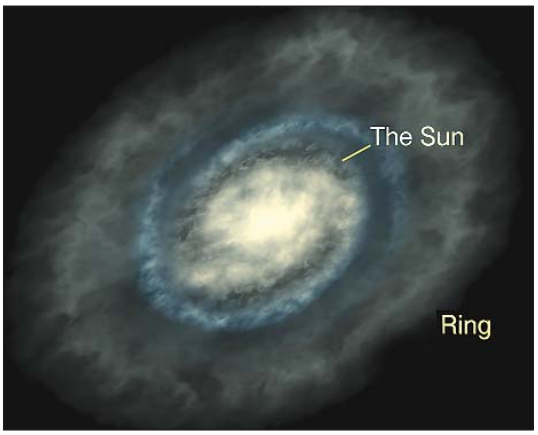
ASTRONOMY

Surveys Spot Ring Around the Milky Way

SEATTLE—Two teams of astronomers rang in the new year by announcing that our galaxy—like Saturn and a certain hobbit—possesses a grand ring of its own. The thick torus of stars, about twice as far from the center of the galaxy as our sun, probably arose after the Milky Way shredded a much smaller neighbor billions of years ago. "This is a vivid smoking gun of the disruption of a satellite galaxy," says astronomer Bruce Margon of the Space Telescope Science Institute in Baltimore, Maryland.

The new ring, described here on 6 January at a meeting of the American Astronomical Society, is a galaxy-spanning structure consisting of hundreds of millions of stars. It had remained hidden because it lies in the plane of the Milky Way's disk, which contains our sun and most of the galaxy's stars, gas, and dust. Two sensitive surveys of broad patches of the sky have now peered through that clutter to expose a procession of stars beyond the disk, embracing the galaxy in a circle about 120,000 light-years wide.



Galactic jewel. New surveys have unveiled a thick ring of hundreds of millions of stars around the outskirts of our Milky Way. The structure is about 120,000 light-years wide.

Astronomers had seen much smaller arcs and ribbons of stars coursing through our galaxy's vast outer halo, a sparsely populated sphere of old stars. Researchers think these stellar streams are the remnants of dwarf galaxies and globular clusters that dissolved in the Milky Way's powerful gravitational field (*Science*, 3 January, p. 62). By using a 3.5-meter telescope at the Sloan Digital Sky Survey's (SDSS's) Apache Point Observatory in Sunspot, New Mexico, astronomers have now identified a band of stars wrapping one-sixth of the way around the galaxy.

The smooth distribution of the stars suggests that a satellite galaxy merged with the Milky Way as long ago as 10 billion years, giving the stars ample time to spread out. Independently, European and Australian astronomers using the 2.5-meter Isaac Newton Telescope at La Palma, Canary Islands, spotted the torus in two other directions, strengthening the suspicion that it girdles the galaxy.

Astronomers have floated other ideas about how the ring arose. Its near-perfect alignment with the Milky Way's disk suggests that the stars in the ring might have spread out from the galaxy itself, says astronomer Annette Ferguson of the University of Groningen, the Netherlands, a member of the Canary Islands team. But SDSS astronomer Heidi Newberg of Rensselaer Polytechnic Institute in Troy, New York, notes that stars in the ring move through space at similar speeds—whereas stars puffed up from the disk would have more-scattered velocities. "We have to assume that this is a group of stars coherently moving together" and with a common birthplace, Newberg says.

–ROBERT IRION

PALEOCLIMATE

Tropical Pacific a Key to Deglaciation

Despite their obvious role as the solar-driven "firebox" that fuels global weather, the tropics have long been neglected by researchers sorting through the ups and downs of climate over the millennia (*Science*, 27 April 2001, p. 660). But now paleoclimatologists are bringing the heat-laden tropics back into the climate system.

In this week's *Nature*, paleoceanographers present the latest and most persuasive evidence yet that the tropical Pacific did not stand idly by as the world melted out of its latest ice age 18,000 years ago. Instead, the tropical Pacific was a participant, if not the dominant driver, in one of the biggest climate shifts of the past half-billion years. "It is a sea change in how we look at climate change," says paleoceanographer David Lea of the University of California, Santa Barbara. "It points to the tropics being a big player."

