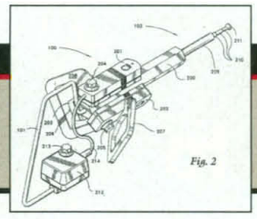
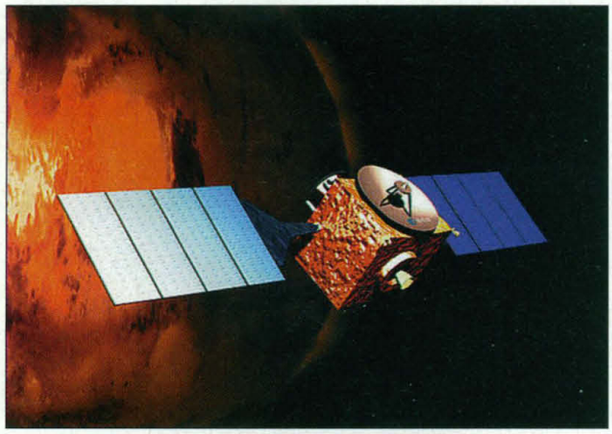


gravity research between 2000 and 2003 as a precursor to science aboard the station, but ministers slashed this program by half.

Even ESA's basic program for space station exploitation only barely won full commitment of funds from member states. Germany, which has accounted for 41% of Europe's contribution, had long been the station's champion, but the new Social Democrat administration elected last year is no friend of the project (*Science*, 5 February, p. 784). Bulmahn says it is time to find ways to interest industry in exploiting the facility. "Industrial involvement on [the station] will be an important task for ESA," she says. Speaking after the meeting, Rodotà told *Science*, "We will stick with the commitments we have made. That is the right decision, but we do not like this station. It is hard to say what the value of such a project is."



Staying in the race. Ministers agreed to a special payment of $44 million to keep Mars Express on track.

When the discussion turned from science to application programs, however, the ministers got out their checkbooks with relish. ESA put forward a new plan for a constellation of navigation satellites called GalileoSat that would allow receivers on the ground to fix their position with millimeter accuracy—a European competitor to the U.S. military's Global Positioning System. As an optional mission, each government can pledge however much it wants to spend, but even the 1-year definition phase of GalileoSat was 50% oversubscribed at the Brussels meeting, and without even being asked some member states, including the usually tightfisted United Kingdom, indicated their willingness to fund the development stage.

The agency's overhaul of its Earth-observation strategy in the 2 years since Rodotà's appointment also won support. Previously, ESA's remote-sensing satellites had been huge technology demonstrators, such as ERS-1 and ERS-2, which did a lot to open up the field of radar remote sensing for civilian users. "These were magnificent beasts," says Southwood, but the launch of ESA's Envisat this year "will mark the end of the great technology demonstrators for Earth observation." Southwood and Roger Bonnet, the agency's science chief, have now drawn up a 5-year program of small application and research missions designed to provide data to a wide cross section of Earth-observation users. The plan won plaudits at the meeting, yet ministers cut ESA's request by 10%. As one U.K. official said at the meeting, "the days of the big prestige projects are over."

–HELEN GAVAGHAN

Helen Gavaghan is a writer in Hebden Bridge, U.K.

ARCHAEOLOGY

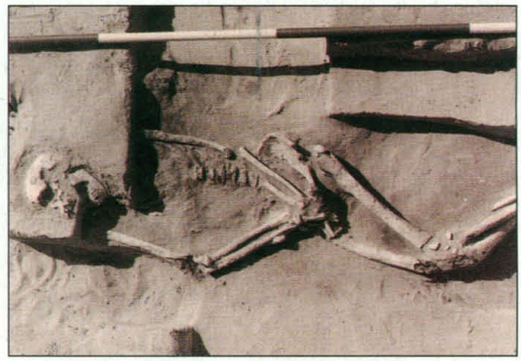
New Date for the Dawn of Dream Time

LAKE MUNGO, AUSTRALIA—Looming over this dry lake bed is a crescent of ancient sand dunes, carved by the wind into miniature canyons and mesas. Built up over tens of thousands of years, the dunes preserve traces of fires made by Aborigines to cook golden perch they once caught in the lake, spear points they used to hunt the kangaroos and other game that crowded Mungo's shores—and now, a team of researchers claims, the oldest human remains ever found in Australia.

In the June issue of the *Journal of Human Evolution*, Alan Thorne of Australian National University (ANU) in Canberra and his colleagues put the age of a skeleton from Lake Mungo at 62,000 years. If correct—and some experts are withholding judgment until they see the paper—the date would mean that human beings had reached Australia tens of thousands of years earlier than some archaeologists thought. It also has implications for the history of modern humans. Many researchers maintain that all modern humans descend from a single population of Africans dating back perhaps 100,000 years; these founders later spread out across the Old World, replacing any humans or hominids they encountered. One of the last places they would have reached would be Australia, so an early date for their arrival would mean an earlier migration than some researchers had pictured—or perhaps an alternative scenario of modern human origins. "If the dates are reliable, the implications are very substantial," says Stanford University's Richard Klein.

