old, but it seems to correspond to a grade of hominin that ceased to walk on the Earth a few million years ago," says Wood. "How it got there and managed to persist—that's clearly a challenge to explain."

One explanation is that the hobbit stems from a very ancient migration of a primitive hominin out of Africa. *H. habilis*, for example, had a short stature and a smaller brain than later hominins did, so it's easier to derive something hobbitlike from such an ancestor, Jungers said.

But there's no other evidence anywhere in the world of such an early exodus out of Africa. Such a hypothesis requires "special pleading," says paleoanthropologist Russell Ciochon of the University of Iowa, Iowa City. Australopithecine expert William Kimbel of the Institute of Human Origins at Arizona State University in Tucson agrees. "I'm not ready to go back to the Early Pleistocene of Africa for an ancestor," he says. "That spans a lot of time and space, and I'm not comfortable with those gaps." Ciochon thinks the evidence suggests that a more recent ancestor, perhaps *H. erectus* itself, shrank to hobbit size in an evolutionary dwarfing process.

Brainteaser. Researchers continue to puzzle over why the hobbit's cranium is so tiny.

For other researchers, the whole debate is moot because they view LB1 as simply an aberrant *H. sapiens*. The foot "is such a mixture of characters, requiring very convoluted evolutionary and biomechanical explanations, that a developmental anomaly in a pathological human seems much more parsimonious," says paleopathologist Maciej Henneberg of the University of Adelaide in Australia, a longtime hobbit critic.

A few recent papers have expressed such skepticism. The authors of a controversial report on small-bodied *H. sapiens* skeletons on the island of Palau argue that LB1 could have been a small-bodied *H. sapiens*, too (*Science*NOW, 11 March: sciencenow.sciencemag.org/cgi/content/full/2008/311/1). And several papers have attributed LB1's peculiarities to microcephaly, Laron syndrome, and most recently, cretinism, in a procession Dean Falk of Florida State University in Tallahassee calls

GEOCHEMISTRY

Two Geologic Clocks Finally Keeping the Same Time

First the bedroom clock reassures you that you're right on schedule. Moments later, the kitchen clock tells you that you're running minutes behind. If you find that annoying, pity the geochronologists. For decades, two of their workhorse timepieces—isotopic clocks ticking to the steady decay of two different radioactive elements—have been disagreeing by millions of years.

Now geochronologists have recalibrated one of the clocks, bringing it into agreement with the other. They've tried it before, but this time it looks like the fix will stick. "This is a huge step forward," says geochronologist Mike Villeneuve of the Geological Survey of Canada in Ottawa. "You'd like to see it reproduced, but it looks very solid to me." The synchronization of clocks lends more support to a link between huge volcanic eruptions and mass extinctions.

The clocks in question are argon-argon radiometric dating, based on the decay of potassium-40 to argon-40, and uranium-lead dating, based on the decay of uranium-238 to lead-206. Both techniques have been yielding increasingly precise ages, but argon-argon dating was giving slightly younger ages for the same rocks than the uranium-lead technique. Researchers suspected that they had gotten the decay rate of potassium-40 wrong, but they couldn't really say.

So isotope geochronologists looked around for an absolute measure of passing time to which they could tie their argon-argon ages. They settled on orbital variations, the regular nodding and wobbling of Earth's rotation axis and the changing elongation of its orbit. On page 500, Klaudia Kuiper, now at Vrije Universiteit Amsterdam, and colleagues from Utrecht University, the Netherlands, and the Berkeley Geochronology Center in California report on the latest linking of astronomical variations and argon-argon dating.

They found their chronological connection in 6-million- to 7-million-year-old layered rocks exposed in northern Morocco. Back then, the Melilla Basin was undersea. Orbitally induced climate variations translated Earth's rhythmic orbital variations into marine sediment layers of alternating mineral composition. Astrodynamicists had calculated the subtleties of orbital-variation timing over the ages. That made the Melilla layering a time scale readable with an accuracy of 10,000 years.

At random intervals over the same time period, nearby volcanoes were peppering the sea with ash containing large grains of the mineral sanidine, ideal for high-precision argon-argon dating. The group dated the sanidine grains in a particular layer of ash by noting the layer's position relative to astronomically dated sediment layers. And they measured how far potassium-40 decay had gone in the layer's sanidine grains. Then they compared their measurements with analyses of sanidine in a rock known as the Fish Canyon Tuff, which has long been used as the standard for argon-argon dating

In effect, Kuiper and her colleagues linked the poorly dated Fish Canyon standard to the metronomic astronomical time scale via the volcanic ash of the Melilla Basin. By this astronomical recalibration, the Fish Canyon standard is 0.65% older than had been thought. Recalculate previous argon-argon ages using the standard's new age, and everything ever dated using the technique becomes 0.65% older.

The new calibration "gives us a much better hook to hang our ages on," says Villeneuve. "It's a very nice piece of work," agrees geochronologist Samuel Bowring of the Massachusetts Institute of Technology in Cambridge. "It brings us closer to agreement between argon-argon and uranium-lead, [although] we need to see a lot more of these" studies.

