hormone (ACTH), surged earlier than normal in the fetuses carried by once undernourished ewes. All 10 had an early release of ACTH—a messenger released by the pituitary gland in the brain that tells the adrenal gland to pump out cortisol. Cortisol normally rises dramatically in the fetus late in pregnancy, prompting the lungs, liver, and other organs to mature and turning on various enzymes that will be needed for life outside the uterus. In five of the 10 fetuses, the cortisol spike happened earlier than normal.

This suggests to Bloomfield that the pituitary and adrenal glands matured early in fetuses of ewes deprived of food. How conditions near the time of conception cause this is a puzzle. Bloomfield thinks it's unlikely that the root cause is a lack of calories for the fetus—it makes only trifling nutritional demands on the mother in the first month of gestation. A shortage of a particular vitamin or amino acid is a more likely trigger, he says.

Such mechanisms are plausible, agrees Alan Jackson, who studies maternal and fetal nutrition at Southampton. Still, what's true for a ewe may not be true for you, cautions Seckl. For example, he says, "there is evidence that the link between cortisol and parturition is there in humans, but it's not as clear as in sheep."

Although the mechanisms remain murky, work on the causes of preterm birth—which affects about half a million babies in the United States each year—is more relevant now than ever, say Fall and others. The rate of preterm births in the U.S. jumped from 9.4% to 11.9% in the last 2 decades. And in some countries with a high incidence of undernutrition, the proportion of births known to be premature can reach 20% or more.

–GREG MILLER

ANTHROPOLOGY

Great Age Suggested for South African Hominids

A few limestone caves in South Africa have been called the cradle of humankind because they contain nearly one-third of known early human fossils—arguably the world's richest concentration of these rare bones. But without volcanic sediments to date, no one has been able to reliably assign the wealth of fossils to a place in the story of human evolution.

Now a promising new method used to date the retreat of glaciers has been tested in the Sterkfontein Caves, the resting place of the most complete early hominid skeleton. On page 607, researchers conclude that this skeleton and newly discovered hominids at nearby Jacovec Cavern are a stunningly ancient 4 million years old. If so, "hominids were basically all over Africa 4 million years ago," says paleontologist Fred Spoor of University College London.

But many researchers are wary of the new results, partly due to Sterkfontein's complex stratigraphy. "These dates do not stand up to close scrutiny," says paleoanthropologist Lee Berger of the University of the Witwatersrand in Johannesburg, South Africa.

Age estimates for Sterkfontein's 500 hominid fossils have ranged widely, from 3.5 million to 1.5 million years old. Witwatersrand paleoanthropologist Ron Clarke identified and partially described the skeleton known as Little Foot as a 3.3-million-year-old australopithecine, contemporaneous with the famous Lucy skeleton of east Africa.

Clarke's team based its dates on reversals in Earth's magnetic field and comparisons with well-dated fauna from elsewhere in Africa. But Berger argued last fall in the *American Journal of Physical Anthropology* that Clarke's dating team, led by Witwatersrand geologist Tim Partridge, had misread the sequence of magnetic reversals and used unreliable animals as age indicators. Little Foot is only 2 million to 3 million years old, said Berger.

Now Partridge says Berger was partly right: "We did misread the magnetic reversals. But we read them too young."



Aging ancestors. A new method dates these hominid bones to a surprisingly ancient 4 million years old.

CREDIT: R. J. CLARKE

Partridge concluded this after sending five samples for analysis to Darryl Granger, a geologist at Purdue University in West Lafayette, Indiana, who has developed a new dating method for buried sediments. When cosmic rays bombard Earth's surface, they collide with the nuclei of atoms such as oxygen, producing unstable isotopes of beryllium and aluminum. The older the rock, the more isotopes it accumulates; when it is buried, the bombardment stops and the isotopes simply decay (*Science*, 11 January 2002, p. 256). Granger and a colleague adapted and tested this method on sand inside a Kentucky cave, with impressive results, says geochronologist Paul Renne of the Berkeley Geochronology Center in California. "I wish I had thought of it," says Renne.

Granger dated samples of the cementlike matrix of rock and sand surrounding Little Foot to 4.17 million years ago, plus or minus about 350,000 years. If that's correct, then Little Foot's contemporary was not Lucy but her ancestor, *Australopithecus anamensis*, who lived 4 million years ago in east Africa. Yet co-author Clarke says that Little Foot does not resemble *A. anamensis* in crucial aspects. And he says that the new Jacovec fossils, which Granger dated to 4 million years ago, may represent two types of australopithecines—suggesting a diversity of 4-million-year-old hominids.

But the sketchy anatomical descriptions in the current paper don't back those claims, says Spoor. Those familiar with Sterkfontein add that Granger, who didn't visit the caves, is on shaky ground using his method there. The site is notoriously complex, with collapsed ceilings and overhead shafts that may have allowed debris from the surface and cave walls to fall in and mix with dated sediments, says geochemist Henry Schwarcz of McMaster University in Hamilton, Canada.

Partridge counters that the chance of mixing is "very remote indeed," because the cave's dolomite walls don't shed small debris, and because the skeleton was apparently buried rapidly.

But Schwarcz and others say that Granger needs to check the method in a cave of known age in South Africa and sample a sequence of sediments to make sure the dates get younger as the samples move up in time. Expect more footwork in the grotto at Sterkfontein before anything like a consensus emerges on these hominids' ages.

–ANN GIBBONS