surveillance at the Centers for Disease Control and Prevention ($86 million).

In addition, the Administration would like to set aside $1.464 billion for "critical infrastructure protection and computer security," which Clinton said is 40% more than the government now spends in this area. Most of the money would pay for applied research on computer security through the Department of Defense. About $3 million would fund new computer science scholarships, Clinton said, to create a "cyber-corps" of electronic network defenders.

Congress seems likely to approve, or even increase, the amount of funding Clinton proposes to spend on antiterrorist projects, according to Representative Curt Weldon (R–PA). Weldon, chair of the House armed services subcommittee on research, says he has been "hammering" on the Administration to support civilian defense programs like these. "While I welcome the statement by the president," Weldon says, "it's about time the White House got on this bandwagon." –ELIOT MARSHALL

COMPUTING

Gore Presents Plan to Spend $366 Million

ANAHEIM, CALIFORNIA—The field of computing is chock-full of acronyms, from RAM to Y2K. Last weekend the Clinton Administration coined another one: IT^2, to describe its plan to boost basic research in information technology. Speaking here at the annual meeting of the American Association for the Advancement of Science (AAAS, the publisher of *Science*), Vice President Al Gore unveiled details of an initiative that would add $366 million to the $1.5 billion already in the federal budget this year for information sciences, a 28% increase. Next week the Administration will submit the proposal—dubbed Information Technology for the Twenty-First Century, or IT^2—to Congress as part of its fiscal year 2000 budget proposal. Gore's preview was part of a deliberate series of leaks designed to highlight key initiatives in the president's budget (also see p. 611).

The widely anticipated plan (*Science*, 15 January, p. 302) is the White House's response to an August 1998 report from a presidential task force that urged greater investment in the kind of basic computing that produced the Internet and other digital breakthroughs. The task force recommended an increase of $1 billion over 5 years. Gore's announcement "did a remarkable job of responding to our report—I'm optimistic we can convince Congress it's the right thing to do," says Ken Kennedy, a computer scientist at Rice University in Houston, Texas, and a co-chair of the panel. But Republican leaders in Congress, although likely to support the concept, may well reshape the details to avoid giving Gore an accomplishment he can tout on the campaign trail.

In his speech, Gore said the new money is needed to bolster long-term research neglected by companies. "We must do more to use science and technology to sustain our prosperity," he said, adding that the Administration also supports another 1-year extension of a $2.4 billion tax credit for companies that invest in R&D.

If approved, the majority of IT^2 funds are slated for peer-reviewed university research aiming to create machines and software that could run at speeds exceeding 40 teraflops—or 40 trillion calculations per second—by 2003. The money would be divvied up among

CREDIT: AP

Challenge grants. Vice President Gore announces IT initiative at AAAS meeting.

NEXT STEP FOR INFORMATION TECHNOLOGY (IN $ MILLIONS)

Agency	Software, etc.	Supercomputers	Ethical issues	Total
NSF	$100	$36	$10	$146
DOD	100	0	0	100
DOE	6	62	2	70
NASA	18	19	1	38
NIH	2	2	2	6
NOAA	2	4	0	6
TOTAL	**$228**	**$123**	**$15**	**$366**

ScienceScope

Stem Cell Switcharoo Senator Arlen Specter (R–PA) now says he won't hurry to lift the controversial ban on federal funding of human embryo research. In an attempt to accelerate promising studies of human stem cells, Specter's staff had drafted a bill to end the legal taboo against using embryo tissue from private fertility clinics in taxpayer-funded labs. It would have given these labs direct access to "spare" frozen embryos, which are the source of one type of stem cell. But at a 26 January hearing, Specter suggested he will shelve the bill now that the Department of Health and Human Services, parent of the National Institutes of Health (NIH), has announced that stem cell research doesn't violate the ban (*Science*, 22 January, p. 465). Scientists hope this new interpretation will enable them to work with privately developed cells, which they aim to coax to grow into an array of transplantable tissues.

