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Feature Article:

Young Explorers Discover a Mastodon in Colorado

Steven R. Holen



Figure 1. Tyler Kellet and Jake Carstensen

Two thirteen year-old boys, Tyler Kellet and Jake Carstensen, were exploring a creek bed near their home in Littleton when they discovered a large mandible.

They called Don Kellet, Tyler’s father, to ask what kind of an animal had really big teeth. Don mentioned bison and horses, but the boys were insistent that the animal had a really big tooth. Before Don returned home from work the boys had searched the internet and identified the animal as a mastodon.

Knowing that this was an important discovery, they contacted DMNS and I went to investigate the site. I confirmed the mastodon identification and also identified a section of mastodon tusk. We went to the site, a plunge pool below a small waterfall, but did not find any additional bone in the water. However, Tyler and Jake were wading in the plunge pool and Tyler was feeling along the cutbank under the water when he discovered a tusk in place in the bank.



Figure 2. Mel Grantham and Steven Holen casting the Mastodon Tusk

The weekend of September 19 and 20, we pumped out the plunge pool and excavated a five foot section of tusk (Fig.1). This was not an easy task because the area was very wet and we had to cast the tusk before removal (Fig.2). Finally, we were able to remove the tusk and take it to DMNS where it is presently undergoing conservation treatment with preservatives. We are also making a cast of the mandible and tooth for exhibit at the Ken-Caryl Ranch Community Center.

Two mastodon teeth had been reported from Colorado much earlier, one in the 1870s from near Pueblo and one sometime before 1924 from Golden. Neither tooth can be found today. The mastodon find at Ken-Caryl Ranch is the most important mastodon discovery in Colorado to date. Mastodons lived primarily in the Midwest and are common in Ohio, Michigan and nearby states, with some also present on the West Coast. They are very rare in the inter-mountain west. The mastodon mandible and tusk have been donated to DMNS and may be exhibited in the future after they are conserved.

Experimental Archaeology:
Elephant Bone Breakage
Experiment Trumps Romance
Kathleen Holen and Steven R. Holen

On February 14, 2009 while many were exchanging chocolates with sweethearts, we gathered a group of professional and avocational archaeologists to conduct another elephant bone breakage experiment. This time, we invited expert flint knappers Leslie Quintero and Phil Wilke, from University of California at Riverside, to test their skills on fresh, thick proboscidean limb bones.

The precedence of science over romance seems habitual with us given that we spent

our wedding anniversary digging up the elephant whose bones we were about to break. Lucy, the elephant, was 46 years old when she died at the Milwaukee Zoo in 2006. She was buried in a 12 foot deep pit, but after the back hoe had reached a depth of six feet Lucy made her presence known. The smell only got worse. Haz Mat suits and respirators could not disguise it. Her hide and muscles had held together so that the right femur, humeri, and both tibias all had to be defleshed and disinfected after recovery.

The main goals of this experiment were to break the femur with hammerstones on an anvil and to flake the thick limb bone. Initial breakage was accomplished using a 32.5 pound boulder that tapered to an 8 cm point. Hammering with the large rock worked better than a hafted stone hammer and resulted in a perfect impact mark with cone flakes comparable to those found at ancient mammoth sites (Fig. 1).



Figure 1. Impact mark created by a blow from a 32.5 pound hammerstone.

Bone flakes with diffuse bulbs of percussion were also produced. Organic billets made of elk and moose antler and of elephant bone produced the largest and most usable flakes. Dr. Quintero used the detached head of the femur to remove a 16 cm wide flake that was 6.5 cm long (Fig. 2).



Figure 2. Flake produced by bone hammer.



Figure 4. Expedient bone tool used to remove periosteum.



Figure 3. Expedient bone tool used to remove marrow.

During the experiment expedient bone tools were selected from the bone fragments and flakes. They were used to remove marrow (Fig. 3), scrape periosteum from bones (Fig.4), and to flake bones (Fig. 5).

Dr. Wilke was surprised at how difficult the task of breaking elephant bones really is. "It's incredibly tough material. I'm shocked."



Figure 5. Expedient bone hammer used to flake the elephant femur.

