African discovery yields new hominid clues

Anthropologists have revealed the 1991 discovery of a group of archaeological sites in southern Ethiopia, known collectively as Konso-Gardula, that so far has yielded a partial lower jaw and several teeth assigned to *Homo erectus,* as well as stone tools closely resembling those found with *H. erectus* remains at other African sites.

Deposits at Konso-Gardula may eventually yield fossils and artifacts rivaling those from the most fertile African sites, such as Tanzania's Olduvai Gorge, assert Berhane Asfaw of the Ministry of Culture in Addis Ababa, Ethiopia, and his colleagues.

Konso-Gardula sediments span the period from about 1.9 million to 1.3 million years ago, based on dating of volcanic ash layers deposited above and below the remnants of human ancestors, Asfaw's team reports in the Dec. 24/31 NATURE.

"This site should shine much new light on the evolution of hominids [members of the human evolutionary family]," remarks anthropologist F. Clark Howell of the University of California, Berkeley, who did not participate in the project but has seen some of the Konso-Gardula artifacts. "It will undoubtedly also help us realize how complicated hominid evolution really was."

Initial excavations uncovered two main types of tools: pear-shaped stones with edges sharpened on both sides and thinner "picks" with triangular points. Large mammal bones, including those of saber-toothed cats, appear among the stone implements and contain marks produced by hominids, such as thin incisions near joints. The investigators offer no opinion, however, as to whether human ancestors at Konso-Gardula hunted animals or scavenged their carcasses.

Excavations also revealed a lower left jaw containing four cheek teeth and a separate molar tooth, all of which the scientists classify as from *H. erectus.* Some anthropologists now place East African specimens formerly dubbed *H. erectus,* which would include those from Konso-Gardula, in a different species they consider directly ancestral to modern humans (SN: 6/20/92, p.408).

Stone tools and fossils unearthed at Konso-Gardula date to approximately 1.4 million years ago.

Asfaw's team obtained this estimate through a dating technique that gradually heats grains of ash and then exposes them to a laser beam that identifies different forms of the element argon. Comparing the abundance of these argon variations enables scientists to calculate when the ash formed.

Dates from Konso-Gardula support earlier suspicions that the distinctive sharpened tools favored by *H. erectus* in East Africa – which also turn up at Asian and European sites extending to as recently as 200,000 years ago – abruptly appeared for the first time around 1.4 million years ago, the researchers note. Konso-Gardula artifacts required considerable skill to produce, and they appear in large numbers at the several sites, indicating intensive occupation of the area by *H. erectus,* they argue.

The new Ethiopian finds also call into question the theory that periods of global cooling – which sparked savanna expansion and the shrinkage of woodlands in Africa – promoted the evolution of *H. erectus* and its eventual migration out of Africa. Another African site provides the earliest *H. erectus* fossil, about 1.7 million years old, and Konso-Gardula establishes the emergence of sophisticated stone tools 300,000 years later, Asfaw's team asserts. These dates fall between major ice ages that occurred around 2.4 million and 900,000 years ago.

Uncertainty also surrounds hominid evolution prior to 1.4 million years ago in Asia, the Middle East, and Europe, the investigators hold, because anthropologists have explored those regions far less intensively than East Africa.

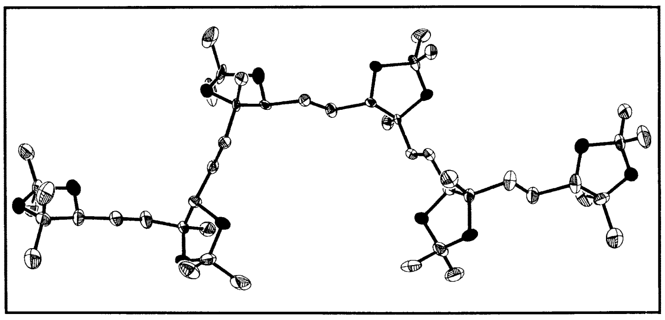
For now, scientists cannot conclude with certainty that *H. erectus* originated only in Africa and later migrated elsewhere, the researchers note. *– B. Bower*

NATURE

Investigators attribute this partial jaw unearthed at a newly discovered Ethiopian site to H. erectus. *It ranks among the largest of early African* H. erectus *jaws yet excavated.*

Lab-made catalysts increase chiral yields

When chemists make new molecules, they often produce mixtures that include several versions of a product. Each version, or isomer, contains the same atoms connected in much the same way. But in one isomer, a chemical side group might point up, for example, while in another, that same side group might point down. This property, called chirality, can greatly affect how the molecule functions; it can even turn a useful medication into a harmful one.



Gerard A. Crispino *et al.*/SCIENCE

Catalyst controls how oxygen (black circles) links to squalene-based molecule.

So, taking a lesson from nature – catalytic enzymes produce specific isomers – scientists have developed ever more selective reactions.

Using a lab-made catalyst formed by an osmium compound and a modified plant alkaloid, organic chemists have produced complex chiral molecules from nonchiral starting materials. This catalyst can oxidize squalene, a 30-carbon molecule that liver enzymes convert into hormones, says K. Barry Sharpless of Scripps Research Institute in La Jolla, Calif.

The multistep reaction produces surprisingly high yields of just one isomer of the final molecule – not a mix of the 36 possible isomers – Sharpless and his colleagues report in the Jan. 1 SCIENCE.

During the 1980s, Sharpless discovered that he could use this catalyst to control the addition of two hydroxyl side groups to olefins – molecules with carbon atoms connected by double bonds. Depending on the version of the alkaloid used, the catalytic reaction causes hydroxyl side groups to attach either above or below the plane of olefin's carbon atoms.

The work with squalene "extends [the use of the catalyst] to multiple double bonds," says Charles M. Zepp, a chemist with Sepracor, Inc., in Marlborough, Mass. "It's a much more general chiral synthesis than almost anything."

The catalyst causes each of squalene's six double bonds to break so that each doubly bonded carbon atom can then take on a hydroxyl. The side group attaches in a particular orientation, depending on the isomer of the alkaloid used.

Sepracor plans to use this process, called asymmetric catalysis, to produce starting compounds for pharmaceutical manufacturers. Sharpless thinks it will also provide shortcuts to new drugs, including the anticancer drug taxol (SN: 4/18/92, p.244). *– E. Pennisi*