Giving the tropics their due required all the latest paleoceanographic tricks. Paleoceanographers Katherine Visser of the U.S. Geological Survey in Woods Hole, Massachusetts; Robert Thunell of the University of South Carolina, Columbia; and Lowell Stott of the University of Southern California in Los Angeles went to a climate record likely to hold vital information on any role for the tropics—a sediment core punched from ▶

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ScienceScope

And Then There Were None

The U.S. Department of Energy (DOE) last month quietly ended an exemption that seven civilian science laboratories had enjoyed from certain security regulations involving visiting foreign scientists. From now on, the labs will have to gather and report to DOE more information about non-U.S. citizens who want to use their facilities. "It's a little tedious, but it shouldn't keep anyone away," says Judy Jackson of Fermi National Accelerator Laboratory in Batavia, Illinois, where scientists are getting new security badges and filling out more forms.

The old rules, developed in the wake of the 1999 Wen Ho Lee spying scandal at Los Alamos National Laboratory in New Mexico, required DOE labs doing classified research to screen and track visitors from about two dozen nations, including China and Russia. Officials at the more academic labs—including Fermilab and the Stanford Linear Accelerator Center in California—had successfully argued that the rules weren't necessary in their settings. But on 17 December, after the DOE Inspector General found continuing problems in tracking foreign visitors, the agency announced that it was ending the exemption, to enhance security.

–David Malakoff

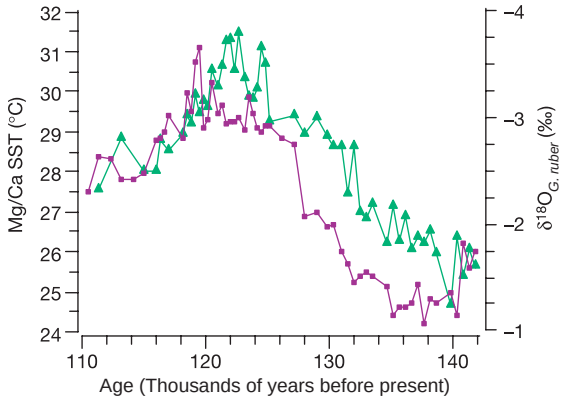
Biosphere 2 Reconsidered

Rumors are flying that Columbia University will end its association with Biosphere 2, a research and educational facility in Oracle, Arizona. The university is mulling the partnership's future, officials say, and administrators have already decided to move one Biosphere-based master's degree program to Columbia's New York City campus.

Built by Texas billionaire Edward Bass in 1990, the 1.3-hectare greenhouse was originally designed as a sealed, experimental ecosystem capable of supporting eight people for 2 years. After the experiment failed, Columbia took over the facility in 1996, eventually signing a 14-year contract to transform its miniocean and landscapes into a center for ecosystem studies (*Science*, 22 May 1998, p. 1183).

The center has produced some interesting science. But high costs and leadership changes at Columbia have apparently prompted a second look. A university spokesperson confirmed that officials are "evaluating our level of involvement in Biosphere" but gave no timeline for decisions. Moving the degree program, she said, was designed to strengthen the home campus.

–Naomi Lubick



Tropics first. Warming of the tropical Pacific (rising green line) preceded and presumably caused ice melting (purple).

the sea floor in the Makassar Strait of Indonesia. The piston core comes from the hottest part of the tropical firebox, called the Indo-Pacific warm pool. A near-record 55 meters long, it contained a detailed, well-preserved record locked in microscopic skeletons of a surface-dwelling foraminifer.

The group members made two kinds of analyses so they could separate the fingerprints left by the melting of the great northern ice sheets from those of the Pacific warming. They measured oxygen isotopic composition, which reflects both varying seawater temperature and seawater salinity. The scientists also determined the ratio of magnesium to calcium in the foram skeletons, a new technique for measuring paleotemperature without salinity's influence. Before the magnesium-calcium technique came along a couple of years ago, paleoceanographers had trouble telling whether tropical warming came first and thus could have driven high-latitude melting. But because the fresh water from the melting ice sheets reduces seawater's salinity globally, the dual measures allowed them to track the start of the western Pacific warming relative to ice melting.