From the Collections:

The Angus Mammoth: A Scientific Controversy Resolved

Steven R. Holen

The Angus Mammoth was first excavated in 1931 near the hamlet of Angus in south-central Nebraska, by A. M. Brookings of the Hastings Museum in Hastings, Nebraska.

Brookings reportedly found a spear point with the mammoth. He reported the find to Jesse Figgins, Director of the Colorado Museum of Natural History (now Denver Museum of Nature & Science), who rushed to the location the next day. Figgins sent a professional crew to excavate the remaining mammoth bones but no additional artifacts were found.

Figgins reported that the site represented the first association of an artifact with a mammoth in North America. However, geologists and paleontologists from the University of Nebraska disputed the claim and suggested the deposits were mid Pleistocene in age ca. 300,000 years old. This controversy remained unresolved until recently.

More recent geomorphic study by David May showed that the Angus Mammoth is in the high fourth terrace of the Little Blue River. This terrace fill is older than cultural horizons associated with fluted points on the Great Plains. Shannon Mahon of the USGS in Denver conducted Optically Stimulated Luminescence dating of the sediments above the mammoth horizon. Dates of 60,000 to 70,000 years above the mammoth bone horizon supported the geologic evidence that the fluted lithic artifact was not associated with the Angus Mammoth.

Research on the Cooperton Mammoth

Steven R. Holen and Kathleen Holen

The Cooperton Mammoth has been an enigma since it was excavated in southwest Oklahoma in 1961 (Anderson 1962, 1975; Johnson 1991). Anderson noted the differential breakage of limb bones while the scapula, part of the pelvis, and skull were largely intact. The limb bones exhibited spiral (green-bone) fractures

indicating that the bones were fresh when broken. He also noted one 9-inch diameter cobble weighing 19 pounds next to fractured limb bone segments. The mammoth was situated in fine-grained silt and sand deposits so it was apparent that the large cobble did not wash into this deposit. Three radiocarbon ages on the mammoth bone/tooth range between 17,575 and 20,400. However, these ages were run on bone apatite, the inorganic part of bone, which is now considered to provide unreliable ages. Apparently, there was no collagen in the bones and tooth that were sampled so they used apatite.

Anderson's interpretation was that humans had broken the limb bones for bone blanks to produce bone tools. The site and the interpretation have been largely ignored by the archaeological community since the 1975 publication.

We visited the Great Plains Museum in Lawton, Oklahoma and worked with the Cooperton mammoth collection on October 14 on our way to the Plains Anthropological Conference in Norman. We were hosted by Debra Baker, Collections Manager for the Archaeological Collections. Our research identified one lateral flake scar on a spirally fractured limb bone segment (Fig. 1), two impact points on the distal right humerus, and one probable impact point on another humerus (Fig. 2). Our experimental research breaking fresh elephant bone indicates that it takes tremendous force from large rock hammer stones to produce these types of impact points. Moreover, large cobbles do not occur naturally in fine-grained geological deposits.

It is apparent to us that the Cooperton mammoth limb bone was broken by humans wielding large rocks. In this case one of the rocks, a 19 pound hammer or anvil was found next to the fractured mammoth limb bone. Future research on

the Cooperton mammoth will include a new attempt to radiocarbon date the bone.

References Cited

- Anderson, A., 1962. The Cooperton Mammoth: A Preliminary Report. *Plains Anthropologist* 7(16):110-113.
- Anderson, A. D. 1975. The Cooperton Mammoth: An Early Man Bone Quarry. *Great Plains Journal* 14:131-173.
- Johnson, E. 1991. Late Pleistocene Cultural Occupation on the Southern Great Plains, in R. Bonnicksen and K.L. Turnmire, eds. *Clovis: Origins and Adaptations*. Center for the Study of the First Americans: Corvallis, Oregon, 215-236.



Figure 1. Negative flake scar on thick cortical limb bone. Photograph above the bone shows a negative flake scar on a limb bone segment from the Lovewell Mammoth Site, Kansas.



Figure 2. Probable impact fracture on the humerus.

