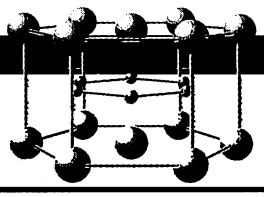


some early *Homo* species had large molars, *Orrorin*'s small molars alone are insufficient to sideline australopithecines: "If big molars exclude *Australopithecus* from a close relationship to *Homo*, they also exclude most of early *Homo*." Others assert that enamel thickness varies so much from one species to another that it may not be a valid measure for evolutionary relationships.

But there are more than teeth for the community to chew on. Pickford and his colleagues also believe that *Orrorin*'s femurs have several features ancestral to later *Homo*. One of the three retains its head, which fits into the pelvis. The team points out that the femoral head—although smaller than that of modern humans—is nevertheless much larger than Lucy's. According to Pickford, this implies that *Orrorin*'s femurs were built to support its upper body in a bipedal stance long before australopithecines arose. He concludes that this makes Lucy—who lived 3 million years ago and had smaller femoral heads—an unlikely human ancestor.

To some experts, *Orrorin*'s femurs push back the earliest evidence for bipedalism by almost 2 million years. "Upright walking goes way back in prehistory," says Ron Clarke of the University of Witwatersrand in Johannesburg. Johanson notes that other features of *Orrorin*'s femurs, including grooves where muscles and ligaments needed for walking on two feet might have attached, could be evidence for bipedalism.

But the femur argument has gotten a lukewarm reception from others. They point out that many male specimens of Lucy's species—*Australopithecus afarensis*—have much larger femoral heads than Lucy's. (Few researchers agree with Senut's contention that these larger specimens belong to another species.) And Alan Walker of Pennsylvania State University, University Park, argues that the lower femur—not found among *Orrorin*'s remains—would be more likely to make the bipedalism case by revealing the structure of the knee.

These conflicting views reflect the fact that experts lack a clear definition of a hominid, says Jeffrey Schwartz of the University of Pittsburgh. But that only means researchers seeking to penetrate our shadowy origins will be debating Pickford and Senut's find for years. Says Leslie Aiello of University College London: "If half of what they are claiming is true, it's fantastic."

–MICHAEL BALTER

CREDIT: ITER

JAPAN

Fusion Scientists Urge Closer Look at ITER

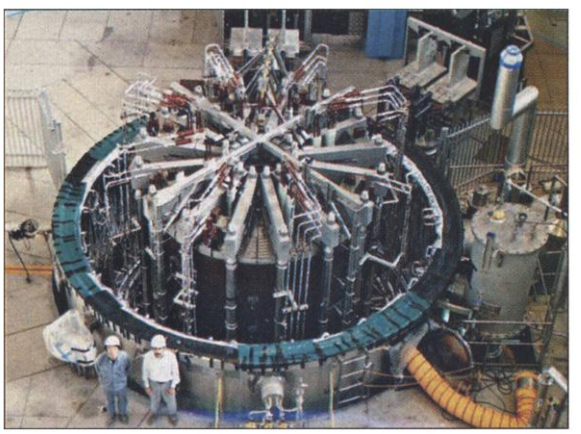
TOKYO—Japan's scientific community has always appeared to be four-square behind the $5 billion International Thermonuclear Experimental Reactor (ITER). But last week, the first cracks in that unified front appeared as the country's leading fusion researchers gathered to discuss the megaprojects's potential impact on the country's fusion research efforts, with some urging a fresh look at other options. "We really should have gotten more involved sooner," says Osamu Motojima, one of the fusion scientists raising concerns about ITER. Scientists are worried that the recent merger of Japan's two major science agencies will put other projects more directly in competition with ITER for funding.

The debate comes as the major ITER partners—Japan, Europe, and Russia—prepare to select by next year a site and budget for the giant machine, which has a troubled history. When researchers first proposed the project in the early 1980s, there was substantial support in the United States and elsewhere for the idea of harnessing nuclear fusion, the process that fuels the sun and stars, to produce energy on Earth. Some government budgetmakers were shaken, however, after scientists estimated that it would cost $10 billion to build a tokamak—a doughnut-shaped device in which a magnetic field contains a superheated ionized gas, or plasma—capable of containing the violent reaction. Despite efforts to cut costs by scaling back the device, the U.S. Congress abandoned ITER in 1998, leaving the three remaining partners to complete the project on their own.