Curiously, Specter's cautious approach—which would prevent a contentious debate over the ban—is welcomed by an odd couple: the U.S. Catholic Church and members of the American Society for Reproductive Medicine (ASRM). The clerics like the status quo because it continues the funding ban, which has been attached as a "rider" for several years in succession to NIH appropriation bills. ASRM members favor it because the current rider expires with the 1999 appropriation in September. There is a chance, at least, that Congress will decide not to renew the ban. From their point of view, no law would be better than an "improved" law.

Mix and Match A prominent Japanese scientist has added his voice to the rising international chorus calling for stronger links across academic disciplines. Hiroyuki Yoshikawa, president of the powerful, independent Science Council, has been talking up the idea of mixing social scientists into projects that have broad implications for the public. Cloning experiments, for example, might add ethicists to the usual mix of biologists, while public health experts might join nuclear fusion teams.

The idea is to look at research "from a very wide point of view," Yoshikawa says. His "very important" ideas will get a hearing during an upcoming review of Japan's R&D policies by the Council for Science and Technology, says Hiroo Imura, former president of Kyoto University and a member of the panel, which advises the prime minister.

six agencies led by the National Science Foundation (NSF), the Department of Energy (DOE), and the Department of Defense (DOD) (see table on previous page) to support research in three categories. The largest chunk—$228 million—is slated for research on new computer and software architectures to help people interact with computers and make sense of vast stores of information housed in complex databases, such as those involved in predicting weather. Another $123 million would go to develop advanced computers needed to propel research in other areas of science, including earthquake prediction, materials simulations, and modeling the evolution of the universe. Some $15 million is being set aside for research on the ethical implications of the information revolution, including data privacy issues. About 60% of funds will go to university research, says DOE research chief Ernest Moniz; the rest will go for peer-reviewed projects in industry and the national labs.

Scientists hoping to exploit massive new sources of computing power are welcoming IT^2. "Anything that would move forward the forefront of computing would help genome efforts," says J. Craig Venter, president of Celera, a Rockville, Maryland–based company hoping to sequence most of the human genome in the next 2 years. Venter points out that more powerful supercomputers are needed to handle data-intensive tasks, such as analyzing the human genome sequence. "We're talking about completely new ways of computing," adds Jane Alexander, acting deputy director of the Defense Advanced Research Projects Agency of DOD.

Although White House officials are touting the funds as "new money" that won't require cuts in other science programs, they have yet to explain how they will pay for the increases under increasingly tight budget caps. They are also fuzzy on which agency will direct the program. The presidential task force had recommended designating NSF as coordinator of IT research spending, but some agencies chafed at that idea. Gore announced that NSF's head of computing will lead a White House working group coordinating the initiative and that a second panel will report to the Administration's National Science and Technology Council. But each partner agency is expected to retain control over its own budget.

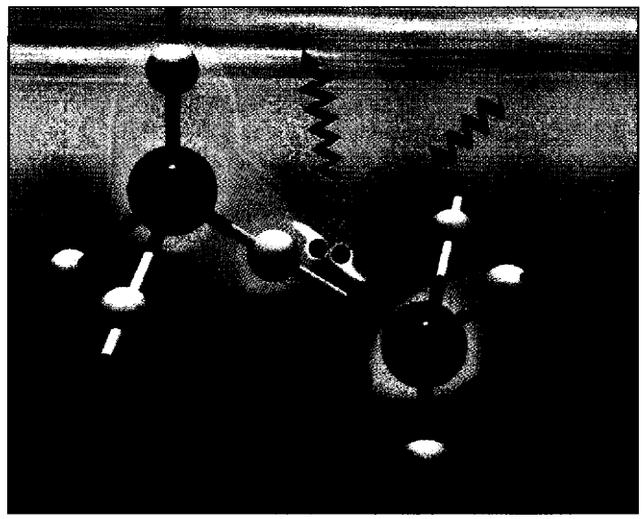
It's also unclear whether Congress will climb aboard the IT train—or whether it will prefer to construct its own version. "There's a good chance" that IT^2 will gain bipartisan support, says Representative Vernon Ehlers (R–MI). "But we need to learn about the details first and find out how they plan to pay for it."

