Fossil Finds Diversify Ancient Apes

The Miocene period of 25 million to 10 million years ago was marked by the appearance of ape-like ancestors of modern apes and humans, known as hominoids, in Africa, Asia and Europe. Although questions and debates persist about the evolutionary relationships of various fossil hominoids to one another, two new types of the early apes have now entered the scene.

The fragmented fossil skulls, jaws and limb bones found along Lake Turkana in northern Kenya suggest that there was a greater diversity of hominoid lines than previously believed, report Richard Leakey and Meave G. Leakey in the Nov. 13 NATURE. The new material also supports arguments for the spread of hominoids from Africa to Asia early in the Miocene period, say the investigators, both of the National Museums of Kenya in Nairobi.

The age of the sediments in which the fossils were found has not been determined yet, but various animal remains in the same sediments are similar to those uncovered at other east African sites dated at 16 million to 18 million years old.

"The most interesting thing about these finds," paleontologist Peter Andrews of the British Museum in London told SCIENCE NEWS, "is that they show the number of hominoid species during the Miocene to have been rather greater than was previously known." It is not clear how the new hominoids fit into the evolutionary scheme, adds Andrews; answering this "key question" requires a closer examination of the remains, particularly the structure of the jaws and tooth enamel.

Nevertheless, say the Leakeys, when compared with other fossil hominoids, the fossils represent two distinct genera. The larger, baboon-size ape was dubbed *Afropithecus*, and the slightly smaller ape was named *Turkanapithecus*.

Afropithecus, explain the researchers, displays the characteristics of a variety of hominoids combined in a single, distinctive category. Its palate is shallow, long and narrow and the nasal passage is "remarkably narrow and high." The forehead inclines steeply to a long muzzle. The size of the canine teeth of the best-preserved specimen suggests that it was a male.

Another 17-million-year-old east African hominoid recently discovered by Richard Leakey and Alan Walker of Johns Hopkins University in Baltimore (SN: 12/7/85, p.360) is also a representative of *Afropithecus*, according to the investigators. Leakey and Walker originally assigned the find to another genus, *Sivapithecus*. There are two controversial lines of thought about *Sivapithecus*: Some scientists argue that it was an early African ape and human ancestor that migrated to Asia, while others contend it developed along a separate family line that led to Asian orangutans.

The new finds do not resolve this conflict, but the Leakeys now believe that *Sivapithecus* was restricted to Asia. They hold, however, that ancestral forms of this group first appeared in Africa.

The second new hominoid, *Turkanapithecus*, is short-faced with a narrow palate and tooth rows converging toward the back. Little is known about the cranial features of small-bodied Miocene apes, but the teeth of *Turkanapithecus* clearly separate it from other hominoid categories, say the researchers.

One possibility, says paleontologist Terry Harrison of New York University, is that *Turkanapithecus* is related to a European hominoid known as *Oreopithecus*. Harrison discusses new 17-million-year-old *Oreopithecus* specimens in the December AMERICAN JOURNAL OF PHYSICAL ANTHROPOLOGY.

He has seen the Leakeys' new finds, but says it is not yet clear if there is a link between the African and European apes. "The ancestry of *Oreopithecus* appears to be from east Africa," notes Harrison.

The first *Oreopithecus* fossil was discovered in 1872, and since then a number of well-preserved partial skeletons have been unearthed. Still, much about this group of hominoids is poorly understood. They apparently evolved on a group of islands near northern Italy over a period of 5 million to 10 million years. *Oreopithecus* remains reveal a number of curious specializations, says Harrison, including teeth used for browsing combined with human-like canines. It is a mystery how this line of hominoids settled on islands, he adds, since they had long arms and short legs ill-suited for swimming.

The Leakeys also express puzzlement that *Afropithecus* and *Turkanapithecus* have not been found at more abundant Miocene ape sites in western Kenya. It may be that different environments fostered different hominoids. "These new fossils come from a nonforested part of Kenya," says the British Museum's Andrews. "This is a new area and habitat for early hominoids." —*B. Bower*

Mulling over mastodon mass extinctions

At the end of the Pleistocene epoch, about 10,000 years ago, mastodons, mammoths and many other large mammals that roamed North America suddenly died off. Two theories have been proposed to explain these Pleistocene extinctions. One holds that extreme seasonal shifts in temperature were responsible; the other is that humans, by hunting the animals, had a hand in their demise.

