Reading Old Bones: The Problems

The person most responsible for the convening of the First International Conference on Bone Modification*—Lewis Binford of the University of New Mexico—was conspicuous by his absence. For some years now he has been a persistent irritant to archeologists, keeping them honest in their interpretations of the prehistoric record. While unrestrained enthusiasm has occasionally pushed practitioners into imaginative reconstructions of sometimes meager collections of bones and stones, Binford has been cautioning, How can one be certain of what one says?

Although Binford's rather direct style of criticism has attracted only few avowed acolytes, his influence is "all pervasive," as one conference participant noted. As researchers probed the crepuscular world of postmortem bone modification they discovered an alarming suite of agencies that can inflict apparently human-made marks, which clearly makes the archeologist's job more tricky. More tricky, maybe—but not the impossible task that an extreme Binford position has implied: this clearly was the mood of the meeting.

Together with stone tools, fossilized animal bones at putative prehistoric living sites represent an important data set relating to early human and prehuman behavior. But, as Andrew Hill of Harvard University stressed, the behavior of our ancestors is increasingly likely to be less identifiably human-like the further back into the record one looks. The point was forcefully reiterated by Pat Shipman of Johns Hopkins University School of Medicine. Neither Hill nor Shipman claimed this as a new insight, merely one that all too easily slips from the consciousness as the mind moves from theoretical statement to practical endeavor. In any case, the upshot is that researchers might impose on their material evidence interpretations that fit preconceptions of human-like activity while not recognizing the unknown patterns of extinct, prehuman hands.

The search for unknown patterns in the prehistoric record is made yet more uncertain by the observation that "the differences in bone modifications formed by different means are much more subtle than has been thought," says Hill. For instance, Hill has worked on bone assemblages at hyena dens in Amboseli National Park, Kenya, and has recorded patterns of bone modification—types of breakage and flaking, for example—that once were considered as indicative of human activity. And others reported that even inanimate agencies can etch animal bones in a manner seductively reminiscent of prehuman activity. So, the logical procedure—of, first identify remains of human activity in the record, then infer detailed elements of behavior—is seen to be logical but by no means simple.

By bringing together researchers interested in both New World and Old World sites and in recent and not so recent times, the meeting has helped engender a degree of coherence in tackling the problems of reading old bones that hitherto has not existed. Unfortunately, Binford was unable to accept an invitation to participate.

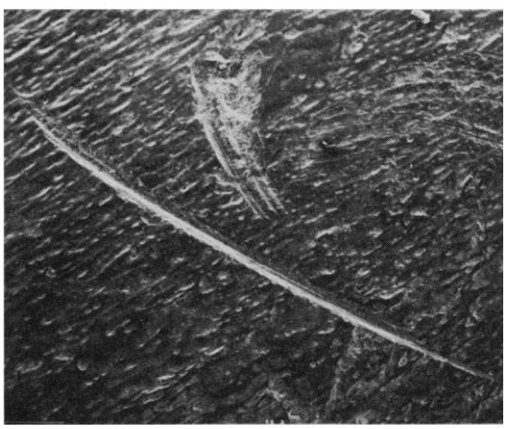
*First International Conference on Bone Modification, Carson City, Nevada, 17 to 19 August. Sponsored by the Center for the Study of Early Man, University of Maine.

Cutmarked Bones: Look, No Hands

When an archeologist finds an accumulation of animal bones and putative stone artifacts in ancient sediments, the obvious inference to be drawn is that here is tangible evidence of prehistoric butchering activity or perhaps even the litter of a living site. That inference is strengthened when, as has happened over the past several years, one can find clear signs of use of the implements on the bones. Several researchers, using either light or scanning electron microscopy, have independently reported the presence of human-made cutmarks on animal bones from Olduvai Gorge, in Tanzania, and Koobi Fora, in Kenya, the diagnostic features being both the overall and detailed shape of the incision. Here, apparently, was a relatively straightforward and direct method for linking the bones with the stones and inferring butchering and other bone-working activity.

However, James Oliver, of the Museum of Anthropology, University of Kansas, reported an interesting analysis of a bone accumulation in Shield Trap Cave, Montana, that will force seekers of cutmarks to be aware of being led astray. "Cutmarks" can apparently be scored on bone surfaces without the intervention of human hands.

Oliver studied the Holocene (10,000 years onward) accumulation of bison and other large animal bones at Shield Trap, which is a 14-meter-deep, bottle-shaped pit cave, because it offered an opportunity to observe bone modification that had occurred in the absence of humans. Animals that tumbled down the meter-wide cave neck eventually found themselves in a 4-meter-wide cavern strewn with the bones of previous victims and the coarse, chert-filled material from occasional roof falls. Many animals were killed in their fall, but some survived for a few days or even weeks.



A pseudocutmark

The linear, V-shaped groove in the surface of a foot bone (magnification, × 10) looks like a genuine cutmark.

The upshot of survival in the cave bottom is impressive and more than a little alarming. For a start, should the animal break a rib or two during its plunge, the subsequent stumbling around in the dark causes sufficient movement between the fracture surfaces to cause significant "polish" of the sort that might easily be taken in a single bone to imply use as a bone tool, in working hide for instance.

