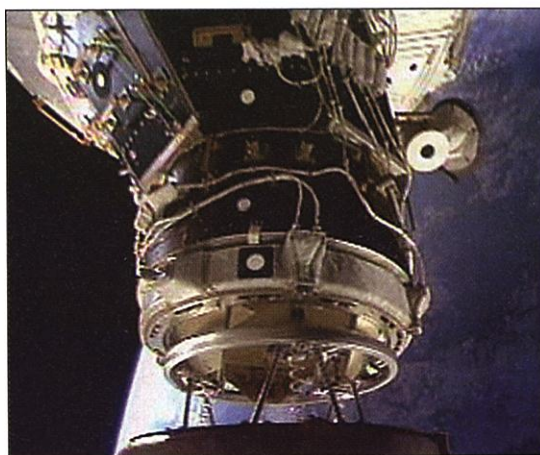


SPACE BIOLOGY

New Cuts in Station Could Spark Walkout

U.S. researchers eager to use the international space station are threatening mutiny if NASA carries out plans to trim facilities and crew in the wake of exploding costs. A biological sciences advisory group has called the proposed cuts a "betrayal of the public trust" that undermines the scientific rationale for the station. Although critics have long questioned the station's likely scientific payoff, what's new about the latest attack is that it's coming from the station's staunchest scientific supporters.

Last month, NASA announced that the station, now under construction, faces a \$4 billion overrun. In response, agency managers plan to cancel a habitat module and a rescue vehicle, and reduce the size of the crew and the amount of power available. Further cuts, such as delaying or canceling a centrifuge module critical for non-human biological research, are pending. Even so, administration officials insist that the \$60 billion station will meet NASA's promise to the science community and its international partners to operate a world-class research facility with a sustained human presence. "We can continue to maximize research," says Joe Rothenberg, NASA's space flight chief.



Destiny diminished. Cutting back on crew size could hamper research aboard the space station's laboratory, Destiny.

Not true, say members of NASA's space station biological research project science working group, made up of a half-dozen outside advisers. "We were [already] at the extreme edge of maintaining a credible science endeavor," writes Martin Fettman, a veterinarian at Colorado State University in Fort Collins and chair of the working group, in a 9 March letter to Rothenberg. If NASA goes ahead with the proposed cuts, the panel adds, "we might as well completely discon-

ScienceScope

Role Reversal Maybe science is bipartisan after all. Last week the Republican and Democratic leaders of the House Science Committee made an unexpected departure from politics as usual on a front-page environmental issue.

During a hearing on climate change science, panel chair Representative Sherwood Boehlert (R-NY, right) took fellow Republican George W. Bush to task for a "misguided and unjustified" decision to drop a campaign promise to regulate emissions of carbon dioxide and other greenhouse gases. "I wish the Administration would have waited to hear from experts" before reversing course, Boehlert said.

But the president's reversal won support from an equally surprising source, Democrat Representative Ralph Hall. A Texan with close ties to the Bush family, Hall said he was skeptical of the global warming threat and pleased that Bush had "clarified his position."

What to make of the exchange? Joked one House aide, "[The panel] is either boldly independent—or just confused."

Energetic Defense California legislators have pulled a new and heavily publicized state research initiative off the chopping block after pleas from the governor and university scientists.

Last week a state budget panel restored \$75 million that Governor Gray Davis (D) has requested for the three California Institutes for Science and Innovation, 2 days after removing the money to bolster an emergency fund to deal with the energy crisis. The new institutes (*Science*, 15 December 2000, p. 2052), which involve scientists at seven University of California (UC) campuses, cover biotechnology and quantitative biomedical research, nanosystems, and information technology and telecommunications. But legislators failed to restore a \$33 million request from the governor to create a fourth institute that would apply information technology to critical societal problems.

"We hope that they will continue to fund this investment," says UC administrator Susanne Huttner, noting that the money must still survive votes later this spring. With the return this week of rolling blackouts, however, it's not clear whether legislators will continue to see the light.



"the courage to recognize diversity in the hominid fossil record."

