New Fossils Push Back Primate Origins

The discovery of four skulls belonging to mouse-sized, saucer-eyed primates that lived in North America 50 million years ago has dramatically pushed back estimates of when early primate groups first evolved.

Anatomical features of the nearly complete fossil skulls indicate that this animal, called *Shoshonius cooperi,* was a primitive form of tarsier – a tree-dwelling primate today found only in the forests of Southeast Asia. Thus, the discoverers conclude in the Jan. 3 NATURE, *Shoshonius* and modern tarsiers evolved from a common ancestor that split off from the forerunners of simians – monkeys, apes and humans – sometime before 50 million years ago.

Paleontologists K. Christopher Beard and Leonard Krishtalka of the Carnegie Museum of Natural History in Pittsburgh, working with Richard K. Stucky of the Denver Museum of Natural History, plucked the ancient skulls from quarries in Wyoming's Wind River Basin between 1984 and 1987. Animal bones found in the area and the age of volcanic ash straddling the site place the specimens at 50 million years old, Krishtalka says.

The oldest known simian fossil skull, dubbed *Catopithecus* by its discoverers, turned up in an Egyptian deposit in 1988 and dates to about 40 million years ago. Until now, many scientists assumed that the evolutionary parting of tarsiers and simians occurred around that time.

"This important find of the first *Shoshonius* skulls significantly pushes back in time the existence of tarsiers as a separate [primate] group," says anthropologist Elwyn L. Simons of Duke University in Durham, N.C.

Like living tarsiers, and in contrast to simians, *Shoshonius* had a short snout, enlarged bony ear chambers, and enormous eyes well suited to nocturnal activity. "These features were probably evolutionary novelties [of the tarsier lineage] that arose from a common ancestor," Krishtalka asserts. The geographic origin of that common ancestor remains unclear, he adds.

Scientists divide forest-dwelling primates living 55 million to 36 million years ago into two families: the adapids, including many species resembling modern lemurs; and the omomyids, comprising several animals with anatomical ties to modern tarsiers.

Denver Museum of Natural History

Preliminary reconstruction of Shoshonius.

Because most fossils assigned to the omomyid family consist only of teeth and jaw fragments, Krishtalka contends the omomyids represent a "wastebasket group" into which scientists dump all sorts of fossilized bits and pieces merely because the specimens come from small primates living in the same distant time period.

Many scientists regard omomyids as the forerunners of simians. Dissenters, such as Simons, view the adapids as more likely simian ancestors.

Simons led excavation teams that uncovered the 40-million-year-old *Catopithecus* skull and three skulls from 35-million-year-old primates called *Aegyptopithecus.* Neither of these creatures displays anatomical links to omomyids such as the Wyoming specimens, he argues.

In any case, the omomyids apparently included several independent primate lineages, observes anthropologist Robert D. Martin of the University of Zurich, Switzerland, in a commentary accompanying the research report. One omomyid branch may incorporate *Shoshonius* and living tarsiers, although confirmation of the link must come from lower-body bones as well as cranial fossils, he says.

Last summer, Krishtalka and his colleagues uncovered trunk and limb remains for *Shoshonius,* as well as three additional *Shoshonius* skulls. Preliminary, unpublished analyses of these finds suggest the tiny tree-dweller employed a tarsier-like posture and limb movements, Krishtalka says. "These new specimens show that the fossil record does not account for at least 10 million years of primate evolution," he contends.

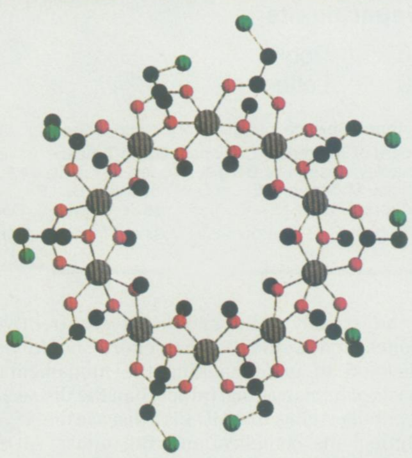
– B. Bower

Study spin-off: A molecular 'ferric wheel'

"Once in a while nature gives you a real beauty like this one," says Stephen J. Lippard, a chemist at the Massachusetts Institute of Technology in Cambridge.

The object of his admiration is a 200-atom molecule with a circular architecture resembling the famous amusement park ride invented in 1893 by engineer G.W.G. Ferris. The molecule's double entendre name reflects its chemical character: compounds containing iron – or *ferrum,* in Latin – often have the terms ferric or ferrous in their names depending on the number of positive charges that their iron atom brings into chemical bonds with the compound's other atomic or molecular components.

MIT graduate student Kingsley L. Taft serendipitously created the "ferric wheel" during routine studies of iron- and oxygen-containing complexes, which he and Lippard use as simple models of certain protein cores. Taft found that when one of these "iron-oxo" complexes reacts with ferric nitrate in a methanol solution, a green-brown color appears and then gives way to a yellow color when ether diffuses into the system. After several days, brown-gold crystals form. X-ray diffraction studies of the crystals reveal that the reaction produces circular molecules with 10 iron atoms linked via molecular bridges consisting mostly of carbon, hydrogen and oxygen; chlorine atoms cap the bridge groups that form the wheel's outer rim.



Lippard, Kingsley

"Ferric wheel" made of iron (gray), oxygen (red), carbon (black), chlorine (green) and hydrogen (not shown) atoms.

The chemists describe the evocative structure, which they say has no known use, in the Dec. 19, 1990 JOURNAL OF THE AMERICAN CHEMICAL SOCIETY. *– I. Amato*