Ancient Apes May Have Branched Out

A partial skeleton of a 15-million-year-old African ape—painstakingly excavated, prepared, and analyzed over the past 5 years—represents a new fossil genus in the primate family that includes great apes and humans, according to its discoverers. Their conclusion adds to a growing conviction among researchers that ancient apes branched out in more evolutionary directions than had previously been appreciated.

Scientists, however, express a range of opinions about how to classify the new fossil ape. The find, reported in the Aug. 27 SCIENCE, also shows no signs of cooling off scientific controversy about whether fossil apes within or outside of Africa served as ancestors for modern apes and humans (SN: 4/19/97, p. 240).

The team that unearthed the skeleton assigns it to a new genus, *Equatorius*. The find also leads Steve Ward of Northeastern Ohio Universities College of Medicine in Rootstown, Andrew Hill of Yale University, and their colleagues to reassign one of two *Kenyapithecus* species—African fossil apes that lived from around 15 million to 14 million years ago—to *Equatorius*.

The new specimen and previously excavated remains of *Kenyapithecus africanus* share facial and dental features that appear much more exaggerated in the handful of fossils assigned to the species *Kenyapithecus wickeri*, the researchers contend.

"We now have to figure out where *Equatorius* fits into subsequent ape evolution," Ward says. "I suspect that there were separate movements of *Equatorius* and *Kenyapithecus* out of Africa."

In 1993 and 1994, Ward and his coworkers recovered blocks of hard clay containing the partial skeleton from the Kipsaramon site in central Kenya. It took 3 years to remove the bones intact from their rigid casing, followed by more than a year of skeletal analysis.

The skeleton, from an adult male, includes a lower jaw retaining most of its teeth, two teeth from the upper jaw, and bones from the spine, chest, shoulders, arms, wrists, and fingers.

Equatorius exhibits signs of having inhabited a position at or near the evolutionary root of modern apes and humans, Ward and his colleagues hold. In their view, some of its anatomical features look like those of African apes dating to as early as 22 million years ago.

However, *Equatorius* also displays evidence of having frequently moved about on the ground, much like later fossil apes, Ward says.

The decision to fold *K. africanus* into the new genus received further confirmation, he notes, from the observation of dental similarities between *K. wickeri* and an unnamed fossil ape species of about the same age previously unearthed in Turkey. The nature of the link between African and Eurasian apes at that time remains poorly understood.

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Jaw and tooth remains of African fossil ape proposed to embody a controversial new genus.

"The description of this new genus is long overdue," comments Peter Andrews of the Natural History Museum in London. "Until now, *Kenyapithecus* has been a waste-bin [genus] into which people put all sorts of fossils."

Equatorius may have been ancestral to later African apes, or even to all modern apes, Andrews suggests. On the other hand, *K. wickeri* sits on an evolutionary side branch that eventually ended in extinction, he says.

Eric Delson of Lehman College, City University of New York doubts that enough evidence exists to justify the proposed new fossil-ape genus. *Kenyapithecus* finds—especially those of *K. wickeri*—remain too scarce for the extensive comparisons needed to establish the existence of *Equatorius*, he asserts.

Brenda R. Benefit of Southern Illinois University in Carbondale, who with Illinois coworker Monte L. McCrossin directs ongoing Kenyan excavations of *K. africanus* fossils, rejects the analysis of Ward's group. The new specimen exhibits no traits that separate it from *Kenyapithecus*, she argues.

In contrast to Ward's view, recent finds of *K. africanus* indicate that the species bears substantial dental similarities to *K. wickeri*, according to Benefit.

Several partial skeletons of a 15.3-million-year-old African fossil ape were recently recovered by a Japanese team at another Kenyan site and described in July at a conference in Kyoto. Most scientists at the conference accepted the finds as a new genus distinct from *Kenyapithecus*, says Benefit, who attended the Kyoto meeting.

No one in Ward's group attended the Kyoto conference, and the group hasn't yet compared its find with the Japanese team's. —*B. Bower*

Turkish earthquake: A wobbly domino falls

The tremor that turned life upside down in northwest Turkey last week has helped to put an earthquake theory on more solid footing, according to seismologists who anticipated the disaster.