They have since finished basic design work on the slimmer version, flippantly called ITER Lite. Each is now preparing to propose a candidate site for the reactor, with a final decision on the location and funding to come by the end of 2002. Completion is not expected before 2013.

Many Japanese scientists—including a solid majority of the 300 who stayed to the end of the meeting—would like to see the device built in their nation. "I think virtually everyone is convinced of [ITER's] scientific and engineering feasibility," says Kenro Miyamoto, a plasma physicist and professor emeritus of the University of Tokyo. There is also widespread agreement that the next big step for fusion research will be a facility to study an actual burning plasma.

But there is scattered opposition to ITER. And some scientists wonder if it is the best bet for plasma studies. "ITER is one candidate, ... [but] we need to investigate other alternatives," says Motojima, director of research at Japan's National Institute for Fusion Science (NIFS). The institute operates the Large Helical Device, a $650 million facility that confines plasma in a magnetic field created by spiraling coils instead of the plain rings of a tokamak (*Science*, 20 March 1998, p. 1846). Although such helical devices "are a decade or two" behind ITER's tokamak technology, Miyamoto says the government should still fund research into alternatives. And more than a quarter of those at the meeting felt that ITER's scientific details need to be vetted more carefully before the partners move ahead.



Charged up. Japanese scientists have begun to question ITER, shown with a model superconducting coil from the latest design.

Their concerns are fueled, in part, by the January merger of the Science and Technology Agency (STA) and Monbusho, the Ministry of Education, Science, Sports, and Culture. STA traditionally funded big science projects, including ITER, while Monbusho handled virtually all other fusion work at universities and other institutions. The former STA's budget currently provides $139 million for ITER R&D and other projects, while Monbusho spends $108 million on NIFS

and other academic fusion work. But with all fusion funding now coming out of a single bureaucratic pot, some researchers worry that paying up to 60% of ITER's overall cost could squeeze out other research.

"It would really be a shame if Japan does not maintain its current position at the forefront of a broad range of approaches to fusion," says Atsuo Iiyoshi, former director-general of NIFS and now president of the private Chubu University in Nagoya. He notes that NIFS's Large Helical Device has been closing the technological gap with tokamaks, and that Osaka University's Institute of Laser Engineering is making steady progress in using lasers to crush fuel pellets to the point of igniting fusion. These and other university-based research facilities, he says, could define the characteristics of a power-producing reactor.

Adding to concerns, Iiyoshi notes, was the government's decision to eliminate a Monbusho advisory council that had staunchly supported university-based fusion research. "We're in a transition period, and it's hard for researchers to see where decisions are being made," he says.

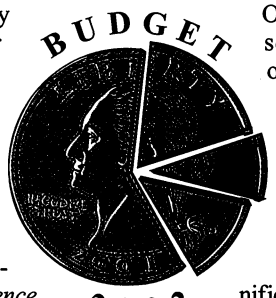
Where the discussion will lead is not clear. Shuichi Takamura, a Nagoya University electrical engineer and a key organizer of last week's meeting, says research leaders hope to issue some sort of report. "We're still discussing what the next step should be," he says. Iiyoshi suggests that any decision on ITER be delayed for half a year or so to allow the Japanese government to work out a comprehensive strategy for fusion research.

But with the government still firmly backing ITER, further delays are unlikely. Miyamoto predicts that the situation "will be resolved within a couple of months." That means Japan's fusion science community must act quickly if it wants its voice to be heard. **–DENNIS NORMILE**

2002 SPENDING

First Bush Budget May Put Science on Diet

The Bush Administration's first budget request to Congress may leave many scientists feeling a little flat. White House officials will release a preliminary spending proposal next week for the 2002 budget year that is expected to boost biomedical and military science but hold down new spending at the National Science Foundation (NSF), NASA, and the Department of Energy (DOE). Rumors about the plan, which White House officials were still assembling as *Science* went to press, have alarmed some science groups and members of Congress, who were expecting spending hikes for nonbiomedical science as well.



