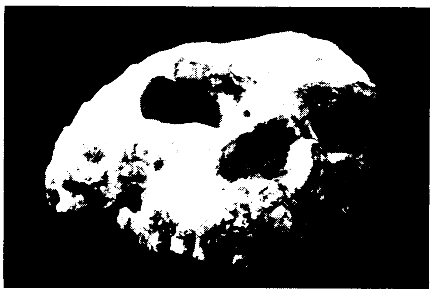
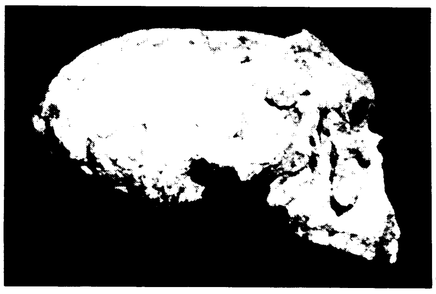
Chinese skulls face evolutionary mosaic





Etler

One Chinese skull lists to the right and was severely flattened. A side view of the other skull shows flat face and long, low braincase.

Since the 1970s, farmers tilling the soil along a ridge overlooking China's Han River have occasionally turned up fossil bones of long-extinct animals. That sparked the interest of Chinese paleontologist Li Tianyuan of the Hubei Institute of Archaeology in Wuhan, who led excavations at the site in 1989 and 1990 that yielded two nearly complete adult skulls of human ancestors dating to approximately 1 million years ago.

The specimens provide evidence that anatomically diverse populations of *Homo erectus* once lived throughout the Old World and independently gave rise to modern humans, assert Li and Dennis A. Etler of the University of California, Berkeley, in the June 4 NATURE. Their conclusion contrasts with the theory, also based on fossil evidence, that modern *Homo sapiens* arose in Africa and eventually settled in Asia and other regions.

Although both Chinese skulls remain largely intact, they did suffer varying degrees of crushing and flattening; this has obscured some important measurements, such as the volume of the braincase.

After viewing slides of the new fossils at the annual meeting of the American Association of Physical Anthropologists in April, G. Philip Rightmire of the State University of New York at Binghamton questioned whether scientists could assign the misshapen skulls to any species without a careful reconstruction of the crushed portions.

The limestone-encrusted specimens will be difficult to reconstruct, but they still preserve an "immense amount" of anatomy, Etler responds. "These are among the largest fossil crania of human ancestors ever discovered," he says.

The skulls, dated on the basis of extinct animal bones found in the same layer of sediment, display facial features much like those of early modern humans, Li and Etler maintain. These include a flat face with a nonprotruding jaw and a distinctively oriented upper jaw. However, the fossils also preserve more primitive features typical of *H. erectus*, namely, a long, low, sharply angled braincase; thick bones around the ear holes; a long, narrow jaw joint; and signs of a relatively flat cranial base.

This mosaic of advanced facial features and a more primitive look elsewhere on the skull also turns up on other east Asian fossil hominids (members of the human evolutionary family) from the same time period, the researchers point out. Anthropologists usually classify all of these remains as *H. erectus*, a species thought to have lived from about 1.6 million to 400,000 years ago.

A different mosaic pattern characterizes European and African fossil hominids that date to the same period as the Chinese finds, Li and Etler contend. It consists of a more primitive, angled facial arrangement combined with advanced traits elsewhere, such as a higher, rounder braincase and a discernible curve in the base of the skull. Some investigators consider the latter changes critical to human development and thus place the origin of our species in Africa.

Etler disagrees. "A different mosaic of features reflected the move toward modern human [anatomy] in different areas of the world," he argues. "No hominid population at any one place, including Africa, was more intimately tied to human origins than any other population living around 1 million years ago."

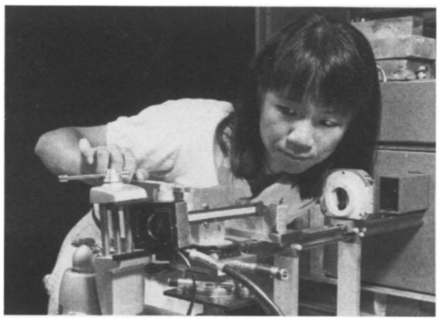
The varying mosaic of human evolution in different areas makes it difficult to define fossil species on the basis of "primitive" and "advanced" anatomical traits, Etler adds. Investigators should look for evidence of population dispersals, climate shifts and other factors that may have kindled regional changes in anatomy, he maintains. *— B. Bower*

Glass fibers to channel neutrons to a focus

Like flat stones skipping across placid water, neutrons striking a material at very low angles glance off its surface. Taking advantage of this behavior, researchers have now demonstrated that bundles of glass fibers containing microscopically narrow channels can guide, shape and focus beams of neutrons.

Instead of penetrating the glass, neutrons stream down these channels, repeatedly reflected by their smooth, inner walls. By gently curving each of the fibers in a bundle, researchers can manipulate the emerging neutron beams to concentrate them on a spot much smaller than possible without this novel "lens."

"There are many other approaches for focusing neutrons," says R. Gregory Downing of the National Institute of Standards and Technology in Gaithersburg, Md., who is a member of a team studying glass-fiber neutron lenses. "The difficulty has been to do that efficiently — to get intensities of neutrons useful for analytical purposes. By combining a number of technologies that just came together at one time, we've been able to accomplish that."



NIST

Neutrons emerge from a source (right), then pass through a strip of glass fibers permeated by extremely narrow channels (middle) before reaching a detector (left).

The idea of using narrow channels fabricated in glass fibers to control and manipulate both X-rays and neutrons originally came from Muradin A. Kumakhov of the I.V. Kurchatov Atomic Energy Institute in Moscow (SN: 4/13/91, p.236). In the June 4 NATURE, Kumakhov and colleague V.A. Sharov describe experiments showing that a lens assembled from 721 bent fibers of lead-oxide silica glass, each threaded by more than 1,000 narrow, parallel channels having inner diameters only 6 micrometers wide, can focus neutrons to a spot slightly smaller than 1 millimeter in diameter. This prototype lens amplifies the neutron intensity by a factor of six or seven.

In an accompanying paper, Downing and his colleagues, along with Kumakhov's group and Walter M. Gibson of the State University of New York at Albany, demonstrate that such bundles of multichannel fibers can also guide a neutron beam. Using glass fibers supplied by the Russian group, the researchers found they could bend a neutron beam through 20° in a distance of 130 millimeters while losing only half the neutrons.

"These investigations will form the basis for the design of a neutron lens for use in materials research or a beam bender capable of dividing and directing a neutron beam towards several experimental stations," the researchers say.

— I. Peterson