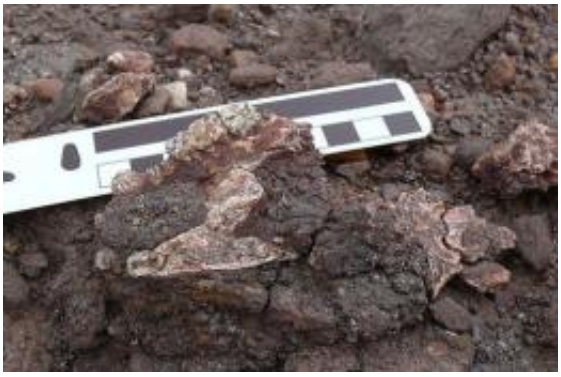
Fossil find puts a face on early primates (w/ Video)

July 14 2010



This photo, provided by the University of Michigan Museum of Paleontology, shows the cranium of Saadanius hijazensis as it was found in February 2009 during a joint Saudi Geological Survey and University of Michigan field expedition. The last ancestor shared by monkeys and humans probably lived between 28 and 24 million yrs ago, several million later than previously thought, fossils have revealed.

When paleontologist Iyad Zalmout went looking for fossil whales and dinosaurs in Saudi Arabia, he never expected to come face-to-face with a significant, early primate fossil.

But the skull he stumbled upon provides new insights into what the last common ancestor of apes and monkeys may have looked like and when the two lineages went their separate ways.

Zalmout and colleagues at the University of Michigan and the Saudi Geological Survey describe and interpret the fossil in a paper published online July 15 in the journal *Nature*.

It is well known that Old World monkeys and apes share ancestry, but exactly when the two branches split from the common trunk has been unclear. Debates also have swirled around the question of what sort of facial structure the progenitor of apes and monkeys had.

Both lineages belong to the primate group known as catarrhines. The earliest catarrhines in the fossil record, creatures that were neither monkey nor ape, date back to the late Eocene to early Oligocene epochs, 35 to 30 million years ago. Later fossils, from around 23 million years ago, suggest the split had already occurred by that time. But few fossil catarrhines from the interval between 30 million to 23 million years ago have been found, making it difficult for scientists to know precisely when monkeys and apes became distinctly separate groups and what catarrhines looked like around the time of the split.

The new fossil catarrhine, Saadanius hijazensis, dates from 29 million to 28 million years ago and lacks the specialized features that distinguish modern apes and Old World monkeys, suggesting that the split had not yet occurred. The researchers' analysis of the fossil leads them to believe its physical features are much like those of the last common ancestor of Old World monkeys and apes.

Zalmout, a postdoctoral fellow working with U-M paleontologist Philip Gingerich, found the fossil in 2009, during a trip focused on finding fossil whales and dinosaurs. Working with the Saudi Geological Survey (SGS), he was exploring an area where geological maps indicated the rocks might contain fossils from the Cretaceous period (145 to 65 million years ago), a time when dinosaurs dominated the land. His first clue that the maps were wrong came when he saw a jawbone sticking out

of the sediments and realized it was from a hippo-like animal that lived more recently---around 35 to 33 million years ago.

The next day, he explored a nearby area that seemed more likely to yield older fossils, but again the first thing he found was another fossil from a more recent hippo-like creature.

"I didn't know whether to be disappointed or not, but I thought, well, maybe something interesting will pop up here, so I started looking around," Zalmout said. "Within minutes, I found teeth sticking out of the ground, and when I realized what they were I was shocked. I had worked with Phil on terrestrial mammals in the Bighorn Basin, and my first look at the size and shape of these teeth told me I had found a primitive primate."

Zalmout e-mailed a photo to Gingerich, an expert on early primates as well as ancient whales.

"I knew right away what it was, and I was thrilled," said Gingerich, who is the Ermine Cowles Case Collegiate Professor of Paleontology and director of the U-M Museum of Paleontology. As a student, Gingerich had worked with paleontologist Elwyn Simons, who studied Aegyptopithecus, a primitive catarrhine from the early Oligocene. "Here was something very much like it looking up at me," Gingerich said.

Yahya Al-Mufarreh, head of the paleontology unit at SGS, also was elated. "On the day of the discovery, we could not believe what we had," he said. "We were so lucky and happy to have an experienced paleontologist from Michigan who explained the discovery on site. This discovery is a critical step in paleontology along the Red Sea. It will answer many questions about the age, environment and paleogeographical context of the Oligocene Shumaysi Formation in western Saudi Arabia."

Zalmout had to leave the skull where he found it---he had a schedule to adhere to, and he knew that properly collecting the primate fossil would take days. For the next few days he couldn't stop thinking about the fossil, worried that a wandering camel or goat would trample it before he could return. Eventually, he was able to excavate the site and bring the fossil to U-M for preparation and study.

The Saadanius skull should help resolve an ongoing debate about the facial anatomy of the ancestral stock of apes and Old World monkeys, said Laura MacLatchy, an associate professor of anthropology who worked with Zalmout, Gingerich, assistant research scientist William Sanders and associate research scientist Gregg Gunnell to interpret the find. One view is that the oldest common ancestor's face was like that of modern gibbons: dainty and button-nosed. Alternatively, the ancestor may have had a baboon-like, long snout, like that of the oldest true apes and monkeys. The Saadanius fossil supports the second hypothesis, MacLatchy said.

Also of interest is the tympanic bone, a part of the skull that surrounds the ear drum. In Aegyptopithecus this bone is ring-shaped, but in Saadanius it's a tubular outgrowth like that of apes and Old World monkeys.

"That tells us that Saadanius is probably closely related to catarrhines at the base of the ape-monkey split," MacLatchy said.

Commenting on the significance, SGS vice-president for technical affairs Abdulla Al-Attas said, "This is a very unique and smart discovery that we do not encounter every day. We have to keep the geological and paleontological investigation running at the SGS so we can have more promising and encouraging discoveries and exciting stories about the geological history of this country."

SGS president Zohair Nawab expressed pride in SGS and U-M for connecting Africa with Arabia through paleontology. "This is a very important discovery for our country," he said, "because it will enrich the record of our natural history and heritage and place our region correctly on the paleontological map of the world. I am so thankful to the Government of Saudi Arabia and His Excellency Minister of Petroleum Ali Naimi for his guidance and continuous support of our long-term plans."

SGS and U-M are investigating opportunities for further and more advanced collaborative field exploration in the Kingdom, not only along the Red Sea province, but also in other potentially promising areas of Saudi Arabia.

Provided by University of Michigan