social encounters and the need to convey more information about oneself to strangers. "Rather than saying it's a new brand of human being, we're saying it's a new rate of social contact," she says. Furthermore, a sudden biological change most likely would have occurred in only one place, Stiner says, whereas ornamentation arose independently in at least three.

The theory is plausible and intriguing, says Frank Hole, an archaeologist at Yale University, but he notes that the finding is only a correlation. "There are other cases where people are living close together and not doing anything like this," he says.

–BEN SHOUSE

Ben Shouse, a former *Science* intern, is an intern at *The Nation*.

Viral Threat to Newborns Under Radar

A common herpesvirus that infects healthy adults but rarely harms them—cytomegalovirus (CMV)—is now being recognized as a major threat to newborns. More than 40,000 children in the United States are infected with CMV at birth each year, and as many as 8000 of them suffer major consequences, including hearing loss and reduced IQ, says clinical researcher Richard Whitley of the University of Alabama, Birmingham.

Speaking here at the meeting, Whitley estimated the national economic loss due to CMV at more than $1 billion a year. Whitley says this makes it one of the greatest health risks for U.S. children—comparable to infectious agents such as *Haemophilus influenzae* that have received far more attention in the past.

CMV infection, which often coexists with HIV, attracted the attention of drug companies in the 1990s. When HIV infection rates were climbing, the pharmaceutical R&D investment in this area increased in parallel. But when more effective combination drug therapies began to reduce HIV incidence, CMV infections dropped in parallel; records show a sharp drop-off in opportunistic CMV infections of the eye (CMV retinitis) in adults starting in 1997. Since then, Whitley and other speakers said, drug companies have been cutting back on support for anti-CMV drugs because the potential market has declined.

The drugs now available for treating CMV, researchers noted, are far from ideal. They cause life-threatening side effects and must be injected intravenously (or in the case of CMV retinitis, directly into the eye). Whitley and several other speakers—including Leroy Townsend of the University of Michigan, Ann Arbor, and Karen Biron of GlaxoSmithKline—described new compounds they are helping develop that might eventually be used as oral medicines to combat CMV. None has yet been approved by the Food and Drug Administration.

–ELIOT MARSHALL

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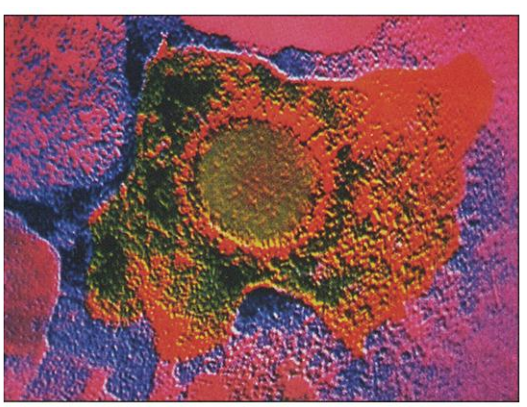

Dangerous. Although cytomegalovirus can harm children, industry research on it is declining.

GEOSCIENCES

'Earth Simulator' Puts Japan on the Cutting Edge

Researchers are eagerly awaiting the debut next month of the world's fastest computer for modeling Earth's climate and interior

YOKOHAMA, JAPAN—Will rising levels of greenhouse gases make northern Europe as cold as Alaska? Current climate models disagree sharply about how a slight rise in atmospheric temperatures could affect the North Atlantic currents that carry warm water from the Caribbean and keep Europe's winters relatively mild. That's because the models' picture of climate is too crude to make accurate predictions based on such fluctuations. But next month, Japanese scientists will start to operate a $310 million supercomputer that can digest a much more detailed model and, researchers hope, spit out a better answer.

Conceived around the time Japan was hosting the Earth Summit that produced the 1997 Kyoto Protocol on climate change, the Earth Simulator—billed as the world's most powerful computer—is designed to do more than help resolve such key questions about global warming. The supercomputer, housed at the Earth Simulator center here, will also add a new dimension to studies of Earth's interior by allowing the first global-scale simulations of the interaction between core and mantle, and between mantle and crust. And, although climate change and Earth's interior get priority, incoming director-general Tetsuya Sato, a computer simulation specialist, says he hopes to make the supercomputer available "for anything that promises to produce epochmaking results."

Scientists are already excited about its potential. "It's really a marvelous present the government has given to Japan's scientists," says Syukuro Manabe, a prominent climate modeler at Princeton University who is an adviser to the project. Geoff Jenkins, head of the climate prediction program at the U.K.'s Hadley Centre in Bracknell, says the computer's "more comprehensive climate models should contribute substantially" to the debate over the effects of climate change.

Groundbreaking work. Director Tetsuya Sato says the computer is available for "anything that promises to produce epochmaking results."

However, some researchers fear that bureaucratic and budgetary squabbles could handicap their work. The center's budget is split between several agencies that have different priorities. The country also has a dearth of senior-level environmental scientists capable of using the facility, and officials have not yet worked out a mechanism

for sharing their bounty with foreign researchers. "The challenge is creating a system [of usage] to make this project worthwhile," says Manabe.