Visser and her colleagues were able to show that the tropical Pacific was both powerful enough and early-acting enough to drive climate change. The warm pool warmed a hefty 3.5°C to 4.0°C at the end of each of the last two glaciations, according to their analysis, not the 1°C to 2°C assumed since the landmark 1976 CLIMAP study. And the Pacific warming began 2000 to 3000 years before melting ever got under way. "That's a very, very important result," says Lea, who in 2000 reported a similar lead of tropical warming over ice melting. Adds Thunell, "It's now obvious to most people that the tropics are important."

Determining exactly how important the tropics were in triggering deglaciation—or in lesser climate swings from decade to decade or millennium to millennium—will require more work. "We have a system in which it is not just one hot spot controlling everything," says Thunell. Other players may include the greenhouse gas carbon dioxide, the deep circulation of the North Atlantic, and, ultimately, changes in where and when the strongest sunlight falls as Earth's orbit changes.

But some meteorologists think that the tropical Pacific might go it alone. In new climate-model simulations by Keith Rodgers of the Laboratory of Dynamical Oceanography and Climatology in Paris and his colleagues, a uniform warming of the glacial tropics by 3°C warms North America's great ice sheet by up to 6°C in summer. In the model, the tropics reach out to high glacial latitudes over a "bridge" of changing atmospheric circulation, much as El Niño does year to year. If researchers can find evidence to support such behavior in the distant past, the tropics will truly have arrived. **–RICHARD A. KERR**

NATIONAL LABORATORIES

UC Ties at Stake in Los Alamos Shakeup

Can this marriage be saved? Top officials of the troubled Los Alamos National Laboratory in New Mexico stepped down this week amid a fraud scandal, stoking rumors that the Department of Energy (DOE) may end the lab's 60-year relationship with the University of California (UC).

Lab chief John Browne announced last week that he and top deputy Joseph Salgado were resigning after deciding that "only a change in leadership" could "restore [the government's] confidence" in managers of the lab, who oversee a $2.2 billion budget and nearly 11,000 employees. Browne, a physicist who's spent 23 years at Los Alamos, has been embroiled in several controversies since becoming director of the science and nuclear weapons research center in 1997. In 1999, the lab came under fire for the government's bungled effort to prosecute physicist Wen Ho Lee for mishandling weapons secrets. In 2000, it suffered a temporary loss of classified information, as well as extensive damage from an accidental forest fire. The latest incident involves the November firings of two internal investigators who had revealed credit-card misuse by employees and the apparent loss of computers and other lab equipment worth millions of dollars.

After each episode, prominent members of Congress and other critics demanded that DOE remove the university as manager of Los Alamos. (UC also runs the Lawrence Livermore and Lawrence Berkeley laboratories in California.) Their criticism builds upon those of some faculty members who have long insisted that the university's stewardship of the weapons labs clashes with academic values. But DOE has repeatedly resisted such efforts to end its UC ties, most recently by extending the arrangement through 2005.



Implosion ahead? DOE Secretary Spencer Abraham is reviewing the University of California's management of Los Alamos National Laboratory.

But the streak could be drawing to a close. The recent problems "have called into question the [university's] ability to run" Los Alamos, DOE Secretary Spencer Abraham wrote in a 24 December letter to UC president Richard Atkinson. Abraham has asked aides to report to him by 30 April on the department's options.

"This could be the beginning of a very messy divorce," says one congressional aide familiar with the issues. But finding another manager willing to take on Los Alamos could be difficult, he and other observers say. The University of Texas has expressed interest in running a weapons lab, but any move could generate opposition from those who say no academic institution is capable of imposing the necessary security requirements. Other possible candidates include companies with defense interests and Battelle Memorial Institute, a Columbus, Ohio–based nonprofit that already manages four of DOE's nonweapons labs.

In the meantime, the 60-year-old Browne says he plans to return to research. The university has named George Nanos, a lab official and retired Navy admiral, to be interim director. **–DAVID MALAKOFF**

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