

"People focus very narrowly on the megaflop rate of the processor," says Massachusetts Institute of Technology chemical engineer Gregory McRae, who heads an NSF-funded Grand Challenge project that models pollution in cities. "What's missing is how you go about reducing the elapsed time to solve a problem, which requires software, access, training, and the support structures that go with that." That combination of factors, says Princeton cosmologist Jeremiah Ostriker, who models galaxy formation, another Grand Challenge, provides an attractive bottom line for scientists. "You can solve problems at these places that you couldn't solve any other way," he says.

But even staunch supporters concede the evolution of high-performance computing raises serious questions about the centers' purpose. "The technical case [for the centers] is less clear," says theoretical biophysicist Peter Wolynes of the University of Illinois, who helped start the Illinois center. With the growth of state supercomputer centers, the centers are no longer the only places to do high-performance computing. The growing power of workstations, linked over high-speed networks, is approaching the capabilities of mainframe supercomputers. And the need for software to operate newer, parallel-processing supercomputers has led some scientists to suggest that NSF should spend its money in other aspects of computing.

At the same time, backers take heart from a succession of positive reviews of the centers. Most recently, a 1993 advisory panel on high-performance computing headed by Harvard University physicist Lewis Branscomb concluded that even an open competition among the supercomputing centers would be disruptive. Instead, it recommended that their contracts be renewed. An advisory panel to the computing directorate agreed, as did an internal review by NSF officials.

But science board members say the political climate in Washington has changed since then. The report "was written when there was still a feeling there would be growth in the NSF budget," says John Hopcroft, dean of engineering at Cornell University, citing the Branscomb panel's recommendation for a doubling of funding for workstations. "Given the new budget realities," says Hopcroft, the board is now asking itself, "What are the choices that we should make?"

One idea before the task force is to give researchers "green stamps," or vouchers, that

could be exchanged for time on any supercomputer. NSF would still foot the bill, but the money would come out of individual programs, not the supercomputing budget.

Last month NSF was encouraged to consider the idea in a report by a National Research Council panel reviewing the federal High-Performance Computing and Communications initiative, a \$1 billion program of which the NSF centers are a part. That panel was chaired by Frederick Brooks, a computer scientist at the University of North Carolina, who advocated the use of such green stamps in the 1980s while a member of the

science board.

Not everyone loves the idea, however. "These researchers shouldn't have to go around begging and making local deals," one center administrator told *Science*. "These are world-class scientists who have every right to command the resources that they need." And some scientists worry that the new arrangement would inevitably reduce NSF's total investment in high-performance computing: "It would be disastrous to reduce the amount of supercomputing time available to scientists," says Peskin, "and I think it's likely that any reorganization will have that effect."

The task force's first step will be to gather information from users, vendors, and the centers themselves; some will probably testify at future public meetings. But Hayes predicts that most of the debate will take place in private. "People don't talk a lot about these various kinds of scenarios because they're threatening to the status quo," he says. And change is precisely what the science board has in mind.

—Jocelyn Kaiser

Jocelyn Kaiser writes for *Science News*.

## NSF'S STABLE OF SUPERCOMPUTING CENTERS

Center	Budget (in millions)	(% from NSF)	# staff	Main Hardware	Highlights
Cornell Theory Center	\$29.1	50	110	512-processor IBM SP2	Focus on massively parallel computing
Nat'l Center for Supercomputing Applications (Univ. of Illinois)	\$30.6	55	215	Thinking Machines CM-5, Convex Exemplar, SGI Challenge	Created MOSAIC, Telnet, and other Internet software
Pittsburgh Supercomputing Center	\$36.1	50	132	Cray T3D parallel linked to Cray C90	First high-speed link of massively parallel and vector machines
San Diego Supercomputing Center	\$24.1	71	100	Cray C90 vector, 400-node parallel Intel Paragon	Graphics and computational biosciences
Budget numbers are for FY 1994 SOURCES: NSF, INDIVIDUAL SUPERCOMPUTING CENTERS					

## HUMAN EMBRYOLOGY

### Japanese Panel OKs IVF Screening

OSAKA—A researcher affiliated with Kagoshima University, in western Japan, has received preliminary approval from a university committee to carry out the country's first genetic screening of in vitro-fertilized human embryos. Kazuhiro Takeuchi, who developed a technique to remove individual cells from a four- to eight-cell embryo to identify its sex, hopes to screen embryos before implantation in cases where mothers are known carriers of X-linked genetic diseases. The parents would then have the option of implanting only unaffected female embryos.

This screening method has been used in the West for several years. Takeuchi himself trained with scientists at the East Virginia Medical School in Norfolk, Virginia, which runs one of the largest IVF centers in the country, the Jones Institute for Reproductive Medicine. Although the U.S. government hasn't supported the development of screening techniques because it has had a de facto moratorium on funding IVF research, the technology is available privately, says Susan Black, senior clinical geneticist at the Genetics and IVF Institute of Fairfax, Virginia.

At Kagoshima, the seven professors and one lawyer on the university committee gave unanimous approval for the screening last week after an 8-month review of Takeuchi's application. (The absence of one member prevented final approval, which is expected to occur at another meeting next week.) The university committee did, however, restrict screening to three X-linked diseases—Duchenne type muscular dystrophy, hemophilia, and fragile X syndrome. The committee also required Takeuchi to obtain informed consent from the would-be parents.

Once the committee's vote is final, Takeuchi will be free to go ahead, for although two Japanese panels oversee applications for gene therapy, there is no national body that regulates genetic screening. Takeuchi welcomed last week's vote, noting that "we have worked for so long to develop these techniques, and now we will be able to help parents who are carriers of these diseases."

—Marc Lamphier

Marc Lamphier is a scientist working at Osaka University.