Using their new calibration, Kuiper and her colleagues recalculate some key dates in geologic history. Going back in time, they move the great impact 65.5 million years ago and the accompanying extinction of the dinosaurs to 66.0 million years

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"disease of the week." In her talk, she added more data to her rebuttal of Laron syndrome (*Science*, 10 August 2007, p. 740); a cretinism rebuttal is in the works.

At the Columbus meeting, the pathology scenario took a blow from an unexpected source, in a talk by mammalian tooth-development expert Jukka Jernvall of the University of Helsinki in Finland. Jernvall has been working for years on a model of how teeth grow and develop, finding that the first molar sets the template for the size of the second and third. This is true in living people and also for ancient hominins, although the precise relationship among the molars varies somewhat among species.

If development is disrupted, as by an illness, the molar relationship falls apart, says Jernvall. For example, in pituitary dwarfs—one of the syndromes suggested for LB1—the second molar is small as predicted, but the third molar usually doesn't appear at all.

And LB1? Although small overall, it retains the tooth proportions typical of larger bodied hominins, as does a second hobbit jaw, LB6, Jernvall says. "If you look at it from a tooth-development point of view, the drop in size looks like an evolutionary process, not a medical condition," he says.

Critics were unswayed, saying that even if one kind of pathology has been refuted, hundreds of others remain possible. And several experts would prefer not to discuss the whole issue, saying that they're still taking a wait-and-see approach. Given the wildly diverging opinions on the hobbit, "*Somebody's* going to take a big fall here," says paleoanthropologist C. Owen Lovejoy of Kent State University in Ohio. He's waiting for DNA from LB1 or for a second skull. On that, at least, groupies and skeptics agree: All are hoping for another skull when the discovery team returns to dig at Liang Bua this summer.

–ELIZABETH CULOTTA

CREDIT: K. F. KUIPER *ET AL.*, *SCIENCE*

Tick, tick, tick. The rhythmic layering of sediments in this seaside cliff at Zumaia, Spain, reflects precisely timed variations in Earth's orbit used to calibrate an isotopic time scale.

ago. That shift matters particularly to astronomical daters because they use the impact as a benchmark when working farther back in time. The argon-argon age of the mother of all mass extinctions—the Permian-Triassic—moves from 251.0 million years ago to 252.5 million years ago. The new date puts it precisely at the group's preferred uranium-lead age for the Siberian Traps eruptions, the mother of all volcanic outpourings. That supports the claim that the eruptions could have triggered the extinction (*Science*, 17 September 2004, p. 1705).

Older argon-argon ages would likewise make another of the big-three mass extinctions—the Triassic-Jurassic—coincide precisely with the great volcanic outpourings of the central Atlantic magmatic province. That's according to a new uranium-lead age that places the extinction at 201.6 million years ago, as published by geochronologist Urs Schaltegger of the University of Geneva, Switzerland, and colleagues in the 1 March issue of *Earth and Planetary Letters*. So a fraction of a percent multiplied by geologic time can make a difference.

–RICHARD A. KERR

ID at the Box Office

A new film that links Darwinism and Nazism and accuses the scientific community of bullying proponents of intelligent design (ID) grossed $2.9 million at U.S. theaters over the weekend, ranking fourth among newly released movies. But Glenn Branch of the National Center for Science Education (NCSE) in Oakland, California, predicts that Ben Stein's *Expelled: No Intelligence Allowed* won't affect public attitudes toward evolution. NCSE debunks many of the movie's claims at www.expelledexposed.com.

David Beckwith, an aerospace engineer in suburban Maryland who took his family straight from an evangelical church service to see the show, says he buys the film's claim that persecuting those who question Darwinism is an attack on academic freedom. "I am more convinced than ever that there are a lot of scientists who think intelligent design should get a fair hearing," he says. But a recent college graduate who says she's politically conservative but not religious says she was disappointed that the movie did not "present any arguments in support of intelligent design."

–YUDHIJIT BHATTACHARJEE

Small Business Looms Large

A planned 20% increase in a $2-billion-a-year program to promote research by small companies through a tax on current budgets is moving rapidly through Congress, even as scientists complain that federal basic research is strapped for cash.

This week, the House of Representatives was expected to approve a bill that would boost the share set aside for the Small Business Innovation Research (SBIR) program from 2.5% to 3% of an agency's budget. Some 11 federal agencies operate the program, begun in 1982 to help commercialize basic research discoveries. Although academics with start-up companies are part of the intended audience—companies with fewer than 10 employees receive 30% of the competitive awards from the National Science Foundation, for example—most science lobbying groups have long viewed it with suspicion. The Bush Administration also opposes any increase in the set-aside, which was last raised in 1995. "This is the wrong time to do it," Representative Vern Ehlers (R–MI) argued unsuccessfully last week as a House science subcommittee marked up its bill, which the next day was folded into a nearly identical version approved by the small business committee. In the Senate, a companion bill that would boost SBIR's share to 5% is temporarily stalled.

–JEFFREY MERVIS

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