithsonian Institution.

NASA's costly satellite program would continue to account for the lion's share of this budget. Heading NASA's list for global change R&D: \$505.4 million for building a satellite fleet called the Earth Observing System (EOS) and an Earth-bound system to process the unprecedented volume of data when these craft begin to fly, at century's end. The 1994 budget request for EOS represents a 28 percent increase from this year, reflecting a surge in costs as the construction process kicks into high gear.

Until now, the global change program has stressed basic research aimed at understanding how Earth's climate works. This year, Congress will evaluate whether the program adequately addresses some of the questions that policymakers need to consider, such as what impacts global change might have.

Other notable proposals in the budget:

- \$40 million in 1994 to support NASA's Gravity Probe B, a physics experiment that will attempt to verify theories of relativity.

- \$39 million to begin developing a \$2.7 billion Advanced Neutron Source at Oak Ridge (Tenn.) National Laboratory. This experimental reactor would permit studies of materials' properties and lessen U.S. dependence on foreign sources of isotopes for medicine and research (SN: 8/1/92, p.68).

- A 1 to 13 percent decrease in all Environmental Protection Agency R&D divisions but one – the "multimedia" program, which studies environmental problems that involve land, air, and water. This program would increase 50 percent next year, to \$217.6 million.

– D. Pendick, J. Raloff, and staff reports