

# Skull Gives Hominid Evolution New Face

A 2.5-million-year-old fossil skull recovered in East Africa last year is causing paleoanthropologists to reconsider ideas about the sequence of evolutionary changes and who is related to whom among the earliest species of hominids, or humanlike creatures.

The discovery, reported in the Aug. 7 NATURE, represents the oldest known hominid not directly related to modern humans. The skull was found in a gully west of Kenya's Lake Turkana by Alan Walker of Johns Hopkins University School of Medicine in Baltimore, who analyzed the specimen with Richard Leakey of the National Museums of Kenya in Nairobi, John M. Harris of the Los Angeles County Museum of Natural History and Frank H. Brown of the University of Utah in Salt Lake City.

Although there are still different interpretations regarding the shape of the human family tree over the past 4 million years, the new find challenges the view that two lines of australopithecines, one of which led to modern humans, branched out from a single species known as *Australopithecus afarensis*. The latter species includes the famous skeleton "Lucy," which was discovered in Ethiopia by Donald Johanson of the Institute of Human Origins in Berkeley, Calif., and his colleagues more than 10 years ago.

"This is the most exciting specimen since Lucy," says Eric Delson of the City University of New York.

Walker and his co-workers hold that the cranium is either an early member of the species *Australopithecus boisei* or part of a new species clearly related to *A. boisei*. Previously, *A. afarensis* was seen by many paleoanthropologists as leading, in one direction, through three progressively larger species: *afarensis*, *robustus* and *boisei*, which marked the end of the genus *Australopithecus*. In the other direction, *afarensis* led to the genus *Homo*.

But it now appears that *A. africanus*, which has been found only in southern Africa and is estimated to have arisen between 2.5 million and 3 million years ago, was a contemporary of *A. boisei*. The investigators suggest that *boisei* was a separate line evolving in parallel with the *afarensis-robustus* line.

The new specimen has the typical protruding snout and flared cheekbones of later *boisei* skulls, dated at between 1.2 million and 2.2 million years old. But the researchers note that the skull contains primitive characteristics similar to *A. afarensis*, such as a flat cranial base and a bony crest running over the top and down the back, presumably used to an-



Reconstructed skull, found last year, of 2.5-million-year-old hominid.

chor the muscles of its protruding jaw. Furthermore, its brain is the smallest of any fossil hominid measured to date.

The primitive features of the skull suggest, according to the scientists, that the early *boisei* may even have existed at the same time as some of the *afarensis* specimens that have been uncovered. This interpretation fits into the assertion of Todd Olson of the City University of New York that there are two species in the *A. afarensis* remains, one of which is a large-boned "robust" australopithecine similar to that represented by the new cranium. Other researchers recently concluded that *A. afarensis* gave rise to *A. africanus*, which then led to *Homo* and robust (*A. robustus* and *A. boisei*) forms. Leakey holds that the common ancestor of australopithecines is older than *A. afarensis* and has yet to be found.

In a commentary accompanying the NATURE article, Delson wades into this confusing picture with his own interpretation of hominid evolution based on the new find. "This may well be a new species," he says. He speculates that *A. afarensis* split into two lines, one becoming *A. africanus* and later evolving into modern humans, the other becoming the species represented by the new skull, which then split to form the two "dead-end" species, *A. robustus* and *A. boisei*.

The mixture of features on the specimen discovered by Walker—a relatively advanced face combined with a primitive cranium—is an unexpected twist. "We couldn't have predicted how this animal would look from what we already knew," says Delson.

Paleoanthropologist David Pilbeam of Harvard University finds the new skull "exciting and quite interesting," but points out that the fossil record in East

Africa prior to 2 million years ago is sparse and discourages definitive interpretations of hominid branching. In addition, he notes that *A. africanus* specimens are not well dated and these hominids may not have existed in East Africa at the same time as Walker's specimen.

"This skull may represent a new species, but in any case it is very similar to *A. boisei*," says Pilbeam. "The analysis [of Walker and his colleagues] seems to document the robust lineage at least as far back as 2.5 million years ago."