Experts are unanimous in the opinion that *Kenyanthropus* will complicate efforts to trace the convoluted course of human evolution. This task is especially mind-bending because, beginning about 3 million years ago, hominid species began sprouting like wildflowers across Africa. But for the period between 3 million and 4 million years ago, things had seemed relatively simple. After decades of searching, most researchers had concluded that *A. afarensis* was the only clearly identified hominid in Africa at that time. Winding the clock back farther, a 4-million-year-old australopithecine, *A. anamensis*, seemed a likely ancestor to Lucy. But the new discovery, dated smack in the middle of this critical million years, could put a kink into any straight-lined phylogeny, because it doesn't share key features with either *A. afarensis* or *A. anamensis*. "It certainly puts a big question mark over the status of *A. afarensis* as the sole ancestor" of all later hominids, says Chris Stringer of London's Natural History Museum.

Indeed, just last month, a Paris-based team led by Martin Pickford and Brigitte Senut described a 6-million-year-old candidate hominid from Kenya's Tugen Hills, named *Orrorin tugenensis*, which had small, humanlike molars (*Science*, 23 February, p. 1460). Pickford and Senut argued that Lucy and her large molars could not have given rise to humans. In the *Nature* paper, Leakey's team says that *Kenyanthropus*'s small molars might also sideline *A. afarensis* as a human ancestor. "If the hominid status of *Orrorin* is confirmed, it would support the suggestion that small molar size is the primitive condition," says Leakey's co-author Fred Spoor of University College London. And Lucy co-discoverer Donald Johanson, director of the Institute of Human Origins in Tempe, Arizona, says he isn't surprised that Lucy has a rival in *Kenyanthropus*. "The presence of a single [species] between 3 and 4 million years ago," he says, "just didn't make any sense."

On the other hand, few researchers, Leakey's group included, are suggesting that *Kenyanthropus* necessarily lay on the path to *Homo*. Rather, experts say, the importance of the new discovery lies in its demonstration that the roots of the human evolutionary tree are pretty tangled. "Those of us who have been suggesting that human evolution is more like a bush than a ladder," says Wood, "may not have been far off the mark."

—MICHAEL BALTER

Woods Hole Oceanographic Institution in Massachusetts. "It titillates the imagination." But she's not sure whether to call *Acaenoplax* an aplacophoran, because it is so different from modern ones. To Runnegar, that's part of the attraction. "It gives us a great deal of information about early molluscan evolution that cannot be retrieved from the living biota," he says.

—ERIK STOKSTAD

DARK MATTER

Astronomers Glimpse Galaxy's Heavy Halo

Astronomers deal in light, so dark matter drives them a little crazy. For decades they have watched as the gravitational pull of an invisible hand twirls stars and gas around the fringes of galaxies like a ball on a string. And for decades they have failed to identify the source of the excess galactic gravity. With little to guide them, astronomers have fashioned dark matter candidates out of everything from underweight failed stars to massive subatomic particles that currently exist only in a theorist's imagination.

Now, they have something more to work with. In a paper published online today by *Science* (www.sciencexpress.org), an international team of astronomers claims to have directly spotted the source of at least 3% of all the dark matter in the galaxy: They have identified large numbers of fast-moving white dwarf stars that formed when the Milky Way first flickered to life several billion years ago. And that is just a cautious lower limit. "They could account for up to one-third of it," says team member Ben R. Oppenheimer, an astronomer at the University of California, Berkeley.

"The authors are to be congratulated," says astrophysicist Harvey Richer of the University of British Columbia in Vancou-

ver. "This is a very nice piece of work."

Most of the mass in a galaxy is invisible. The Milky Way's familiar sparkly pinwheel of relatively young stars sits amid an extended spherical halo of older stars and gas. Their combined gravity holds the galaxy together and keeps the stellar pinwheel spinning. Far enough from the center, the pull should eventually weaken and the stars slow down. But they don't. Stars and gas clouds as far as the telescope-aided eye can see continue to orbit at the same speed. The best explanation is that almost 90% of the total mass of the galaxy is an invisible substance spread throughout the halo called, for want of a better name, dark matter.

Tiny clumps of dark matter occasionally pass between Earth and distant stars. The gravitational field of the clump bends light from the star, causing a sudden brightening called microlensing. After spending the last 6 years counting these rare microlensing events, the Massive Compact Halo Object survey has concluded that between 8% and 50% of galactic dark matter is in clumps weighing about half the mass of the sun. But they never actually caught the culprit in the act.

