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

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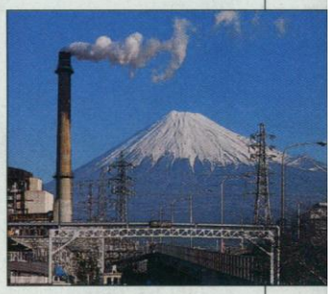
ScienceScope

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.

lar system on the winds of a nearby supernova explosion or, perhaps, spawned by particles from the young sun, ^{26}Al was first proposed as a heat source for the early solar system back in 1955. With a half-life of 730,000 years, ^{26}Al could have melted early asteroids, then disappeared long before our own planet grew to full size. But it wasn't until the mid-1970s that researchers found indirect evidence for ^{26}Al's existence: the presence of its decay product, magnesium-26, in calcium-aluminum–rich inclusions, the first specks thought to have formed in our solar system's primordial gas cloud and

Clue to early solar system. A rare isotope hints at the energy source responsible for melting the parent asteroid that spawned this ancient meteorite, found in India.

preserved in ancient meteorites. But researchers came up empty-handed when they looked for ^{26}Mg in meteorites from parent asteroids that once had molten interiors. Complicating the search, these so-called differentiated meteorites make up fewer than 5% of those that hit Earth.

Lucky for Srinivasan and his colleagues, just such a meteorite thundered into the desert state of Rajasthan in western India on 20 June 1996. Called Piplia Kalan after a nearby village, the 42-kilogram meteorite resembles basalt, and its tiny crystals suggest it cooled rapidly after melting. Auspiciously, one section contained crystals of plagioclase, an aluminum-laden mineral that might once have been rich in ^{26}Al. And compared to most other differentiated meteorites, the grains contained little magnesium. That led Srinivasan and his team to think they had a good shot at finding the ^{26}Mg produced by ^{26}Al decay, which would be swamped by common magnesium in most plagioclases. Indeed, ^{26}Mg levels in four grains of Piplia Kalan were up to 3% higher than the usual amount in terrestrial plagioclase. By cosmic chemistry standards, says Srinivasan, "this excess is very significant."

The finding "strengthens implications that ^{26}Al was the heat source" at the heart of asteroids, says Glenn MacPherson, a geochemist at the Smithsonian Institution in Washington, D.C. For connoisseurs of asteroid history, it also suggests how long it took for the parent body of Piplia Kalan to melt and cool after the formation of the solar system. Like measuring time according to sand in an hourglass, our solar system's initial allotment of ^{26}Al can be extrapolated from the ^{26}Mg in calcium-aluminum inclusions. The tricky part is that in molten rock, the hourglass wouldn't collect falling sand, so to speak, because any ^{26}Mg would have been elbowed out of minerals that prefer aluminum atoms. After the molten rock cooled into crystals, however, the ^{26}Mg would become trapped and begin to accumulate; its abundance would reveal that of ^{26}Al during crystallization. By comparing ^{26}Mg abundance in the calcium-aluminum inclusions to the vastly smaller amount in Piplia, the team estimates that 5 million years must have elapsed before the plagioclase in Piplia crystallized. This time span for accreting and melting the parent body jibes with computer models of the process, providing "a real shot in the arm for theoretical work," says geochemist Richard Carlson of the Carnegie Institution in Washington, D.C.

The hunt is on for longer lived isotopes, such as samarium-146, manganese-53, and iron-60, that may have been trivial heat sources in the early solar system but, by their abundance in differentiated meteorites, could help narrow the window on when asteroids began solidifying. Such radiometric dates "will help explain processes operating 4.6 billion years ago in the inner solar system," says Srinivasan. And that, notes Carlson, could help us better understand modern features of our solar system, such as the chemical composition of different planets.

–ERIK STOKSTAD

ENVIRONMENTAL POLICY

EPA's Piecemeal Risk Strategy on Way Out?

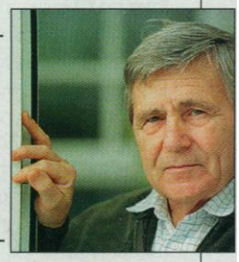
In diagnosing the ailments afflicting the Florida Everglades, researchers at first painted phosphorus as the archvillain: The nutrient, they concluded, nurtured the cattails that choked the saw grass and sent many species into decline. Among the staunchest advocates of this message were Environmental Protection Agency (EPA) scientists, who since the 1970s had trained a harsh light on phosphorus

ScienceScope

Opening New Vistas British astronomers have secured $36 million for a new telescope that will map the southern skies. The 4-meter Visible and Infrared Survey Telescope for Astronomy (VISTA) will be located in Chile and capture more than 100,000 stars and galaxies in every 10-minute exposure, researchers announced. "This will be the largest telescope fully dedicated to surveys," claims Jim Emerson of the Physics Department at Queen Mary and Westfield College in London, who heads an 18-university consortium planning the instrument.

Britain's Joint Infrastructure Fund coughed up cash for the project, which will flag interesting objects that can be studied in depth by more powerful telescopes. VISTA's broad scope "will unquestionably identify many unusual [objects]," says astronomer Bruce Margon of the University of Washington, Seattle. But planners are still figuring out exactly where to put their new eye on the sky, which is expected to see first light in 2004.

Altered Food Redux A study that stirred concerns over the safety of genetically modified (GM) foods in the United Kingdom was seriously flawed, a scientific panel has concluded. Last year, biochemist Arpad Pusztai (below) sparked controversy by publicizing preliminary data suggesting that rats fed transgenic potatoes had stunted growth and suppressed immune systems (*Science*, 19 February, p. 1094). But this week, an anonymous six-member panel convened by Britain's Royal Society concluded that poor experiment design and a host of other problems rendered Pusztai's data—which had not been peer reviewed—"inadequate."



Pusztai is disappointed in the panel's conclusion and says there still "needs to be a scientific debate about testing GM food." And Derek Burke, a former head of the government's Advisory Committee on Novel Foods, says the controversy has "done a great disservice to the GM debate." But whether the panel's findings will help calm the continuing storm over altered foods—which has prompted calls for everything from labeling to import bans—remains to be seen.

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