Pilbeam adds that the find challenges the growing view that a worldwide climatic change around 24 million years ago spurred the evolution of robust australopithecines. A cooling trend is thought to have caused a shift in Africa toward more open, savanna-like habitats, resulting in the appearance of many new animals. The Lake Turkana specimen, however, predates the estimated time of the climatic change.

"This raises the whole issue of what drives species change," says Pilbeam. "At this point, it would be impossible to say what caused hominid speciation."

—B. Bower

## Pill cleared of breast cancer role

More than 20 years after the introduction of oral contraceptives in the United States, it seems that—with the possible exception of one subgroup of women—the pill has not increased women's risk of breast cancer.

The findings come from the largest study to date on the subject, released in the Aug. 14 NEW ENGLAND JOURNAL OF MEDICINE. Caveats and questions remain, but, says an accompanying editorial, the study as a whole should reassure physicians and pill users.

Because there is a great deal of evidence that hormones play a part in causing breast cancer, the use of oral contraceptives, which are based on hormones, has long been a matter of concern. Hormone-related factors such as age at first menstruation or first full-term pregnancy, for instance, can affect a woman's risk of breast cancer throughout her lifetime.

Though most investigations have given the pill good grades regarding breast cancer, some have raised questions about subgroups of women who might be at particular risk—women who use certain types of birth control pills, or women who have used the pill be-

fore their first full-term pregnancy (SN:11/9/85,p.293). But the studies were too small to provide definitive answers; and because most were conducted in the early 1970s, they could not analyze the pill's long-term effects. The new study took up those questions.

"For the first time," says Richard Sattin of the Centers for Disease Control (CDC) in Atlanta, who led a large team of investigators, "we had enough numbers so that we could look at subgroups of women and patterns of [birth control pill] use." The study, conducted by the CDC and the National Institute of Child Health and Human Development in Bethesda, Md., compared the oral contraceptive use of 4,711 women with newly diagnosed breast cancer with that of 4,676 controls.

Use of the pill for 15 or more years had no effect on a woman's risk of developing breast cancer, according to the researchers; nor did it matter how long it had been since the last use of the pill. Neither a family history of breast cancer nor a personal history of benign breast disease made women more vulnerable to pill-related breast cancer; nor did use of the pill before a full-term pregnancy. And there was no evidence that use of any particular type of pill increased the risk of breast cancer.

There is concern that those women who use oral contraceptives when they are very young (mid-teens), while their breasts are developing rapidly, may be more vulnerable to breast cancer. But since few women in that age group took the pill when it was first introduced in the early 1960s, Sattin says, the study couldn't draw any conclusions about the long-term effects of such use. "The evidence for young women will still take quite a while," Sattin says. "There's a lot of conflicting evidence about that."

Indeed, the very long-term effects of pill use by women of any age may not be known for another decade. Samuel Shapiro of the Boston University School of Medicine points out in an accompanying editorial that there are no data on what happens more than 15 years after women stop taking the pill. And as women begin to pass that mark, he adds, they will also be entering the age range in which the incidence of breast cancer climbs steeply.

Other questions that remain open include the effects of new formulations of birth control pills and the effects of patterns of pill use outside the United States. Shapiro adds that the study addresses only the question of breast cancer, and not other possible side effects of the pill, which include an increased risk of heart attack. However, he writes, "From a public health viewpoint, as best we can judge on the present evidence, that cost [of oral contraceptives] is acceptable, at least in the United States."

— L. Davis

## Hanford reactor's safety is questioned

Since the catastrophic Chernobyl reactor accident in April (SN:5/3/86,p.276), at least six studies have been commissioned or undertaken to assess the safety of a U.S. defense reactor at the Hanford site near Richland, Wash., which bears some Chernobyl-like attributes. Three of these assessments have already been published. The most recent, released last week by the U.S. General Accounting Office (GAO), found that many systems and components in the 23-year-old "N-Reactor" — one of two reactors at the Hanford site — are deteriorating to a point where they could jeopardize safety. GAO estimates that correcting those deficiencies and replacing aging parts could cost the federal government as much as \$1.2 billion.