The skeleton itself, called Mungo 3, is not a new discovery. In 1974 geomorphologist James Bowler of ANU uncovered the remains of a lightly built man in one of the dunes. Thorne completed the excavation and determined that the body had been ceremonially buried in a grave, with red ocher scattered over it and its fingers intertwined around its penis. Carbon-14 dating initially put its age at 28,000 to 32,000 years old. But in the mid-1980s, as researchers further refined ^{14}C dating techniques, they were able to remove younger organic contamination and push the date back to at least 38,000 years ago.

Some researchers wondered if Mungo 3 might be still older. When organic material gets to about 40,000 years old, so much of its ^{14}C has decayed that it's often difficult to get a precise age. And new dating techniques that can reach beyond ^{14}C had already hinted that human beings were on the continent well before 40,000 years ago. These methods rely on counting the elec-



Man from Mungo. This ancient Australian was sprinkled with red ocher and carefully arranged in his grave.

CREDITS: (TOP) ESA; (BOTTOM) ALAN THORNE

trons knocked into defects in a mineral's crystal structure by natural radiation. Called thermoluminescence and optically stimulated luminescence (OSL), they can measure how much time has passed since a material has been heated in a fire or exposed to sunlight, which "zeroes" the clock by allowing the electrons to fall back into place. Starting in 1990, Richard Roberts of La Trobe University in Melbourne and his colleagues used these techniques to date several rock shelters in northern Australia to between 50,000 and 60,000 years old. But some archaeologists remained skeptical about these old dates, because the techniques are tricky to use and have sometimes produced outlandish ages (*Science*, 10 October 1997, p. 220).

So Thorne and his colleagues decided to date Mungo 3 not only with OSL but also with two other unrelated techniques. Geochronologist Reiner Grün, also from ANU, used a method called electron spin resonance (ESR), which counts electrons trapped in defects in the crystal structure of bone or tooth. Grün also measured how much of the uranium in the Mungo 3 skeleton had decayed into two daughter elements, thorium and protactinium. Normally researchers have to destroy a sample of bone to get these measurements, but Grün put the Mungo 3 cranium into a custom-built lead-lined box; for over a month he then counted the gamma rays that flew from the bone as the uranium decayed. Meanwhile, ANU physicist Nigel Spooner took samples of the sand from around the skeleton for OSL measurements.

The three methods gave pretty much the same result: 61,000 ± 2000 years from OSL, and 62,000 ± 6000 years from both the uranium-series and ESR methods. This new estimate of the age of Mungo 3 is 50% older than any previous date for Australian human remains. Thorne and his colleagues are confident in the date. "Here is a case where three different methods provide extremely similar results," says Thorne.

Some experts remain cautious, waiting to see the full details. Roberts notes that "uranium is a very mobile element in groundwater and can enter and leave a deposit at will," skewing its apparent age. And he adds that "ESR suffers from some of the same problems, so it's not a truly independent age comparison."

But if the date does hold up, it may challenge some versions of the out-of-Africa theory. Researchers such as Klein have argued that the modern humans emerging from Africa brought with them art, ritual burials, and other signs of cognitive sophistication. The oldest widely accepted evidence for this "human revolution" in Africa is 50,000 years old, and 40,000 years in Europe (*Science*, 20 November 1998, p. 1451). But the ceremonial burial of the Mungo 3 man, along with the boat-building skills that got his ancestors to Australia in the first place, point to such sophistication at a much earlier date. If the date is real, says Klein, "it would mean either that there was a separate evolution of modern humans and modern human behavior in the Far East, or that modern humans emerging from Africa somehow managed to reach the Far East at least 20,000 years before they reached the Far West."

Thorne prefers the first alternative. He points out that whereas Mungo 3 had a slender, gracile build, more recent skeletons, dating back only 15,000 years, were of a very robust build. Thorne suggests that a gracile population evolved in east Asia and came to Australia before 60,000 years ago, while a more robust one came later from southeast Asia. The two peoples then interbred to create today's Aborigines.

But Chris Stringer, a paleoanthropologist at the Natural History Museum in London, doesn't see any need to give up on the out-of-Africa picture, even if the first Australians didn't look like their successors. To him the robust anatomy in later Australians could have been the result of local evolution on the continent after Mungo 3. "There is no evolutionary reason why populations cannot become larger and more robust through time," says Stringer.

