Catching Up With China's Past

"Knowing the ancient beginning is the essence of Tao."

— Lao Tsu

Left: Reconstruction of female H. erectus *skull from northern China.*

By BRUCE BOWER

Taoism has served as a spiritual guide in China for 2,500 years. It was formulated by Lao Tsu, who also wrote that the ancient beginning experienced through Tao cannot be seen, heard or touched because it is "indefinable and beyond imagination."

But there are ancient beginnings in China of a far more concrete—or bony, to be more exact—nature. They are the fossil remains of the forerunners of modern humans and apes, collected by Chinese scientists whose research has only recently broken through the language barrier to the West.

Paleontologists in the United States and Europe often become aware of major Chinese archaeological discoveries during their travels in Asia, by happening upon press reports and journal summaries or through the scientific grapevine. There have even been a few collaborations between American and Chinese scientists. Only in the last year, however, have extensive English translations of important Chinese research papers become widely available.

A ground-breaking series of articles translated by Dennis Etler of the University of California at Berkeley appears in the 1984 *Yearbook of Physical Anthropology.* The papers, first published in Chinese journals in the early 1980s, are written by a number of Chinese archaeologists who describe and analyze fossil hominoids — creatures ancestral to apes and humans — unearthed at the 8-million-year-old Lufeng site. Remains from "tens if not hundreds of individuals" have been found at Lufeng, says Etler.

More ancient beginnings and transitions, from hominoids to modern humans, are illuminated in a book written by China's top archaeologists, titled *Palaeoanthropology and Palaeolithic Archaeology in the People's Republic of China* (Academic Press, Inc., 1985). Anthropologist John W. Olsen of the University of Arizona in Tucson translated the work into English and edited it with Wu Rukang of the Institute of Vertebrate Paleontology and Paleoanthropology in Beijing. Wu is considered the dean of Chinese archaeologists.

"Literally less than a tenth of 1 percent of the phenomenal amount of archaeology done since the end of the Cultural Revolution in the 1970s has been published in English even in summary," says Olsen. "The number and quality of Chinese fossils is very exciting."

The remains uncovered at Lufeng are a good example, he notes. Over the past decade, Lufeng has yielded the largest known collection of *Ramapithecus* and *Sivapithecus* bones, including several skulls, jaws and more than 1,000 teeth. *Ramapithecus,* which lived from about 8 million to 14 million years ago, is thought by some scientists to be an early human ancestor. Others say it is a smaller, female form of the ape genus *Sivapithecus* that lived at the same time and is often found in the same archaeological deposits.

Chinese scientists, and particularly Wu, appear to have flip-flopped on this argument over a relatively short period. In several early 1983 articles translated by Etler, Wu and colleagues contend that *Ramapithecus* and *Sivapithecus* are the female and male of one species, an ancestor of the orangutan. Later that year, in a NATURE article written with Charles Oxnard of the University of Southern California in Los Angeles, Wu says that an analysis of more than 1,000 teeth indicates that there were two distinct animals, with the smaller ramapiths evolving in a humanlike direction (SN: 1/21/84, p. 41). In Olsen's book, Wu and co-worker Xu Qinghua conclude that, until further analysis is completed, either of the two explanations is possible.

Oxnard, who stays in contact with Wu, says the Chinese scientist now supports the single-genus position, but interpretations of these fossils remain controversial. "Nearly everyone is in a state of flux on the nature of the *Ramapithecus-Sivapithecus* relationship," says Olsen.

Recent Chinese discoveries of *Homo erectus* fossils provoke less debate but are "extremely important," according to Olsen. Remains of this immediate ancestor of modern humans have been found at eight locations

throughout North and South China, report Wu and Dong Xingren in Olsen's translation. The deposits range from 1 million to 200,000 years old.

H. erectus fossils continue to be found at the famous Beijing Man, or Peking Man, site, which was first excavated in the 1920s, they add. The remains of more than 40 individuals from all age classes have been recovered from this one site. "This will allow us to study the evolution of *Homo erectus* in one area over several hundred thousand years," observes Olsen. There are important isolated *H. erectus* finds in the West, he points out — notably the recent discovery of a 1.6-million-year-old adolescent in Africa (SN: 10/27/84, p. 260) — but no population sample comparable to the Chinese collection has been unearthed.

Another important *H. erectus* find occurred late last year in northeastern China. Archaeologists from Beijing found the skull and partial skeleton of an individual who lived from 200,000 to 600,000 years ago. "China may well serve as a sort of laboratory for documenting the transition of *Homo erectus* to *Homo sapiens*," notes Etler. Late *H. erectus* and early *H. sapiens* deposits in China are often located in the same vicinity, he says.

For now, however, the Chinese literature suggests that *H. erectus's* jaw and tooth size varies much more than previously thought, explains Zhang Yinyun in Olsen's translation. He argues that four large primate molars found in central China may belong to an atypical population of *H. erectus*, not to the earlier ape-man *Australopithecus*, as some scientists have held.

If this is true, it provides further evidence that east Asia was not a separate "cradle of humanity," says Olsen. Instead, *H. erectus* may have migrated to China from Africa.

