

Analytical standards needed for 'reading' Pliocene bones

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Jackson Njau points to marks on a fossil bone. Credit: Stan Gerbig, Indiana University

Researchers studying human origins should develop standards for determining whether markings on fossil bones were made by stone tools or by biting animals, Indiana University faculty member Jackson Njau writes in an article this week in the journal *Science*.

Njau, a co-director of field research at paleontological sites in eastern Africa's Olduvai Gorge, notes that the lack of agreement on interpreting

such marks is leading to great uncertainty over when early hominids began using tools to kill and butcher animals -- a fundamental step in [human evolution](#).

"There's really no solid, standard method of analyzing these bones that is used by all researchers," he said. "And there is no universal guide, nothing that is part of one's training as a student, that tells you reliably how to judge one type of mark from another."

Njau joined the faculty of the IU Bloomington Department of Geological Sciences in the College of Arts and Sciences as an assistant professor in the fall. He also is a research associate with Stone Age Institute in Bloomington and the Center for Research into the Anthropological Foundations of Technology at IU. He is former principal curator of the National [Natural History Museum](#) in Arusha, Tanzania.

His *Science* Perspectives article, published in the April 6 issue and titled "Reading Pliocene Bones," contends that the "way forward" is through further experimentation, integration of different disciplines to better understand the fossil record, and blind testing of bone samples by researchers and students.

He proposes creating a comprehensive collection of samples, developed from experiments on various forms of [bone](#) modification, and making it available to researchers and students through the sharing of samples and the posting of photographs and information online.

Njau points out that the lack of standard criteria has produced estimates of the earliest use of [stone tools](#) that vary by nearly 1 million years. The consensus is that the earliest evidence of tools associated with butchered bones come from Gona, Ethiopia, 2.6 million years ago, discoveries published by Sileshi Semaw of the Stone Age Institute and others. But a

2010 paper argued that 3.4-million-year-old [fossil bones](#) from Dikika, Ethiopia, showed tool markings, an interpretation that has been challenged by other research groups.

Generally used criteria describe tool marks as V-shaped cuts containing microscopic striations. Percussion marks made by stone hammers are said to consist of pits and grooves, also with micro-striations. But Njau has shown through experiments that the sharp teeth of crocodiles can inflict a range of bite marks closely mimicking tool marks.

This suggests that researchers need to rely on more than the appearance of Pliocene and early Pleistocene bones to determine whether they were marked by stone tools, he says. It's also important to consider the quality of the samples and the context in which they were found. For example, how many bones show what appear to be tool marks? Have stone tools been found in the same area and from the same time? Were crocodiles or other animals present that could have caused the marks?

Provided by Indiana University

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