Either way, Mungo 3 may be a crucial clue to the fate of the 2-ton wombats, 3-meter kangaroos, and other giant animals that once inhabited Australia. Last January Gifford Miller of the University of Colorado, Boulder, and his colleagues offered some circumstantial evidence that humans were to blame for their disappearance. Studying eggshells, they found that a giant flightless bird called *Genyornis* abruptly went extinct about 50,000 years ago. Climate records show no drastic change at the time, leading Miller to suggest that the culprit was hunting or an ecological collapse triggered by humans. Aborigines regularly set fires for everything from flushing out game to clearing water holes. In the process, they may have destroyed fire-sensitive plants and driven the animals that depended on them to extinction (*Science*, 8 January, p. 205).

"If humans didn't come till 40,000 years ago, they aren't involved and we have to give up on this hypothesis," says Miller. "That's why this date on Mungo is important. It's really showing people are not only present in Australia but in the interior. We've got people basically everywhere 60,000 years ago."

Thorne isn't persuaded that the extinctions mark the arrival of humans, because

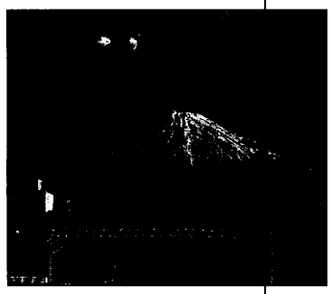
CREDIT: UNIPHOTO

ScienceScope

AIDS Center Shuttered An AIDS research center created by and named after virologist Luc Montagnier, co-discoverer of HIV, has gone belly-up. The Luc Montagnier Center, based at St. Joseph Hospital in Paris, was founded 3 years ago with money raised by a French telethon. But the funds have run out, and last week Montagnier filed for bankruptcy.

The center enrolled nearly 500 HIV-positive patients in a combined program of outpatient clinical care and research, a concept that guided Montagnier's creation of similar centers in the Ivory Coast, Rome, and New York. The Paris center's studies had focused on understanding natural resistance to HIV, identifying immune system targets on the virus, and developing new therapies. But although the hospital will continue to care for the patients, "there will be no more research," says immunologist Alberto Beretta, the center's scientific director. He and four other researchers are now looking for new jobs.

Power Surge In the United States, the hunt for a link between cancer and electricity has fallen into disfavor—earlier this week, for instance, a National Research Council panel concluded that the U.S. does not need a research program aimed at ferreting out possible health effects of electromagnetic fields (EMFs) produced by power lines and home wiring. But Japanese researchers don't share the ambivalence: Japan's Science and Technology Agency has announced it will spend $6 million over the next 3 years to resolve EMF health questions left open by previous surveys.



Project leader Michinori Kabuto says the new study will gather data on 1000 leukemia and 500 childhood brain tumor patients and up to 4500 control subjects. In addition to probing whether leukemia is linked to high EMF doses, his team will search for ties between cellular phone use by pregnant women and leukemia and brain tumors that develop in their children. "There hasn't been sufficient epidemiological data" in such areas, says Kabuto, whose group will coordinate its work with an ongoing EMF study sponsored by the World Health Organization.

he thinks people may have been in Australia long before the Mungo 3 man lived. "We do not know when humans first arrived, and this date on Mungo 3 is an important way of saying that."

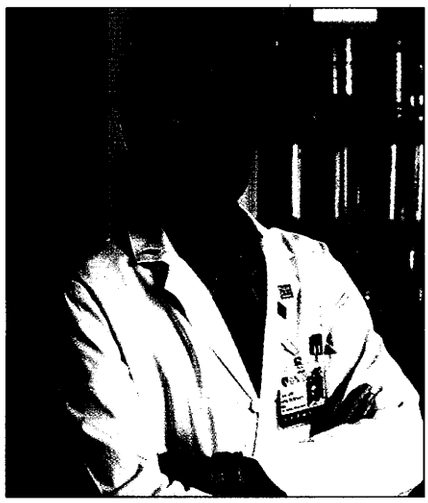
–CARL ZIMMER

Carl Zimmer is the author of *At the Water's Edge*.

CLINICAL RESEARCH

Shutdown of Research At Duke Sends a Message

Last week was a roller coaster for Joanne Kurtzberg, a transplant researcher at Duke University's Medical Center in Durham, North Carolina. First she heard—from a nurse—that her study using placental cord blood as a stem cell source had been suspended. "One of the OB-GYN doctors had come down the hall and said we couldn't consent any more patients," Kurtzberg recalls. Most other clinical researchers at Duke



Under scrutiny. Snyderman plans to re-review hundreds of clinical trials.

received similar shocks as word raced around the building that the Office for Protection from Research Risks (OPRR)—a federal watchdog agency that is part of the National Institutes of Health in Bethesda, Maryland—had lifted the center's authority to do federally funded research. Four days later, the immediate crisis eased when OPRR lifted the sanctions.

