Fossil suggests apes, old world monkeys moved in opposite directions from shared ancestor

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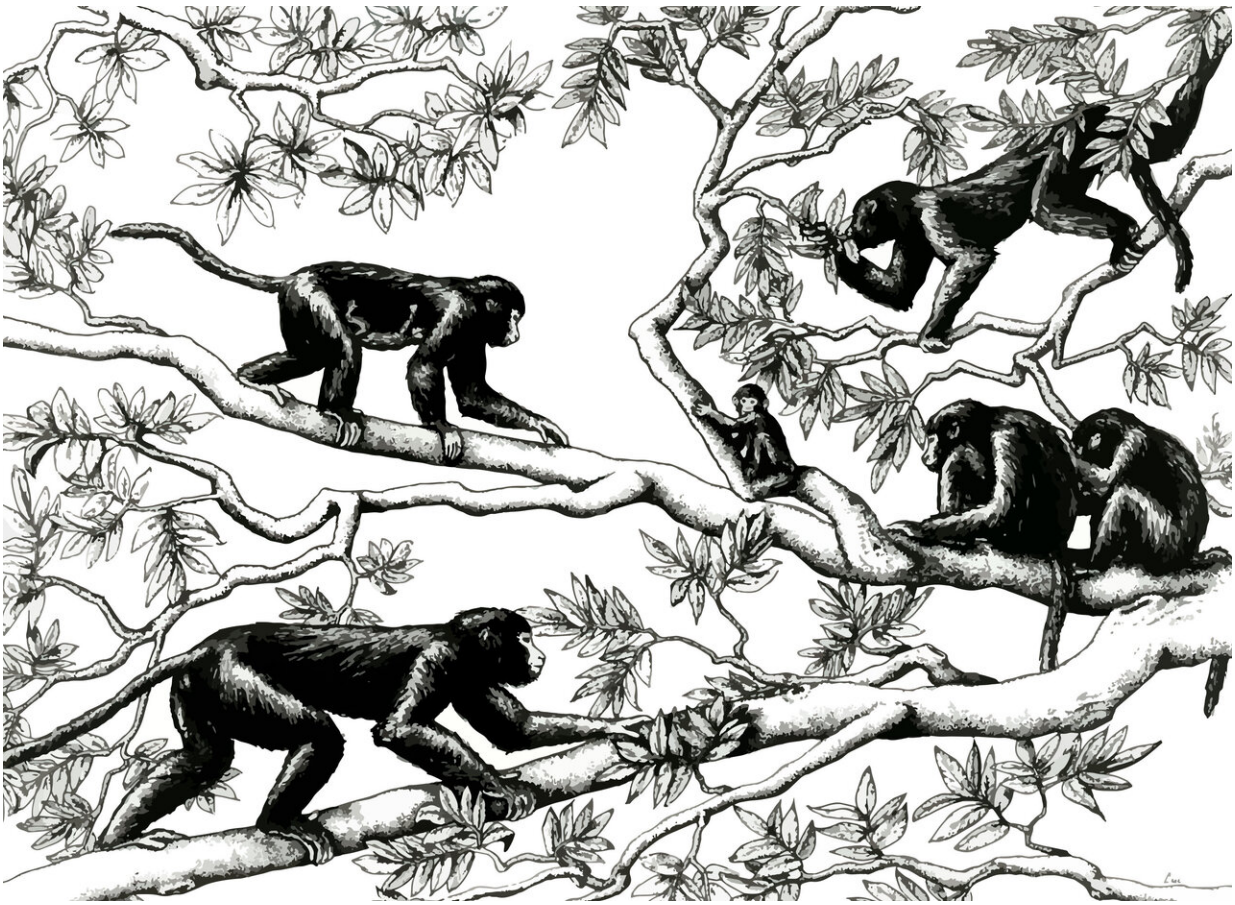

Artistic reconstruction of a group of Aegyptopithecus individuals on a tree during the Oligecene. Credit: Lucille Betti-Nash (modified by Sergio Almécija).

In terms of their body plan, Old World monkeys—a group that includes primates like baboons and macaques—are generally considered more similar to ancestral species than apes are. But a new study that analyzes the first well-preserved femur of *Aegyptopithecus zeuxis*, a common ancestor of Old World monkeys and apes, suggests that as far as locomotion goes, apes and Old World monkeys each evolved a way of moving that was different from the ancestral species as they adapted to different niches in their environments.

"Our study shows that *Aegyptopithecus* preserves an ancient hip morphology not present in living anthropoid primates," said Sergio Almécija, a paleoanthropologist and evolutionary biologist in the Division of Anthropology at the American Museum of Natural History who is first author on the study, which was published in *Nature Communications* this week. "As far as the hip is concerned, it seems that apes, humans, and Old World monkeys have all parted ways long ago—which would explain why they move around so differently today."

The fossil analyzed in the study was discovered in 2009 and is the most complete femur of *Aegyptopithecus*, a 15-lb (7-kg) likely tree-dwelling species that lived in Egypt about 30 million years ago, close to the time when hominoids (the group that includes apes and humans) split from the larger group that includes Old World monkeys. A well-preserved femur allowed researchers to glean details about the hip joint, a major anatomical region for inferring locomotion, using a combination of 3-D morphometric analysis and evolutionary modeling.

For the analysis, the authors compared the fossil bone to other extinct and modern species, including humans, chimpanzees, and Victoriapithecus and Homunculus (extinct Old World and New World monkeys, respectively). The evolutionary modeling analysis used in the study included a method that was developed to identify convergent evolution in anole lizards in the Caribbean, which have independently

developed comparable niche-specific adaptations across various islands.

The results indicate that the ancestral hip joint is, from an evolutionary perspective, as far from the hip joint of modern Old World monkeys as from those of the great apes—suggesting that each group evolved a distinct way of moving as they specialized for success in different environmental niches.

Play session between adolescent male chimpanzee, Faustino, (Pan troglodytes schweinfurthii) and adolescent male olive baboon (Papio anubis). Gombe Stream Research Center, Gombe National Park, Tanzania. Credit: © Kristin J Mosher

In addition, evolutionary modeling suggests that living great

apes—including orangutans, chimpanzees, and gorillas—may have independently developed similar hip joint anatomy that allows wide-ranging, flexible movement through their arboreal habitats.

"What I find really exciting about the modeling approach is that we can develop better hypotheses about what drove the divergence of apes and monkeys, and the emerging picture is that navigating the environment is one of the key factors," said Ashley Hammond, assistant curator in the Division of Anthropology and an author on the study.

More information: Sergio Almécija et al, Early anthropoid femora reveal divergent adaptive trajectories in catarrhine hind-limb evolution, *Nature Communications* (2019). DOI: 10.1038/s41467-019-12742-0

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