The magnitude 7.4 quake occurred near the western end of the North Anatolian fault, a 1,200-kilometer-long tear extending across the northern part of Turkey. Unrest along this fault stems from the slow-motion collision between Arabia and Eurasia, located on either side of Turkey. As these two giant pieces of Earth's outer shell crash together, they force the diminutive Anatolian plate carrying Turkey out of the way.

During quakes, the bulk of Turkey moves westward relative to land north of the fault. "It's kind of like a watermelon seed being squeezed," says Lynn R. Sykes of Columbia University's Lamont-Doherty Earth Observatory in Palisades, N.Y.

After several centuries of building pressure, the seed started slipping in 1939. In that year, an earthquake estimated at magnitude 7.9 ruptured the crust along the eastern third of the fault, killing some 30,000 people. Between 1942 and 1967, the fault generated six large shocks progressing westward toward Istanbul like a line of falling dominoes. Last week, the next patch of the fault toppled beneath the city of Izmit.

Well aware of the pattern, seismologists have long warned about the possibilities of earthquakes in this area. In recent years, scientists started exploring why this series of shocks has stepped so consistently down the fault.

In 1997, a team of U.S. and Turkish researchers proposed that each tremor along the North Anatolian fault helps set off the next one. Scientists had developed this idea, called stress triggering, while studying progressions of California quakes.

When the two sides of a fault jerk in opposite directions during a tremor, it relieves stress that had built up over decades or centuries. At the same time, however, it adds stress to some neighboring patches of the fault, says Ross S.

Stein of the U.S. Geological Survey in Menlo Park, Calif. He and his colleagues calculated that 9 out of 10 large recorded earthquakes on the North Anatolian occurred in areas where previous shocks had increased stress. Their analysis also pinpointed the two most worrisome parts of the fault, one of which caused last week's quake.

Stein notes that this work did not predict the shock. The researchers gave only a 12 percent probability that the Izmit section would go by 2026. "In a sense, we said there was a 88 percent probability it would not occur," admits Stein.

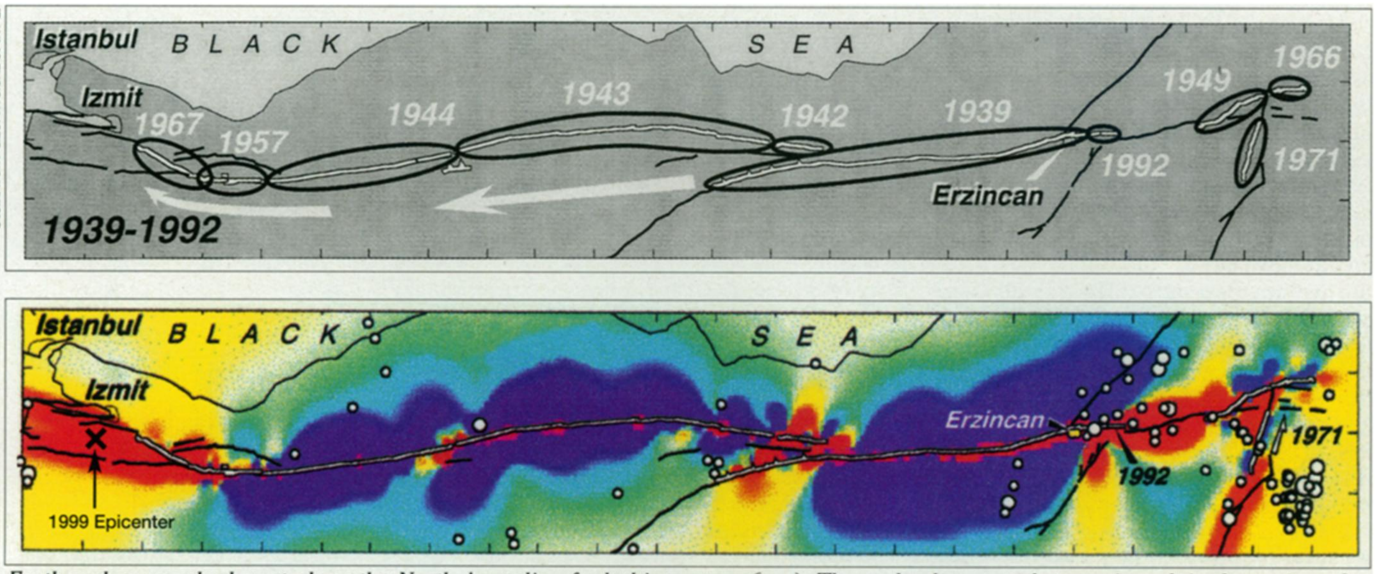
Nonetheless, the earthquake supports the hypothesis of stress triggering, says Gregory C. Beroza of Stanford University. Researchers are currently using this theory to determine how past earthquakes have raised and lowered seismic risk in different parts of California.