–ROBERT F. SERVICE AND DAVID MALAKOFF

CONDENSED MATTER PHYSICS

Getting to the Bottom of Water

With the help of one of the world's most powerful x-ray sources, a team of researchers from the United States, Canada, and France has answered a simple question about a commonplace substance: What holds water together? In 1935, the Nobel Prize–winning chemist Linus Pauling suggested that the standard picture of electrostatic attractions—so-called hydrogen bonds—joining water molecules in water and ice may not be complete. He proposed that the influence of the strong "covalent" bonds within each water molecule leaks into the hydrogen bonds and lends a hand in binding one molecule to the next. More recently, quantum theory confirmed Pauling's view, and now researchers have probed the bonds in ice with intense x-rays and found that he was right.



Pulling together. Covalent bonds (darker yellow clouds) in water spread their influence into intermolecular hydrogen bonds (lighter yellow clouds).

The result, reported in the 18 January issue of *Physical Review Letters*, will allow researchers to refine their models of water and ice assuming that the bonds between molecules are part covalent and part electrostatic, says team member Phil Platzman of Lucent Technologies' Bell Labs in Murray Hill, New Jersey. "It is a nice piece of physics, and their experiment suggests that the theory must be very good," says David Clary of University College London.

The conventional picture of water molecules holds that the two types of bond are entirely separate. In a covalent bond, two atoms each donate one electron to a shared pair that no longer belongs to either atom alone, but occupies a single orbital common to both. In a water molecule, however, the sharing is not 50–50. The oxygen hogs the electron pair, leaving the positively charged nuclei of the hydrogen atoms exposed. Hence water molecules are "polar," and the positive hydrogen atoms of one molecule are attracted to the negative electron cloud around the oxygen atom of another, forming weak hydrogen bonds that, in theory, involve electrostatic attraction only and no electron sharing.

But this tidy classical picture of the hydrogen bond does not square with the quantum mechanical depiction of covalent bonds. Pauling and others since have predicted that the electrons in the covalent bonds should spread out into the hydrogen bonds. Last year, researchers from Bell Labs, Canada's Steacle Institute for Molecular Sciences in Ottawa, and the European Synchrotron Radiation Facility (ESRF) in Grenoble, France, set out to see if they could settle the matter. Their strategy relied on Compton scattering: bombarding the bonds with photons and analyzing how much energy their electrons absorbed. The chance of hitting the bonding electrons is small, but with the powerful flux of x-rays from ESRF, a new third-generation synchrotron source, the researchers hoped to get a detectable number of hits. "This experiment could not have been done 5 years ago," says team member Eric Isaacs of Bell Labs.

The researchers directed an intense, needle-sharp beam of x-ray photons with a precisely defined energy onto a tiny sample of specially prepared ice. A detector placed close to the beamline counted photons deflected backward and measured their energy. The energy distribution indicated how much energy the photons lost to electrons in the sample. The team counted photons for 23 hours, then reoriented the ice crystal and repeated the operation.

One orientation was chosen so that the hydrogen bonds, held fixed by the crystal structure of the ice, were parallel to the incoming beam; the other put the hydrogen bonds at an angle to the beam. If the bond had been purely electrostatic, there would be no difference in the energy profiles. If, however, the hydrogen bonds are partly covalent, there would be shared electrons in the bond which would behave as quantum-mechanical waves and when one energy

CREDITS: ISAACS *ET AL.*, *PHYSICAL REVIEW LETTERS* **82** (3) (18 JANUARY 1999)