Avocational/Student Archaeologist Notes:

When People Broke Bones

Kathleen Holen

In October 2008, I began a Distance Learning Program through Exeter University in the United Kingdom to achieve a Master's Degree in Archaeology. After a year of work I am able to share some of the results of my research effort. My research sought to understand the nature of bone modification and how it supports human association with proboscidean sites in North America.

No one knows for certain when humans first came to the Americas but the question continues to be explored through many lines of evidence. Human technology in the form of bone modification is one line of evidence for human presence. To explore my questions I undertook a content analysis of existing research reports from fourteen proboscidean sites in North America that claimed bone modification as evidence of human association (Fig. 1).

Human-induced bone modification was reported as cut marks, gouges, impact marks, spiral limb bone fractures and patterned distributions of bones. Bone tools and stones were also reported in association with broken mammoth or mastodon bones at some of the sites.

Individual sites exhibited variation in the strength of this evidence. When sample data were combined as a body of knowledge, patterns were revealed that indicated human processes, purposes and possible intentions for bone modification.

Patterns indicative of human presence included ordering and sequence, positioning and repetition. Distribution of bone fragments around objects interpreted as anvils, impact marks caused by percussion and differential bone breakage

were found at numerous sites. These patterns of diagnostic bone modification showed that objects were being made and used, brought and left, brought and taken away, reorganized and manipulated in ways that reflected purposeful processes and human intentions.

When people broke bones they intended to share information about how to efficiently process animal carcasses and bones for later use. They conserved energy by using anvils and segmenting carcasses before butchering. They recognized function in the forms of broken bones and created expedient tools. They quarried bone pieces in preparation for further processing or tool making.

When people first came to the Americas, how, from where, and why are questions that will continue to challenge archaeologists. My research showed that comparing patterns of bone modification across multiple archaeological sites reveals indications of human behavior. The presence of human technology can inform us as to when people came into North America.

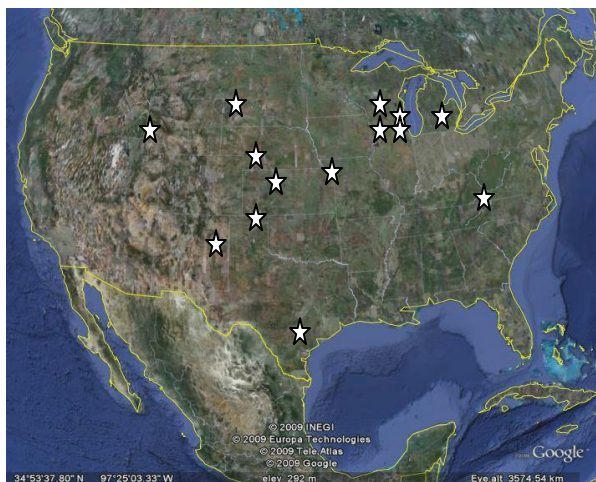


Figure 1. Locations of sites compared for evidence of human presence.

From the Field:

Camel Bones Found at Lovewell Reservoir

Steven R. Holen

Two shoreline surveys were conducted at Lovewell Reservoir, Jewell County, Kansas this summer and fall and both resulted in salvage excavations of late Pleistocene camels. The first survey was undertaken in August by my 14 year-old nephew, Gavin Holen and me. We surveyed the north shoreline of the reservoir and found several late Pleistocene faunal remains. In one instance the bones were in place in the beach deposits and salvage excavation produced a camel pelvis with two vertebrae nearby (Fig. 1). The age of this deposit is estimated to be 20,000 years old. No cultural materials were found in association with the camel bone.

The second survey was undertaken by Bill Chada and his son, Nick, on Labor Day. They found a mammoth tusk eroding from the beach of the reservoir and plans were made to salvage this tusk. Unfortunately, the reservoir level was higher and covered the tusk again when Gavin and I arrived to meet the Bureau of Reclamation crew to salvage the tusk.

We moved a short distance away to investigate a small concentration of bone higher on the beach. Excavation of this concentration produced another camel pelvis with two articulated vertebra (Fig. 2). Again, no cultural material was found with the camel bone estimated to be 22,000 years old. We will return to Lovewell in late summer 2010 to salvage the mammoth tusk.



Figure 1. Gavin Holen with the camel bone he helped to excavate.