U.S. seismologists see parallels between the Turkish and the San Andreas faults. In both, land moves horizontally during quakes. The faults are the same length, and each splits into branches. The earthquake beneath Izmit happened on the north fork of the fault. "That behavior of the fault splitting up is much like what happens in the San Francisco Bay area of the San Andreas," says Sykes.

The quake also offers sobering lessons about how ineffective scientists are in influencing building practices, says Nick N. Ambraseys of Imperial College in London. "From the point of view of reducing damage and cutting down the death toll, science alone can do absolutely nothing."

Turkish building codes accounted for the seismic risk, but the government did not enforce such codes, says Ambraseys. "The important thing is complacency. It doesn't apply only to Turkey or Japan. It also applies to California." *—R. Monastersky*

Stein/from Geophysical J. Int'l.



Earthquakes marched west along the North Anatolian fault this century (top). These shocks created stress, in red, in the region of last week's quake (bottom).

Pokey pulsar mystifies astronomers

Whirling stars called pulsars are like celestial lighthouses, sending a narrow beam of energy into the galactic darkness. Astronomers have now discovered a slowly rotating pulsar that defies their basic understanding of how the stars work.

When a massive star collapses, it forms a terrifically dense, magnetized core, known as a neutron star. A neutron star whose magnetic axis tilts away from its rotational axis emits a beam of radio energy that, from Earth, appears as a pulse at each rotation, and so the body is called a pulsar.

The electromagnetic field, or magnetosphere, that envelops a young, swiftly rotating pulsar generates duos of charged particles called electron-positron pairs. These, in turn, spawn the beam of radio emissions. The faster a pulsar spins, the more particle pairs it produces, and the more powerful are its radio emissions. As the stars age, they slow down and stop producing particle pairs. Scientists have theorized that as this energy supply is exhausted, pulsars' radio emissions cease.

Australian scientists, however, report that a radio pulsar they discovered in 1994, called PSR J2144-3933, rotates only once every 8.51 seconds. This rotation takes more than 3 seconds longer than that of any known pulsar—and is one-third as fast as the researchers had earlier believed.

Spinning this slowly, PSR J2144-3933 should have already stopped producing particle pairs, making it silent to radio telescopes. Instead, the star's radio pulse beats loud and clear, the researchers report in the Aug. 26 NATURE. "It was quite surprising and a very exciting discovery," says study coauthor Matthew D. Young of the University of Western Australia in Nedlands.

The finding challenges long-standing assumptions about pulsars. "I think [the finding] is going to have a fairly large impact," remarks David J. Nice of Princeton University. "Whatever is going on in the magnetosphere of the pulsar is very complicated in ways that we don't entirely understand—we don't know how to figure it out from our current observations."

"It may be that the radio emission derives its energy from some other source [than the particle pairs]," Young speculates. "Or maybe that process can continue for longer than we thought, or maybe we just don't understand the underlying physics of the neutron star itself."

"I'm baffled at this point," admits Alice K. Harding of NASA's Goddard Space Flight Center in Greenbelt, Md. "I think theorists are just going to have to go back to the drawing board for a while."

"It doesn't necessarily mean that you have to throw out all the old theories, but it does mean that you have to rethink the details of them," says coauthor Richard N. Manchester of the Australia Telescope National Facility in Epping.

In an editorial accompanying the study, Alex Wolszczan of Pennsylvania State University in State College argues that "a really meaningful discussion of these and other alternatives will depend on new detection of very slow pulsars like J2144-3933."

That could be tricky. Although the researchers estimate that the Milky Way could contain about 100,000 similar pulsars, Young notes, "the beam from such a slow radio pulsar is very narrow, and it was purely by chance that this one happened to sweep over the Earth." *—S. Carpenter*