But the reverberations will continue at Duke and elsewhere. OPRR had suspended the Duke studies after months of urging administrators to correct "serious deficiencies" in procedures for monitoring consent and keeping records. Although the agency has now accepted a reform plan put together by chancellor for health affairs Ralph Snyderman and medical school dean Edward Holmes, OPRR director Gary Ellis notes that Duke still needs to re-review many projects for compliance with human subjects protection rules. That could take weeks. And with this action—the second shutdown of research at a major clinical center it has ordered in as many months—OPRR has put every federally funded U.S. research institution on notice that its right to conduct clinical research could be summarily yanked.

As though to underline the warning, the President's National Bioethics Advisory Commission (NBAC) also released a statement last week identifying defects in the U.S. system of protecting human research subjects. In a 4 May letter to President Clinton, NBAC chair Harold Shapiro describes gaps in enforcement and promises to deliver a "comprehensive report" in a few months loaded with recommendations for improvement.

OPRR isn't waiting for such advice. In focusing on Duke, it has targeted one of the nation's top biomedical centers. Duke has been aggressively adding staff and facilities —including a special center for industry-funded studies called the Duke Clinical Research Institute—to increase the number of clinical trials it manages. It now has 2000 in its portfolio, says medical center spokesperson Nancy Jensen. In December, OPRR sent nine experts to take a close look at Duke's procedures for monitoring the welfare of patients participating in this burgeoning research enterprise. After poring over records and interviewing staff, the team found no evidence that any patients had been harmed but concluded that the institution needed to tighten its practices.

Immediately after the site visit, OPRR sent a six-page letter to Snyderman listing 22 problems and asking for major changes. In February, OPRR followed up with another letter, warning that fixes offered by Duke were "unsatisfactory." For example, OPRR had asked that members of a panel that clears proposed experiments—the Institutional Review Board (IRB)—be better educated on relevant federal law. Duke responded by suggesting that it might invite IRB members to an annual lecture and brief them on useful Internet sites. Not good enough, OPRR said. Instead, it called for "provisions to ensure that all IRB members periodically receive interactive or didactic training from expert consultants working in the field of human subject protection."

OPRR also faulted Duke for allowing administrators to serve in a conflicted role as voting members of the IRB, for keeping sketchy records, and for failing to staff the IRB adequately. Duke responded in April and May with more suggestions, but OPRR officials again failed them. On 10 May, citing a "lack of progress" and a "failure of leadership," OPRR halted clinical trials.

Snyderman, who says he had no inkling OPRR was considering such drastic action, estimates that "hundreds" of trials were affected. Some clinicians were faced with the possibility that they would have to delay enrolling patients while their projects were rereviewed. Kurtzberg, for example, learned that her study offering experimental therapy to infants with a neurological disorder may fall in that category. She's still not sure when enrollment will resume.

Duke's medical chiefs may take comfort in knowing that they are not alone. Last month, OPRR shut down the Veterans Administration hospital in Los Angeles for similar reasons, and 5 months earlier, the Rush Presbyterian St. Luke's Medical Center in Chicago (*Science*, 2 April, p. 18, and 6 November 1998, p. 1035). Asked if this signals an escalation in enforcement, perhaps in response to congressional urging, OPRR chief Ellis responded, "that's for others to comment on." However, he noted that at a hearing last year, a prominent congressman called OPRR's enforcement efforts "pathetic" and "absurd." Ellis added, "With intense interest in human studies from Congress, the President's National Bioethics Advisory Commission, and advocacy groups, this is no time for dawdling." –ELIOT MARSHALL

PLANETARY SCIENCE

Space Rock Hints at Early Asteroid Furnace

Long before Earth or any other planet had formed around the sun, a vast cloud of dust began to coalesce into asteroids. Most of the drifting chunks were the kind of stone-cold rubble that Han Solo had to weave through in his clunky old spaceship in *Star Wars*, but others were big enough, and hot enough, to ooze lava. For decades, planetary scientists had suspected that radioactive decay stoked the furnace of these hefty asteroids, some of which later merged into planets. But the embers that would identify the heat source have long since died out.

Now comes the first hard evidence of what melted large asteroids in the early solar system. On page 1348, a team led by planetary scientist Gopalan Srinivasan of the Physical Research Laboratory in Ahmedabad, India, reports that a 4.57-billion-year-old meteorite—a fragment of an asteroid that developed a molten interior and crust in the early days of the solar system—bears the unmistakable signs of a radioactive heat source. The rock once contained enough of the radioactive isotope aluminum-26 to have melted. "They've got the smoking gun," says Stuart Weidenschilling of the Planetary Science Institute in Tucson, Arizona.

Thought to have been blown into our so-