

rules that were not polished and still under compression from the machining process. A large variation in performance was observed among zirconia ferrules from different manufacturers with different processing procedures. They attribute this variation to surface deformation and suggest that the subsequent decrease in light transmission may be minimized with properly identified polishing procedures that would limit the amount of aging-induced phase transformation at the polished ferrule surface.

KYLE BRINKMAN

In Situ Stone-Age Bone-Tool Industry Uncovered

Researchers from Iziko South African Museum in Cape Town; the Institut de Prehistoire et de Geologie du Quaternaire in Talence, France; the Institute of Human Origins at Arizona State University (ASU); and Chicago State University have dated a large set of specialized bone tools at more than 70,000 years old. Found with related artifacts in the Blombos Cave, which is set in a cliff overlooking the Indian Ocean at the extreme southern tip of South Africa, the tools represent evidence that modern human behaviors evolved much earlier than previously thought.

The researchers report in the December 2001 issue of the *Journal of Human Evolution* various findings that date the group of 28 bone tools. They said that bifacially flaked stone points, possibly used as spearheads, occur above and within the layers in which the bone tools were found. Archaeological sequences

from other sites with bifacial points in the southern Cape date to about 65,000 years ago, suggesting that the bone tools at Blombos are at least that old.

A distinct, sterile, yellow sand horizon lies above dark, anthropogenic (human-produced) sediments that contain the bifacial points and the bone tools, and below dark, anthropogenic sediments of more recent age. The sand layer acts as a clear stratigraphic break because any penetration through this yellow sand by younger materials from above would be clearly visible; the sand layers are clearly undisturbed above where many of the bone tools occur, the researchers report.

At other archaeological sites in South Africa, such as Die Kelders Cave 1, similar dune layers are found that date to the last glacial period (roughly 60,000–70,000 years ago), when the ocean withdrew from the current coastline. On geological grounds, the researchers believe that the sand layer at Blombos is of similar age, making the bone tools somewhat older. Using thermoluminescence methods, the research team is in the process of direct-dating these sterile yellow dune sediments and burnt stone from the same layers as the bone tools.

The existence of bone and other “formal” tools has been frequently cited as an important item on the trait list of archaeological details traditionally seen as indicators of the presence of modern human behavior in Stone Age and Upper Paleolithic populations. Other items on the list include the hunting of large fish, the use of decoration, and the production of art—evidence of symbolic thinking.

The excavations at Blombos Cave and similar sites have also yielded substantial quantities of ochre, a mineral compound that aboriginal peoples frequently use for body decoration.

Christopher S. Henshilwood, affiliate archaeologist at Iziko and adjunct associate professor of archaeology at the State University of New York—Stony Brook, said, “Based on extensive evidence from European sites, what has been cited repeatedly is that there was an Upper Paleolithic ‘symbolic explosion’ that archaeologists have said indicates the best recorded beginning of modern human behavior at about 35,000 years ago. We’re seeing evidence of a comparable change in Africa, but in the Middle Stone Age—more than twice as far back in time.” Earlier, Henshilwood reported on a fragment of “deliberately engraved bone” found at the site.

Curtis W. Marean of ASU said, “The African record is starting to show evidence that is making it look fundamentally different from Eurasia at the time. We’re getting a lot of evidence for symbolizing behavior, and that is almost certainly related to language.” □

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