CREDIT: (TOP) M. PELLEGRINI *ET AL.*

"It looks like the budget's starting point is not going to mean boom times for science," says David Goldston, staff director for House Science Committee chair Sherwood Boehlert (R–NY). "The way [the proposal] is unfolding raises concern," adds Senate aide Cheh Kim, who works for the appropriations subcommittee that oversees the budgets of NSF and NASA. That panel is led by Senators Kit Bond (R–MO) and Barbara Mikulski (D–MD), who last year launched a campaign to help others catch up to recent increases in biomedical research spending by doubling NSF's budget, now $4.4 billion, by 2006. The 2002 budget covers the fiscal year that begins on 1 October.

The NSF doubling effort, however, is expected to get little support in the plan that will be released on 28 February. Knowledgeable sources say that the White House whittled down NSF's initial double-digit request to 1%, which the agency then countered with an appeal for a boost of 6% to 7%. The final request will probably fall below the predicted inflationary rate of 3% to 4%, sources predict.

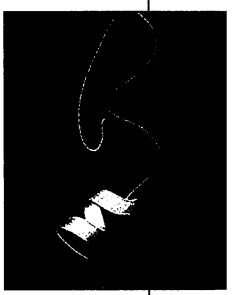
At the same time, NSF director Rita Colwell seems to have salvaged at least a chunk of her plan for a fivefold increase over 5 years in mathematics research. Sources say that the mathematics division may garner up to one-third of the agency's total projected increase for research. "The budget is a disaster for NSF as a whole, but she stood up for mathematics," says one NSF official.

NSF is also expected to benefit from a slice of the president's education initiative. Although most of the media's attention has focused on proposals for testing and accountability for elementary and secondary schools, NSF officials and members of Congress have also lobbied hard for a component that would involve higher education, in particular teacher training, as well as programs to strengthen the country's technological workforce.

Other nonbiomedical science agencies also face stagnant spending. NASA's $14 billion budget will reportedly barely keep pace with inflation. DOE's $3.2 billion Office of Science could get squeezed by an even smaller overall agency increase, as officials channel funds to other Bush Administration priorities, such as weapons technology and improving security at national laboratories. Department of Interior officials are also said to be mulling significant cuts in science programs—such as those run by the U.S. Geolog-

ScienceScope

Going 3D A French biotech start-up plans to launch an international consortium aimed at revealing the three-dimensional crystal structures of 100 cell membrane proteins, many of which could be promising drug targets. The 3-year, $9.3 million project, led by Bio-Xtal in Roubaix, France, will include a bevy of drug companies and four academic labs in France, Germany, and the Netherlands.



Several "structural genomics" efforts are already attempting to automate the atomic mapping of proteins, but this is the first to focus on membrane proteins. The targets will be "G protein–coupled receptors," which help cells sense everything from hormones to energy signals. The receptors are notoriously difficult to study, however, because removing them from the membrane destroys their normal 3D shape. In April, the consortium plans to begin searching for new ways to express, crystallize, and image the proteins. Funding will come from private firms and—if all goes as planned—the European Union.

Structural biologist Aled Edwards of the University of Toronto says the effort is "an excellent idea"—but is certain to be slow.

Bowing Out Biologist Hubert Markl last week said he will not seek a second term as president of Germany's most prestigious basic-science research organization, the Max Planck Society. Markl—a respected administrator who has led the society since 1996 and had been invited by the society's governors to seek a second term—reportedly cited his age (63) in declining to run for another 6-year term. A new president will be selected later this year and will take office in June 2002.

Cottage Industry Hoping to build new bridges between academia and industry, the European Union will help some aspiring postdocs work for 2 years in industrial research labs outside their homeland.

European scientists have excelled at basic research but have done a poor job of reaping profits from innovations, says Sabine Herlitschka of the Austrian Bureau for International Research and Technology Transfer. To bridge the gap, over the next 2 years the Fellows for Industry initiative plans to place a total of 140 postdocs in companies with fewer than 250 employees. Their stipends will be paid by another European fund, and Herlitschka promises the companies will get "access to cutting-edge scientists."