White dwarfs in the halo have long been the leading suspects, says Richer. They are of the right mass, they move fast enough, and they should be quite common. Any star born weighing between one and eight times the mass of our sun sheds most of its mass as it evolves, eventually ending up as a dimly glowing, cold, half-solar-mass white dwarf. But are they common enough? The answer seemed to be no. When the number of nearby white dwarfs in the galactic disk—they can be seen directly because they are closer—was extrapolated to the halo, the total density came up short. Although isolated halo dwarfs had been spotted before, attempts to directly identify a large enough population to explain the microlensing had failed. Part of the reason, it turns out, is that astronomers were looking for the wrong color star.

Contrary to the popular images of red-hot peppers and cool blue ice, hot stars are blue and cold stars are red. So searches for white dwarfs in the halo targeted faint red stars. It was a mistake. The light radiated by a hot white dwarf starts off blue and turns red as the dwarf cools, as expected. But when the dwarf's temperature drops below 4500 kelvin, recent theoretical models by astrophysicist Brad Hansen of Princeton University and others show that molecular hydrogen in the dense, cold atmosphere absorbs the red light and reemits it at higher, bluer frequencies.

The realization led the team to change strategies. First, team member Nigel Hambly of the University of Edinburgh scanned almost 200 digital

ScienceScope

Bright Idea The French government may be rethinking plans to privatize a new materials research center after protests shut down two related devices for nearly a week. The scientists are unhappy with plans to operate as a private nonprofit the \$172 million SOLEIL synchrotron (*Science*, 15 September 2000, p. 1859), which was also the subject of protests last year (right). The structure makes it easier for other nations to participate, but French scientists worry that it will make it harder for them to win jobs at government research centers. To make their point, nearly 100 scientists last week pulled the plugs on two machines, known as SUPER-ACCO and DCI. They also petitioned CNRS, France's basic research agency, to make SOLEIL a "mixed research unit" that can employ public-sector scientists.

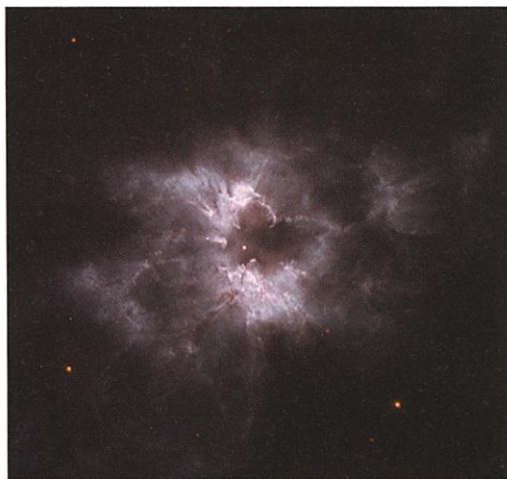
The CNRS appears to be warming to the idea, says protester Pierre Lebasque of LURE, an x-ray lab in Saclay. One compromise would create a public research unit alongside a private management group, he says. Officials have time to mull: SOLEIL won't open until 2005.

No Comment In a rare public dispute, the National Science Board last week thwarted an attempt by its chair, Eamon Kelly, to chide the Bush Administration for neglecting the physical sciences in its 2002 budget proposal (*Science*, 9 March, p. 1882).

It wasn't the content that bothered the board, a presidentially appointed body that oversees the National Science Foundation (NSF). "It's a good statement, and inoffensive," said M.R.C. Greenwood, chancellor of the University of California, Santa Cruz, about a position paper that many board members saw for the first time at the meeting. But Greenwood and others argued that it would be better to wait at least until details of Bush's budget are released in early April. And some thought the less said, the better. "How often do we want to make such statements?" wondered Cornell University administrator Robert Richardson.

Kelly implored the board "to add one more voice to the chorus" calling for larger budgets for NSF and other agencies (see p. 2291). But Greenwood counseled that "voices raised on our behalf are more effective." In the end, the board deferred action until its May meeting.

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Dim prospects. Invisible dark matter may have started out as hot white dwarfs like this one in the middle of planetary nebula NGC 2440.