Still another report, due out soon, will acknowledge there are still many uncertainties as to whether the plant's design features are potentially serious liabilities in a core-melt accident, according to Robert Barber, director of nuclear safety for the Department of Energy (DOE). Such an accident occurred both at Pennsylvania's Three Mile Island #2 nuclear plant and at Chernobyl. Though two earlier DOE studies found no major safety problems, Barber told SCIENCE NEWS, neither appraisal evaluated N-Reactor's design in great detail or considered how the plant might respond in a severe core-melt accident.

The N-Reactor's lack of a domed containment building to trap radioactive materials emitted during a serious accident is one of the design features it shares with the Chernobyl plant. According to Rep. James Weaver (D-Ore.), a recently disclosed report written a number of years ago by the Atomic Energy Commission, DOE's predecessor agency, says the plant's builder chose the filtered "containment" system — instead of a more substantial "containment" building — "because of its lower cost." Weaver notes that a federal advisory committee on reactor safeguards reported at about the

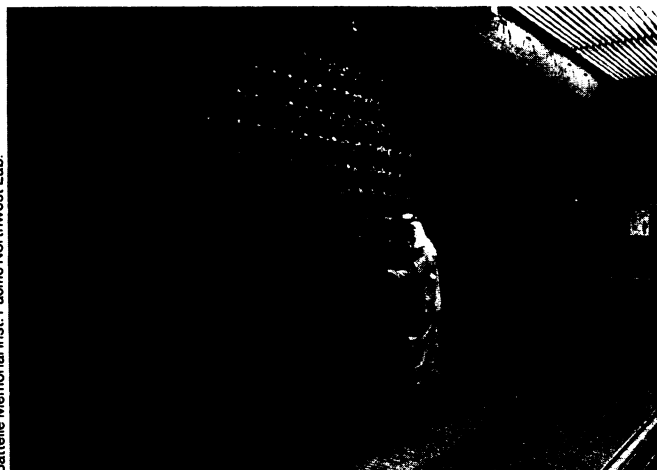
same time, however, that "Several of its features raise questions as to the possibility of larger releases from a severe accident than are believed credible for commercial power reactors."

One of those questionable features is the confinement system's reliance on aerosol filters to limit radioactive releases, according to Washington, D.C.-based reactor-safety analyst Susan J. Niemczyk.

Until about 10 years ago, she says, severe-accident models tended to ignore the quantity of radioactive aerosols that might be released, but recent studies have shown that a pressurized-water reactor, like N-Reactor, might generate tons. Meanwhile, experience has shown in reactor cleanup systems where filters are used that significant filter clogging can occur after just a few dozen pounds of aerosols enter, she adds. With the N-Reactor's system of four filters, "it probably wouldn't take a whole lot of aerosols [during a severe accident] before you'd risk clogging the filters, failing them and then begin pumping [radioactive particles] directly into the environment," she says.

Niemczyk also believes that computer codes recently developed to better gauge a commercial reactor's potential radioactive emissions during a severe accident (SN:4/20/85,p.250) "would not be appropriate for analyzing the Hanford N-Reactor because of the completely different configuration [from other U.S. reactors] of its core." Like the Chernobyl plant, the Hanford reactor core is made up of more than 1,000 separate fuel tubes — each in its own miniature reactor vessel — instead of a single huge reactor vessel surrounding all of the fuel rods together. Without updated codes, she says, "it's not obvious how [DOE] assessed the Hanford reactor's safety."

DOE's Barber acknowledges that the already-published DOE reports fall short on this count, but adds that in the soon-to-be-released report, "Our reviewers



Worker removes cap from one of N-Reactor's 1,003 fuel-holding process tubes in preparation for refueling. Unlike the Chernobyl plant, which also has many individual process tubes housed in a graphite moderator, N-Reactor's monthly refueling is conducted when the plant is shut down.

Battelle Memorial Inst. Pacific Northwest Lab.