Variety reigns in ancient hominid's skull

Fossil discoveries of *Australopithecus boisei*, a member of the human evolutionary family that lived in Africa from around 2 million to 1 million years ago, show that this creature possessed huge teeth and a nutcrackerlike jaw the likes of which even Jay Leno or Kirk Douglas would envy.

New *A. boisei* finds, described in the Oct. 2 NATURE, indicate that this hominid's massive jaw rested beneath an unexpectedly diverse array of skull features.

The striking skeletal variations encompassed by this species challenge the increasingly common practice of using subtle anatomical differences to define new species in the hominid fossil record, concludes a research team headed by anthropologists Gen Suwa of the University of Tokyo and Berhane Asfaw of Rift Valley Research Service in Addis Ababa, Ethiopia.

"We're saying, 'Wait a minute, let's not be so quick to split hominids into new species,'" remarks anthropologist Tim D. White of the University of California, Berkeley, who assisted in the analysis of the new *A. boisei* fossils. "We still don't understand the extent of biological variation in fossil hominid species."

Ongoing excavations in Ethiopia, at a site known as Konso, yielded nine skull and tooth specimens attributed to *A. boisei*, the researchers report. Dating of volcanic ash layers surrounding the sediment in which the fossils rested places their age at between 1.4 million and 1.5 million years.

Earlier work at Konso turned up remains of *Homo erectus* and numerous stone hand axes that also date to around 1.4 million years old (SN: 1/2/93, p. 6). It now appears that *A. boisei* and *H. erectus* coexisted in a dry grassland environment, Suwa and his coworkers assert. The researchers do not yet know whether the two hominid species interacted or if *A. boisei* participated in making and using stone tools.

Jaw and tooth features in the new specimens resemble those of *A. boisei* fossils found at two other locations in eastern Africa, the scientists hold, but *A. boisei* at Konso displays a distinctive look above the jaw.

For instance, the Konso skull exhibits relatively flat cheeks, unlike the flaring, visorlike protrusions on the cheeks of prior *A. boisei* finds. Moreover, only at Konso does *A. boisei's* palate appear broad and short—similar in shape to that of *Homo* species. Also, a bony crest that runs down the middle of the Konso cranium rises sharply at the back of the head, unlike such crests on other *A. boisei* skulls.

Reasons for the anatomical disparities in *A. boisei* populations remain unclear, White notes. The variations may have stemmed from random genetic changes or from different survival challenges faced by *A. boisei* groups living in dissimilar habitats.

Scientists who have led the charge to identify a greater number of fossil hominid species welcome the Konso discoveries but see no reason to quell their efforts.

"This is an important new collection of fossils that should reassure us that *A. boisei* is a valid species," comments anthropologist Bernard Wood of George Washington University in Washington, D.C. "But I think we'll continue to find more, rather than [fewer], fossil hominid species."

Some skeletal features, such as *A. boisei's* distinctive jaw, persist over long stretches of time and serve as valuable species markers, Wood argues. Anatomical variations in other parts of the face and cranium have been evident in previous *A. boisei* finds and merit far more cautious use as markers by scientists who classify fossil species, he adds.

In contrast, White holds that the Konso evidence, combined with observations of considerable anatomical diversity among modern apes, indicates that there may have been fewer ancient hominid species than many investigators now assume. —*B. Bower*

Hubble sizes up a lone neutron star

Neutron stars are among the most economical of celestial objects. Squeezing matter so tightly that electrons and protons merge into neutrons, these collapsed stars pack more mass than the sun into a ball not much bigger than a small asteroid.

Exactly how much bigger may soon be clear. For the first time, astronomers have observed in visible light the emission from a solitary, quiescent neutron star. This feat will help them pinpoint the size of these fantastically dense bodies and single out the most accurate models of their formation.

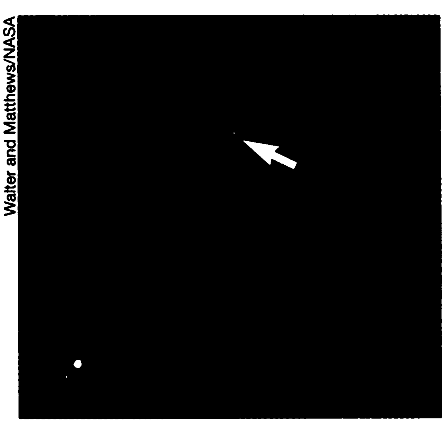
Although the galaxy probably contains millions of neutron stars, astronomers had detected only the violently active ones. Some emit pulses of X rays as they snare matter from a companion; others reside alone and emit radio wave blasts powered by a strong magnetic field. In either case, the radiation reveals little about the star's size.

Frederick M. Walter of the State University of New York at Stony Brook suspected he had come upon something different when he spotted a steady, intense source of low-energy X rays in images by the ROSAT satellite. Ground-based telescopes didn't detect radio emissions and weren't powerful enough to record visible light from the object. The combination of the X-ray emissions and faint visible light fills the bill for a solitary, relatively inactive neutron star. Radiation from such a star speaks volumes about its girth.

Using the Hubble Space Telescope, Lynn D. Matthews, also of Stony Brook, and Walter have now found a dim, visible-light counterpart to the X-ray object. The X-ray and visible-light glow, along with emissions in the extreme ultraviolet, fit the pattern expected of a young neutron star with a surface temperature of 670,000 kelvins. The researchers lack a crucial bit of information—the star's distance from Earth—but they know the object lies in front of a gas cloud that resides 400 light-years away. If the star lies nearly as far, then it has a diameter no larger than 28 kilometers, Walter and Matthews report in the Sept. 25 NATURE.

That number isn't small enough to rule out any of the leading models of how neutron stars form, notes James M. Lattimer of Stony Brook. If the star resides closer, however, the maximum allowed diameter would shrink. Exotic models, in which squeezed neutrons and protons transform into more compressible material, such as a fluid of strange quarks, would then become far more plausible.

Frederick K. Lamb of the University of Illinois at Urbana-Champaign cautions that the star may lie close to the cloud and siphon material from it. The star's magnetic field would direct the gas onto the polar regions, and the observed radiation would stem from only a fraction of the surface. The inferred diameter would then be smaller than its true diameter. Further Hubble studies are expected to pin down the distance and size. —*R. Cowen*



Walter and Matthews/NASA

False-color image of the lone neutron star (arrow).