While the cause of the extinctions is still a matter of debate, some scientists have been cooking up promising methods for testing these ideas. These tools, as well as a new, third extinction theory, were discussed last week at the meeting of the Geological Society of America (GSA) in San Antonio, Tex.

At a GSA meeting three years ago, Daniel C. Fisher and Paul L. Koch of the University of Michigan in Ann Arbor concluded that humans had been hunting as well as scavenging mastodons. They based this theory on the finding that all the scavenged animals had died during one season, the fall, whereas the nonbutchered mastodons had died at the end of the winter (SN: 11/12/83, p.312).

Specifically, they based their conclusions on the thickness of growth bands on the animals' tusks, assuming that thin groups of bands corresponded to winter growth and thick groups to summer. The problem with this approach, says Koch, is that the thickness of the bands might be controlled by the animals' reproductive cycles. So the researchers searched for a method that would more reliably reflect the environmental temperature and not the animals' biology.

Since mastodons could keep their own temperatures relatively constant, the researchers reasoned that the changes in oxygen isotope ratios measured in the tusks must reflect changes in season — oxygen-18 is more prevalent in North American rainwater in the summer and oxygen-16 in the winter. They found that the tusk ratio of oxygen-16 and oxygen-18, which the animals ingested when they drank water, corresponded to the thickness of the growth bands, confirming, they conclude, the seasonality of the deaths.

This "is the first time anyone's been able to measure [prehistoric] seasonality in a continental region," says Koch.

Fisher cautions that while these findings are consistent with the hunting hypothesis, they certainly do not prove it. The next step, adds Koch, is to use the same oxygen isotope method on tusks to see if the seasons really did become more extreme, as the climate theories suppose.

The researchers are also working on another way to test both hypotheses.

Fisher notes that before the mastodons went extinct, their body size became smaller. Each theory could account for this, but in different ways: In a more severe climate, the animals would become sexually mature later in life, and so tend to grow more slowly, whereas hunted mastodons would mature at an earlier age so that they could reproduce more often, and hence would stop their growth sooner.

In studying the patterns of growth bands on mastodon tusks, Fisher has devised a way to gauge the age at which an animal became sexually active. By comparing the life cycles of the last living mastodons with those of their ancestors, he hopes to nail down the cause of the extinction.

In the meantime, Robert G. Brakenridge at Wright State University in Dayton, Ohio, has thrown another theory into the pot. He proposes that the Vela supernova (SN: 6/20/81, p. 391), which appeared at about the time of the extinctions, emitted a burst of gamma and X radiation that destroyed 35 to 80 percent of the earth's ozone layer. This loss of ozone, he says, could have allowed harmful ultraviolet light from the sun to penetrate the atmosphere, killing off the plants upon which the mastodons, mammoths and other large mammals grazed.

The supernova also would have increased the production of carbon-14 in the atmosphere, according to Brakenridge. He hopes his idea will prompt other scientists to look for traces of this increased carbon-14 in the geologic record.

Because there is so much uncertainty in all the calculations that go into this model, comments Fisher, it may be hard to evaluate. "But I'm perfectly happy to put it on the stove and let it cook with everything else," he says. — *S. Weisburd*

Where there's smoke

Nonsmokers are imperiled by their exposure to tobacco smoke, according to a report issued last week by the National Research Council. The council, a branch of the National Academy of Sciences, came to its conclusion after analyzing scientific literature on the emotionally charged question.