The data increasingly indicate, adds Yinyun, that in South China *H. erectus* shared the same environment and even came into contact with *Gigantopithecus*, an ancient primate that probably stood about 9 feet tall and weighed about 1,000 pounds. The most likely modern comparison to *Gigantopithecus* is the mountain gorilla, notes Olsen, which predominantly eats fruit.

Fossil evidence of *Gigantopithecus* is scanty, consisting of several hundred teeth and a few jaw fragments discovered in China, India and Pakistan. But in South China, and in a recently excavated deposit in North Vietnam, *Gigantopithecus* and *H. erectus* remains are found together in the same layers of earth. "It is possible, although unproven," writes Yinyun, "that intense competition between these two forms resulted in the demise of *Gigantopithecus* stemming from the superior abilities of *H. erectus* to exploit their shared environment through the manufacture and use of tools."

One advantage Chinese archaeologists have in locating the teeth of creatures such as *Gigantopithecus* is that these remains often turn up in the shops of apothecaries. The teeth are collected by peasants who quarry fossil-containing caves on what are called "dragon bone hills." They then trade them to druggists, who grind the paleontological treasures into a powder or paste long considered by Chinese folklore to have medicinal properties. This practice was recently banned by the Chinese government, says Olsen, but over the years scientists have had some success in recovering undamaged fossil teeth from druggists' shops and tracing the materials back to their original sites.

But even with an apothecary ace up their sleeves, Chinese archaeologists, like Western investigators, have spirited disagreements over the interpretation of the same sets of fossils, says Olsen. "Chinese science is not a monolithic entity, the product of a policy statement handed down from the Party," he explains. "It's characterized by a diversity of opinions and lively scientific debates." □

Sivapithecus *cranium from China.*

Photos from *Palaeoanthropology and Palaeolithic Archaeology in the People's Republic of China.* © 1985 Academic Press

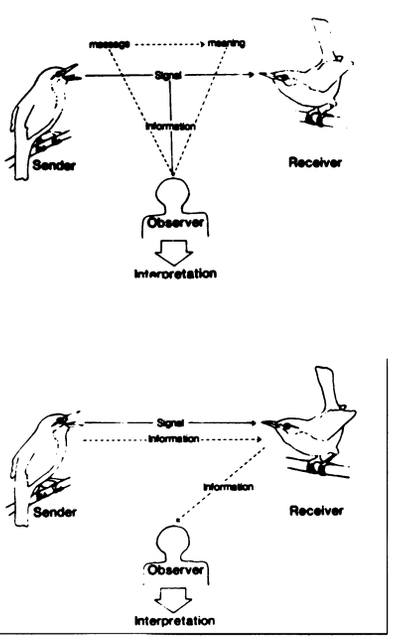
Continued from p. 315

produced without using the vocal cords. The vocal cords are coupled to the brain, Morton explains, and thus vocal sounds reflect an animal's motivational state. A nonvocal hiss, however, is made by an animal that is frightened but wishes to stay where it is until more information about the situation is available. "The hiss provides a way to mask motivation but still look potentially threatening," Morton says. "If vocalized, the hiss would look like a fear sound on a sonagram."

Is a hissing cat playing a game of deception? Not at all, Morton says. "Natural selection has selected for the behavior," he says, "because on the average, it has beneficial consequences." That is, sometimes the cat scares the potential attacker away.

A cat's arched back and raised fur add to the effect of its hiss, as any cat owner knows. These behaviors make the cat look bigger and more threatening. They constitute a general evolutionary trend, Morton says: In the face of incipient attack, the bigger you appear, the better off you are.

The trend is apparent not only in visual displays, such as a cat's arched back or the frilled neck collar of a lizard, but also in animal sounds. The larger an animal is in comparison with others of its species, the lower, harsher and more threatening it sounds.



Traditional concepts of communication emphasize the actions of senders and receivers. Bottom diagram depicts the information theory, while top diagram depicts a related theory called information as knowledge. These models differ from the motivation-structural rules, which emphasize signal structure rather than information communicated.

Amphibians like frogs and toads have it made: They grow all their lives, so the sounds they make constantly get lower and harsher, providing a true reflection of their size. A mating male frog, for example, can tell the size of an encroacher by comparing the encroacher's croak with its own. If the encroacher's pitch is higher, the mating frog is safe from attack because the other frog is likely smaller. If it is lower, the mating frog gets its chance to escape from a frog that is probably larger. Either way, the big frog wins.

Mammals and birds, which evolved later than amphibians, do not grow all their lives, so they are about the same size as others of their species when competing for mates. They evolved voice variability to compensate, Morton says. An animal that makes a low, harsh sound can ward off a potential intruder because the low voice makes it seem bigger. On the other hand, an animal that makes high, tonal sounds can express friendliness or fear.

Mammals and birds, then, appear to be quite clever in their uses of acoustic communication. But Morton is quick to point out that it probably has nothing to do with conscious intent. "Natural selection can come up with clever things," he says. "It's not the animal who's trying to be clever." □