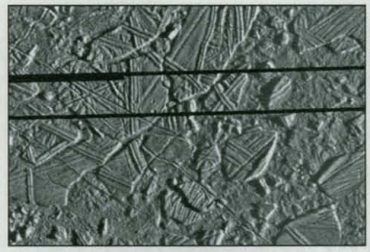
PLANETARY SCIENCE

An Ocean Emerges on Europa

Hints of ancient life on Mars have captivated planetary scientists since last summer, but last week their attention jumped to Jupiter's moon, Europa, when researchers announced what they consider persuasive evidence of a deep ocean below Europa's icy surface. Images newly returned by the Galileo spacecraft show a complex, shattered terrain that bears an eerie resemblance to the ice cover of the Arctic Ocean, researchers said at a NASA press conference in Pasadena, California. If Europa does harbor an ocean, the planet would have an abundance of liquid water—a key prerequisite for life. Some members of the Galileo team, however, aren't ready to take the plunge.

When Galileo began returning images of Europa late last year, planetary scientists realized that something has been disrupting much of the moon's surface by squeezing up ridges and crumpling some areas into thoroughly chaotic terrain. Last month, at the Lunar and Planetary Science Conference in Houston, team member Clark Chapman of the Southwest Research Institute in Boulder, Colorado, argued that the striking dearth of meteorite craters on some parts of Europa implies that the surface is still being reshaped.

Now, the latest Galileo images have convinced some researchers that a thin layer of ice floating on liquid water is the most reasonable way to explain this turmoil. Europan geology "does look a lot like the ice cover of the Arctic Ocean," said arctic researcher Max Coon of NorthWest Research Associates Inc., in Bellevue, Washington. Kilometers-long slabs of ice appear to have broken off and drifted in a "sea" of what looks like refrozen water. "These are icebergs," said Galileo team member Paul Geissler, of the University of Arizona. He and fellow team member Michael Carr of the U.S. Geological Survey in Menlo Park, California, argued that only the circulation of a warm ocean could have partially melted the ice crust and dragged the "icebergs" around.



JPL/NASA

Extraterrestrial icebergs? New views of Europa resemble the Arctic Ocean.

But not everyone is convinced. "It's a bold hypothesis that probably has some staying power," said team member Robert Sullivan of Arizona State University, "but there is room for some surprises." Indeed, each time Galileo has swung by Europa and gathered more images, geologists have had to toss out previous ideas about the moon's geology. In January, for example, the team suggested that "ice volcanoes" have flooded the surface with icy lavas, but Sullivan has now backed away from that idea. Team member Robert Pappalardo of Brown University remains cautious too: "I don't think we have proof of an ocean," he says. "I would argue for keeping open the option that this stuff has moved around on top of ductile ice instead of an ocean. We have a good suggestion of an ocean, but it needs testing."

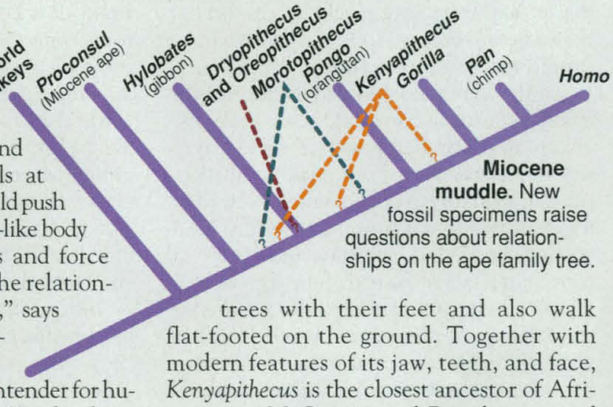
–Richard A. Kerr

PALEOANTHROPOLOGY

Miocene Primates Go Ape

Wind back the clock 5 million to 23 million years to the Miocene, and parts of Eurasia and Africa would seem like the planet of the apes. "If you could have walked from Spain to China 10 million years ago, you'd have seen an amazing diversity of apes," says University of Texas paleoanthropologist John Kappelman, who estimates that no less than 30 different types of early apes lived during the Miocene. But after this spectacular flowering, nearly all these apes became extinct, with only one lineage surviving to give rise to modern apes and humans. Although there have been plenty of candidates for this distinction, including chimpanzee-sized apes from Europe called *Oreopithecus* and *Dryopithecus*, anthropologists have had only fragmentary fossils to tell them which one.

Now, thanks to new fossil finds, two African species are seeking prime ancestral spots on the modern ape family tree. New "ape-like" arm and ankle bones from one candidate, *Kenyapithecus*, indicate that this 14-million-year-old primate was "the best, most likely ancestor of humans, chimps, and gorillas," say paleoanthropologists Monte McCrossin and Brenda Benefit of Southern Illinois University. And another team has proposed a larger tree dweller called *Morotopithecus* as an even earlier ancestor. In a report on page 401, Northern Illinois University anthropologist Daniel Gebo and his colleagues identify modern features of this ape's back and shoulder, and date the fossils at 20.6 million years old. That would push the emergence of a modern ape–like body plan back by 5 million years and force researchers to "rethink all of the relationships of apes in the Miocene," says University of Missouri paleoanthropologist Carol Ward.



Miocene muddle. New fossil specimens raise questions about relationships on the ape family tree.

Kenyapithecus has been a contender for human ancestry ever since the 1960s, thanks to face bones and teeth that set it apart from other Miocene apes. But other parts of *Kenyapithecus*'s skeleton turned out to look more primitive, and it was pushed to an outlying branch of the ape family tree—outside the African ape group, which includes modern gorillas, chimps, and humans (see diagram). Now, however, McCrossin and Benefit claim that new fossils found last summer on Maboko Island in Kenya's Lake Victoria bring *Kenyapithecus* back in the African ape family.

Working with 135 excavators, they unearthed several new *Kenyapithecus* bones that they say resemble those of modern apes, including a straight upper arm bone and an ankle bone shaped to allow *Kenyapithecus* to rotate its foot sideways—a feature of living chimps that allows them to cling to trees with their feet and also walk flat-footed on the ground. Together with modern features of its jaw, teeth, and face, *Kenyapithecus* is the closest ancestor of African apes, McCrossin and Benefit proposed last week at the annual meeting of the American Association of Physical Anthropologists in St. Louis.

A different set of traits has convinced Gebo, Laura MacLatchy of the State University of New York, Stony Brook, and their colleagues that *Morotopithecus* is an even older ancestor. Vertebrae from this ape, found in Moroto, Uganda, in the early 1960s, had long tantalized researchers because they suggest that *Morotopithecus* had a stiff back—a feature critical for the occasional upright posture adopted by modern apes. But other traits in *Morotopithecus*'s teeth and face were primitive.

In 1994 and 1995, however, Gebo and MacLatchy's team found a partial shoulder bone and parts of two leg bones or femurs at Moroto. Not only did argon-argon dating