

Out Of The Woods For 'Ardi': Scientists Rip Habitat Claim for 'Breakthrough of the Year'

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(PhysOrg.com) -- *Ardipithecus ramidus* - a purported human ancestor that was dubbed Science magazine's 2009 "Breakthrough of the Year" - is coming under fire from scientists who say there is scant evidence for her discoverers' claims that there were dense woodlands at the African site where the creature lived 4.4 million years ago.

Instead, "there is abundant evidence for open [savanna](#) habitats," says University of Utah geochemist Thure Cerling, lead author of a critique published as a "technical comment" in the Friday, May 28 issue of Science.

The criticism - by eight geologists and anthropologists from seven

universities - is important because the claim that the 4.4-million-year-old fossil nicknamed Ardi lived in woodlands and forest patches was used as an argument against a longstanding theory of human evolution known as the savanna hypothesis.

That hypothesis holds that an expansion of savannas - grassy plains dotted with trees and shrubs - prompted ape-like ancestors of humans to descend from the trees and start walking upright to find food more efficiently or to reach other trees for shelter or resources.

A Breakthrough under Fire

Last October, a team of four dozen scientists led by Tim White of the University of California, Berkeley, published 11 studies in *Science* outlining 17 years of work in which they excavated *Ardipithecus* fossils - including a partial skeleton of a female nicknamed Ardi - as well as 150,000 animal and plant fossils. They characterized the environment at what is now Aramis, Ethiopia, as woodland to forest patches with a climate cooler and more humid than today.

In December, *Science* named the research that uncovered *Ardipithecus* and her environment as the 2009 "Breakthrough of the Year," citing how the fossils were more than a million years older than those of the previously oldest known hominid partial skeleton - that of Lucy, or *Australopithecus afarensis*.

But a month earlier, in November, Cerling and the seven other scientists submitted their critique to *Science*. The journal didn't publish it until now - when Cerling and his University of Utah coauthor, geologist Frank Brown, are in the field in Kenya and difficult to reach. Both expressed frustration it took so long.

The Utah researchers' critique to *Science* was coauthored by two

anthropologists - Richard Klein of Stanford University and John D. Kingston of Emory University - and by four other geologists: Naomi Levin of Johns Hopkins University, Jay Quade of the University of Arizona, Jonathan Wynn of the University of South Florida, and David L. Fox of the University of Minnesota.

Most of the authors have studied ancient soils and other geological indicators of environment at African hominid sites. Levin, Quade and Wynn are former Utah students.

The critique concludes that Ardi most likely lived in tree or bush savanna with 5 percent to 25 percent of the area covered by trees or shrubs, not the minimum 60 percent to meet the definition of a closed-canopy woodland. Cerling acknowledges Ardi could have lived in a wooded river corridor, but it was a river that flowed through savanna.

"It wasn't a pure grassland, and it wasn't forest either," says Brown, dean of the University of Utah College of Mines and Earth Sciences and distinguished professor of geology and geophysics.

"It was what people call savanna," says Cerling, a distinguished professor of geology and geophysics, and of biology. That contradicts White and coworkers, who "propose an environment that is mostly forested with connected canopy."

Cerling and Brown say they aren't advocating the savanna hypothesis, just noting that White's own data support it rather than contradict it.

"The idea that savannas were important in [human ancestors](#) starting to walk on two legs means they spent less energy getting from one food source to another than they would have if they were still moving around on all fours," says Brown.

"One of the big, newsworthy items that White and coworkers put forward is that *Ardipithecus* walked upright on two legs, yet lived in a forested environment," he adds. "They then say the savanna hypothesis - which holds that the reduction in forest cover in Africa is one of the reasons for early man becoming bipedal - must be incorrect."

Cerling says: "Our conclusion is that much of the evidence that they [White and colleagues] present should be interpreted as a savanna environment, therefore their rejection of the savanna hypothesis is incorrect."

The Case for Ardi's Home on the Savanna

Three of the 2009 Science papers by White and colleagues cited various data they collected from ancient soils, plant fossils and so on to support the notion that *Ardipithecus* lived in woodlands.

Cerling and colleagues based their conclusions on the White team's own data, including data for ancient soils that are buried and compacted, and phytoliths, which are tiny grains of silica that form within living plants and later become fossilized in rock.

The relative abundances of phytoliths from various plants, and stable or non-decaying carbon isotopes in fossil soils both provide evidence of ancient vegetation, letting researchers distinguish whether an area was covered by grasses or woody plants. Cerling says phytoliths from Aramis are inconsistent with a dense woodland environment and instead indicate tropical grasses made up 43 percent to 77 percent of the ecosystem.

White's group examined how much tropical grasses contributed to the carbon composition of soil. Cerling says 83 of 84 samples from nine sites in the Aramis area indicate a significant amount of tropical grasses were growing when the soils formed, and only one sample could be

interpreted as having been from soil formed in a forest with no tropical grasses. For all sites, the median amount of tropical grass by biomass produced was 40 percent to 60 percent - hardly a forest, he says.

Cerling says White contends seven of the nine Aramis sites were forested. Yet the carbon isotopes indicate "the Aramis site has more [tropical] grasses than other sites of the same age that other people have studied in East Africa," he adds. "It means Aramis was more open than even the most open of the sites people have looked at."

Carbon-13 levels in tooth enamel from animals such as giraffes and antelopes were interpreted by White and colleagues to indicate closed-canopy forest patches. Cerling says the values are not consistent with modern animals that live in dense forests, but are consistent with browsing animals that range from river-edge woodlands to savanna.

The team that discovered *Ardipithecus* also used an index of aridity, "and the values they calculate for Aramis are comparable to the driest modern sites that have been examined," says Cerling. Yet they claim "out of the blue" that the area was forested rather than being a savanna with wooded areas along a river.

Cerling sharply criticizes White's team for claiming a forest environment when there are fossils of two species of small grassland rodents.

"What they are saying is all the grassland mice were brought in from somewhere else after they were eaten by owls," he says. "That presupposes it was a forest."

The critique concludes that although its authors do not judge the validity of the savanna hypothesis, the connection between human ancestors walking upright and the expansion of grasslands "remains a viable idea."

Provided by University of Utah

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