Second, as the stricken beast tramples over bones in the cave floor it would tend to cause abrasions by

pushing the bones against coarse material in the floor. Most such abrasions are rather irregular, but Oliver noted some that mimicked very closely the linear, V-shaped profile of genuine cutmarks. Indeed, the unexpectedly creative features of trampling became something of a theme at the meeting, both in other presentations and particularly in discussions. The nature of the sedimentary context and degree of trampling will clearly generate a wide range of convincing bone modifications for the unwary. A good deal of experimentation is required here to delimit the boundaries of what is possible in natural, nonhuman conditions.

Oliver believes that the cutmarks that have been diagnosed on the Olduvai and Koobi Fora bones are likely to be the genuine products of protohuman hands. "It's clear, however, that we are going to have to be even more aware of the context of bone accumulations so that nonhuman marks can be ruled out."

In addition to polished and cutmarked bones from the cave, Oliver also noted that impact on long bones from substantial roof falls can cause percussion breakage and flaking that mistakenly may be taken as diagnostic of human bone working, in the search for marrow, for instance.

Although Shield Trap may represent a rather rare situation for bone accumulation, being a narrow-necked pit cave, it nevertheless reinforces dramatically Binford's warning that prehuman activity will not necessarily be readily distinguishable from other agencies in the archeological record.

Bone Tools from Olduvai Gorge

Mary Leakey's work on the long archeological sequence at Olduvai Gorge has revealed over the years the development of stone tool technology from almost 2 million years before Present to less than 1 million years ago. Although the use of bones as tools does not become common in the archeological record until relatively recent times—150,000 years onward—Leakey recognized 125 putative bone tools in the Olduvai assemblage, which she described in her 1971 monograph on Olduvai. Using scanning electron microscopy techniques that were developed in connection with analysis of cutmarked bones, Shipman has produced strong support for Leakey's contention. Particularly interesting is the possibility that at least some of these implements might have been used in work on soft material, including animal hide.

By working with modern bones Shipman developed a set of criteria from microscopy for judging whether a bone had been utilized and if so on what material, thus following the example of Lawrence Keeley of the University of Illinois who has studied patterns of stone tool use. She then turned to the putative bone tools from Olduvai, of which 116 matched her experimental regime and therefore could be tested. Following a very conservative assessment, a substantial number, 75, were judged as ambiguous, while the remainder, 41, "were positively identified as utilized."

The occupants of Olduvai almost 2 million years ago apparently selected certain bones of large animals, including elephants, hippos, rhinos, and giraffes, flaked them in the manner of stone tools to a greater or lesser extent, and then proceeded to use them for a variety of purposes.

A small number have been designated as "anvils," and there appears to be a possibility that they were used in conjunction with stone awls. The suggestion that other tools might have served as hide workers raises the interesting speculation that the hominids of the time were carrying out nondiet related tasks, such as making hide containers or even clothes. Shipman also has evidence from work on cutmarked bones that Oldowans sometimes concentrated on parts of the carcass that had hide and tendons to offer, but no meat, which is consistent with these inferences from bone implements.

Although he was unable to be at the conference to present the data, C. K. Brain of the Transvaal Museum, Pretoria, has recently recognized putative bone tools from two of the South African cave sites of comparable age to Olduvai. In this case, however, the coarse striation wear on the tips of the implements seems to indicate their use as "digging sticks." Shipman c not see this type of pattern among tl Olduvai bone tools.

Season of Death Indicates Mastodon Hunting

That American Indians hunted ai butchered mastodons is widely a sumed, and probably correctly s But, as Daniel Fisher of the Museu of Paleontology, University of Micl gan, points out, the frequent occu rence of butchery sites does not ne essarily imply that the animals we hunters' prey. Opportunistic scaven ing must also be considered. It just s happened that a farmer's backh serendipitously opened a windc onto the means of death of some these butchered animals.

In discovering the Van Sickle mas odon, the farmer's hoe struck the ai mal's tusk, cracking it open to revea crisp set of dentine layers. Althou the occurrence of such layers h from time to time been referred to the literature, until Fisher's analys no one had examined them in detail. turns out that in some animals the are daily, fortnightly and yearly cycl of dentine formation, which are reco nizable as distinct junctions. The sh between the slow growth period of tl winter months and the onset of spri is particularly sharp.

With this built-in calendar, Fish was able to compare the season death of six butchered as against se en nonbutchered animals, simply l looking at the last-formed dentin Fisher can state within a month or tv at most the time of death of ea individual. As might be expected, tl natural deaths were concentrated du ing the late winter and early sprin when the demands of the cold montl have taken their toll. By contrast, the butchered animals died in the mi to-late fall. This seasonal difference strongly indicative of hunting as cause of death. And a hunter's ratio ale for dispatching animals ma plump and nutritious by spring ai summer feeding is obvious.

This insight into the context of bo modification by looking at things oth than the bones themselves is esp cially pleasing.

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