While stopping short of making public health recommendations, the council suggested that studies showing an increased incidence of lung problems in children of smokers make it "prudent to eliminate environmental tobacco smoke exposure from the environments of small children." It also found that exposure to smoke increases the incidence of lung cancer in nonsmokers: Several population studies have shown a 30 percent higher lung cancer incidence in nonsmoking spouses of smokers than in nonsmoking couples. □

High-radon homes may be widespread

Dwellers in an estimated 1 million U.S. homes with high indoor radon levels may be receiving radiation exposures that meet or exceed those received by the average uranium miner, according to a study by researchers at Lawrence Berkeley Laboratory (LBL) in Berkeley, Calif. At present, there are no federal regulations limiting nonoccupational exposure to the gas. There is also little money available to fund radon research, notes Anthony Nero, a physicist and one of the study's authors. Nero and his co-workers report in the Nov. 21 SCIENCE that the cancer risks posed by inhalation of radon and its decay products are 100 to 1,000 times greater than many of the chemical hazards for which the Environmental Protection Agency (EPA) has already issued regulations.

Over the past decade, there has been growing concern about the hazards posed by indoor radon. The gas, generated by the natural radioactive decay of radium in the soil, enters homes primarily through cracks in the foundation. Though radon is a naturally occurring source of low-level background radiation, various factors can cause buildings to accumulate dangerous concentrations of the radioactive gas and its "daughters," or decay products. Actually it is the daughters that pose the real health concern (SN: 1/18/86, p.43): Unlike their parent gas, the daughters adhere to respirable dust particles in the air. Once inhaled, they tend to adhere to the lungs, where they can eventually emit cell-damaging energy.

In the new study, Nero and his colleagues in LBL's Indoor Environment Program looked at 38 different collections or surveys of radon measurements in U.S. single-family homes. Eventually they focused on those 22 collections which, because there had been no presampling reason to suspect test sites contained high radon concentrations, appeared to offer the most random sampling. The 22 data sets include homes from 17 states and every major geographic region, including many major metropolitan areas such as New York City, San Francisco and Houston. Because indoor radon can vary seasonally — with peak levels typically in winter — less-than-year-long measurements were "normalized," or adjusted to approximate an average annual reading. Nero says his group derived its normalization formula from the four data sets available with radon readings for multiple seasons.

The study found an average home-radon concentration of 1.5 picocuries per liter (pCi/l) in air, a level the researchers say would pose a 0.3 percent increased risk of lung cancer mortality, or 10,000 excess lung cancer cases per year in the United States. An estimated 7 percent of U.S. homes — about 4 million — may have more than 4 pCi/l radon, the level at which EPA recommends taking remedial action. LBL data also suggest that approximately 1 million single-family homes have indoor radon concentrations of 8 pCi/l or greater. The latter concentrations could lead to annual radiation doses of 1.5 to 2 "working level months" (the standard measure of occupational radiation dose), Nero notes, or a level that he says is 50 to 100 percent higher than the average annual dose received by U.S. uranium miners.

"That, in itself, is provocative," says Nero. But more to the point, he believes, is the fact that the federal government "spends a lot of time regulating risks that are much lower." For example, he notes, more than $1 billion is being spent to control radiation risks from uranium mill tailings — voluminous uranium-processing wastes. However, Nero says, "those people exposed to an average of 8 pCi/l of radon from uranium mill tailings are only numbered in the tens or hundreds."

Rep. Gus Yatron (D-Pa.), who authored legislation in July aimed at boosting federal support for the study and control of radon, believes the LBL data could serve as a catalyst for reshaping the current radon policy debate. Congressional action on the pollutant bogged down earlier this year over discussion of whether to focus on this gas individually, or as just one part of a broader indoor-air-quality improvement program. "I think radon is the indoor-air pollutant that poses the greatest threat to human health," Yatron told SCIENCE NEWS. "It would be very unproductive to allow this policy debate to slow our efforts [to control radon]."

Yatron says he would like to see the federal government, especially EPA, given more support — over and above the $5 million in the new Superfund reauthorization (SN: 10/25/86, p.264) — for developing low-cost indoor-radon mitigation technologies applicable to a wide range of homes. States, he says, should focus on disseminating radon information, testing homes for the gas and providing low-interest loans for radon-mitigation renovations. Finally, he would like to see local governments work with builders and realtors in amending building codes and standards to limit radon's infiltration into homes. Developing such government programs "will be made much easier," Yatron says, "if Nero's findings have the impact that they ought to have." — *J. Raloff*