Details, details

There is little doubt about the Earth Simulator's capabilities. At its theoretical peak, the machine's 5120 processors perform 40 trillion floating-point operations per second (teraflops). That is 20,000 times what a typical desktop computer can deliver and 50 times the speed of supercomputers now available to climate modelers in the United States and Europe.

This computing power will put the Earth Simulator at the center of efforts to predict the consequences of global warming. Climate models incorporate data on air temperatures, wind speeds, and precipitation from points at the vertices of rectangular grids placed around the globe. Current models use grids 200 kilometers to 300 kilometers per side. In contrast, the Earth Simulator will use a grid 10 kilometers per side for its ocean model and one 60 kilometers per side for its atmospheric model.

The finer scale, for example, will allow the simulation of mesoscale eddies, currents operating over distances of less than 100 kilometers. Recent research suggests that these local swirls, which are overlooked in current models, play an important role in ocean thermal energy movements, salinity changes, and other factors that could have dramatic effects on the behavior of larger, oceanwide currents. "There are a number of questions beyond the power of currently available computers that we should be able to fundamentally resolve on the Earth Simulator," says Taroh Matsuno, director-general of the 4-year-old Frontier Research System for Global Change, one of several institutes funded by the Japan Marine Science and Technology Center (JAMSTEC) and a primary user of the Earth Simulator.

The new computer could also help climate modelers resolve the embarrassing conflict between models that predict far different outcomes on topics as sensitive as the climate of northern Europe. "If you don't understand why different models give different answers, then predicting climate change is no different from fortune-telling," Manabe says. Resolving conflicts among the different models, he adds, will also allow scientists to send a more consistent message about climate change to policy-makers.

The Earth Simulator is also designed to model movement of Earth's interior more realistically. Until now, says Mitsuhiro Matsu'ura, a geophysicist at the University of Tokyo, researchers have worked with models of either the core or the mantle. The result has been an incomplete understanding of how the core's churning produces Earth's magnetic fields, as well as gaps in understanding interactions between the mantle and the crust, which help drive the globe's tectonic plates, and in modeling earthquake propagation and seismic radiation.

"There were no models which systematically covered processes on a global scale," says Matsu'ura, who since 1998 has worked with a team of earth scientists and computer specialists to develop the software needed to tackle these challenges. "Scientifically, these results are going to be very interesting." The computer will be a shot in the arm for the field, agrees John Rundle, a geophysicist at the University of Colorado, Boulder. "The Earth Simulator will be an extremely valuable facility" in helping geoscientists catch up to their colleagues in condensed matter physics and astrophysics, he says.

On top of the world. The Earth Simulator will give modelers unprecedented computing power to run complex atmospheric and geophysical simulations.

CREDIT: D. NORMILE

Squeeze play

Unfortunately, even a wondrous tool for modeling the complexities of Earth's physical processes can't escape the complexities of political processes within Japan. All three of the Earth Simulator's sponsoring agencies—JAMSTEC, the National Space Development Agency, and the Japan Atomic Energy Research Institute—belong to a class of public corporations that Prime Minister Junichiro Koizumi has vowed to slim down or abolish. The reform is aimed at entities that build and operate toll roads and airports, but all public corporations have been put on a budgetary diet. As a result, JAMSTEC and its partners can provide the center with only half of the $31 million it needs to operate full-time in the fiscal year that begins on 1 April.

To make up the shortfall, the Ministry of Education, Culture, Sports, Science, and Technology hurriedly arranged for a new grants program to fund scientists who develop and use computer models to study climate change and the hydrological cycle. But the rescue comes at a price: Although the program will pay for the rest of the simulator's running costs, the research proposals will be reviewed by a Ministry of Education advisory committee rather than the center's usual reviewers. Sato worries that this bifurcation could lead to redundancies and a failure to tackle the big questions in climate change research. "We're in danger of becoming more like a big time-sharing computer than a mission-oriented facility," he says.

This administrative uncertainty was a turnoff for Manabe, who until last fall ran the global warming modeling unit in the Frontier global change research program. Manabe spent most of his career as a climate modeler at the U.S. National Oceanic and Atmospheric Administration's Geophysical Fluid Dynamics Laboratory in Princeton, New Jersey, before returning to Japan in 1997. But he stepped down after deciding that he lacked the contacts and inside knowledge to assemble a good research team or work effectively on a large-scale project. "I think this group should be headed by somebody who has been [in Japan] for a long time," he says.

A shortage of senior scientists is "our biggest problem," admits Matsuno. Four of the center's six program directors also hold half-time university appointments. The lack of depth within the senior ranks makes collaborations with foreign teams even more important, but Sato says it will be a year or more before the center has a policy in place to govern such arrangements.

However, time is the enemy of any cutting-edge research facility. U.S. climate modelers are hoping to gain at least occasional access to a 100-teraflops computer to be completed by 2005 under the Department of Energy's Accelerated Strategic Computing Initiative, and their European colleagues are lobbying for a new E.U. supercomputer that could be as powerful as the Earth Simulator. Matsu'ura says that "producing some accomplishments is a must" before these other facilities come online.

–DENNIS NORMILE