Archaeology

Stick-ons for Stone Age tools

Two stone implements dating to at least 36,000 years ago bear traces of a sticky black substance once used to attach them to a handle, according to a new report.

The discovery of the gluelike material, identified in chemical analyses as bitumen, pushes back substantially estimates of when adhesives were first used in tool making. Until now, the earliest evidence of this technique appeared at Middle Eastern sites no more than about 10,000 years old.

"These new data suggest that [Stone Age] people had greater technical ability than previously thought, as they were able to use different materials to produce tools," contend Eric Boëda of the University of Paris and his coworkers in the March 28 NATURE.

The artifacts, which run from 2 inches to 3.5 inches in length, come from a site in the Syrian desert known as Umm el Tlel. Each was struck from a specially prepared lump of stone, a technique that became widespread between 35,000 and 100,000 years ago in North Africa and nearby Mediterranean regions.

Bitumen traces appear at convenient spots for attaching a handle to the sharp-edged stones, the researchers assert. Chemical features of the bitumen indicate that it was heated and applied to the implements as a glue, they say.

The new finds lie just below sediment dated at about 36,000 years old. If the artifacts were made 40,000 years ago or more, complex tool making has surprisingly ancient roots, writes Simon Holdaway, an archaeologist at La Trobe University in Bundoora, Australia, in an accompanying comment.

If, however, the artifacts were made close to 36,000 years ago, members of a population wedded to traditional methods of tool production may have copied the adhesive innovations of a neighboring group, he suggests.

Either anatomically modern humans or Neandertals could have fashioned the Syrian tools, according to Holdaway.

There's no place like home base

For more than a decade, a number of archaeologists have challenged the influential theory that human ancestors who lived in East Africa between 2 million and 1.5 million years ago hunted game that they took back to "home bases," where social life flourished. Instead, these critics argue, hominids ate mainly scavenged leftovers, either directly from a carcass or at special processing sites, and camped elsewhere so as not to attract hungry lions and other large carnivores.

A new proposal, published in the April CURRENT ANTHROPOLOGY, attempts to revise and revive the home base hypothesis. Human ancestors took both hunted and scavenged meat to strategic areas near water, fruit trees, and sleeping sites, contend Lisa Rose and Fiona Marshall, both of Washington University in St. Louis. There, a hominid group could defend its beefy booty from intruders, including other hominids, Rose and Marshall theorize.

Repeated use of these defensive outposts encouraged a range of social activities, such as food sharing and tool making, although not necessarily the monogamous sexual relationships and strict divisions of labor between males and females posited in the original home base hypothesis, the researchers maintain.

Hominids did not need home bases of any kind, since they could have scavenged carcasses after predators left and before hyenas or other scavengers reached the scene, argues Robert J. Blumenschine of Rutgers University in New Brunswick, N.J. But Henry T. Bunn of the University of Wisconsin-Madison considers the new proposal a good starting point for understanding how hominids combined hunting with "power scavenging," in which they actively drove predators and competing scavengers away from fresh kills.

Astronomy

Far side crater count yields surprises

Asteroids and comets have pummeled the inner solar system since its infancy, but most places haven't retained a good record of the bombardment.

For example, many small projectiles burned up in Venus' thick atmosphere. Others gouged craters that were erased when widespread volcanic eruptions gave the planet a facelift several hundred million years ago. The cratering record on Earth isn't much better: Erosion and faulting obliterate traces of impacts.

In contrast, Earth's moon—geologically inactive and airless—provides a well-preserved record. Indeed, planetary scientists have used the distribution of craters on the moon to calibrate the time elapsed since the surface of other bodies in the inner solar system got a complete or partial makeover.

New data—the first complete counts of craters on the side of the moon facing away from Earth—suggest, however, that researchers haven't been counting lunar craters correctly.

Like previous lunar crater counts, the new ones focus on craters that have bright rays of material emanating from them. In most cases, the rays represent freshly excavated material that hasn't yet been darkened by exposure to sunlight and cosmic radiation. The rays were thought to disappear in about a billion years, thus their presence indicates recent cratering.

However, compositional differences between areas on the near side of the moon could have created persistent, raylike markings that might disguise an old crater as a young one.

High-resolution images taken by the Clementine spacecraft have for the first time allowed researchers to count accurately the rayed craters on the moon's far side. This region of the moon has a more uniform composition, offering scientists the opportunity to identify young craters more clearly.

Jeffrey M. Moore of NASA's Ames Research Center in Mountain View, Calif., and Alfred S. McEwen of the U.S. Geological Survey in Flagstaff, Ariz., found that the far side has about twice as many rayed craters under 10 kilometers in diameter as predicted by the crater counts from the near side. They reported these results last month at the Lunar and Planetary Science Conference in Houston.

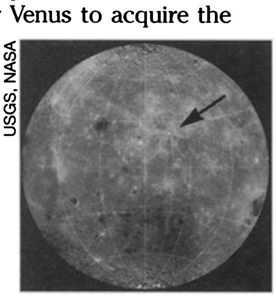
James W. Head of Brown University in Providence, R.I., calls the results intriguing but would like to see more studies.

The researchers note that their findings indicate that Earth's vicinity may harbor a much larger than expected population of asteroids and comets 300 meters to 1 km in diameter. Such objects pose a major threat to Earth. If an object 1 km in diameter landed in the middle of the Atlantic Ocean, for instance, the resulting tidal wave would wipe out coastal Europe and eastern North America.

The lunar researchers also counted fewer rayed craters over 20 km in diameter than expected. The relatively low number of such craters makes this finding less statistically significant, Moore notes. However, if fewer large craters did pepper the moon and the terrestrial planets over the last billion years, then Venus' surface is probably older than the 300 million to 500 million years previously calculated, Moore says. It would have taken longer, perhaps 700 million years, for Venus to acquire the number of large craters now seen.

An independent calculation by Kevin Zahnle of Ames and William B. McKinnon of Washington University in St. Louis, based solely on the estimated distribution of comets and asteroids near Venus, suggests a similar age.

USGS, NASA



Clementine's view of the moon's far side. Arrow shows rayed crater.