Figure 2. Camel pelvis found in place at Lovewell Reservoir in KS

Editorial Comments:

Archaeology in the Future

Kathleen Holen

It occurs to me that this issue, while offering reviews, analyses and interpretations of the past, has featured an aspect of archaeology that is also relevant to the science - the creation of its future. The interest in archaeology generated in the young men whose discoveries are described here are likely to become enduring parts of their life stories. But

experiences like theirs will also shape the future of archaeological science.

The 67th Annual Plains Anthropological Conference in Norman, OK in October of this year included an open discussion of public archaeology lead by Mike Fosha and Virginia Wulfkuhle. Archaeologists from across the Great Plains described how they were linking with teachers to incorporate archaeological content into school curricula. According to the Society for American Archaeology (SAA) website, archaeology belongs in schools “because archaeologists would like to share what they have learned about people who lived in the past, increase appreciation and respect for all cultures, improve awareness of archaeological methods and issues, and promote stewardship of archaeological sites” (saa.org/AbouttheSociety/EducationandOutreach).

Other opportunities for young people to learn about and participate in archaeology are available and can be found on the internet. For example, the *Time Team*, an archaeological television program in the UK that recently previewed in the US featuring Adrien Hannus of the Augustana Archeology Laboratory, offers a Young Archaeologist Club (YAC) online at <http://www.britarch.ac.uk/yac/>. The Crow Canyon Archaeological Center, <http://www.crowcanyon.org>, offers a High School Archaeology Camp.

Not every young person can have a firsthand experience of discovery the way Nick, Gavin, Jake and Tyler did but through public outreach and education archaeologists can share the knowledge and values that constitute our science. As they do, more young people are likely to carry an appreciation for understanding the past into their future.

Recent Publications & Papers:

Publications

Holen, Steven R., 2009. The Plunkett Site: A 1930s Goshen Discovery in Northwest Nebraska. *Central Plains Archaeology* 11(1):1-7.

Holen, Steven, R., 2009. Addendum to: Test Excavations at the Cottonwood Grove Site, 14JW102. Denver Museum of Nature & Science Technical Report 2009-07. Submitted to the U.S. Bureau of Reclamation. 6 pp.

Holen, Steven R., David W. May and Shannon A. Mahan, The Angus Mammoth: A Decades-Old Scientific Controversy Resolved. Article submitted to *American Antiquity*.

May, David W., and Steven R. Holen. Early Holocene Alluvial Stratigraphy and Paleoindian Sites in the Loup River Basin, Nebraska. Chapter for a book entitled. *Geoarchaeology of Large River Valleys*, edited by Rolfe D. Mandel (in press).

Holen, Steven R. Evidence for a Human Occupation of the North American Great Plains During the Last Glacial Maximum. Chapter submitted for a book on the early peopling of North America, National Museum of Anthropology, Mexico City.

Holen, Steven R. Clovis Lithic Procurement and Land Use Patterns in the Central Great Plains. Chapter submitted for a book entitled "Early Paleoindians of the American Mid-Continent" edited by Daniel Amick.

Papers Presented

Steven R. Holen, 2009. Lithic Identification and Procurement Patterns in the Plains of Eastern Colorado, Program and Abstracts, Colorado Council of Professional Archaeologists Annual Meeting, Alamosa, Colorado

Kathleen Holen and Steven R. Holen, 2009. An Engraved Stone Pendant from Colorado: Ancient or Modern? Colorado Archaeological Society Annual Meeting. Pueblo, Colorado.

Steven R. Holen and Kathleen Holen, 2009. Experimental Replication of Mammoth Limb Bone Reduction Patterns Using Elephant Bone: Evidence for Last Glacial Maximum Humans in North America.

Rocky Mountain Anthropological Conference. Gunnison, Colorado.

Steven R. Holen and Kathleen Holen, 2009. Experimental Elephant Limb Bone Breakage as an Analogy for Mammoth Bone Breakage: Implications for the Early Peopling of North America. Plains Anthropological Conference. Norman, Oklahoma.

Upcoming Presentations

Mark P. Muniz and Steven R. Holen. The CW Cache: Can Production Strategies Identify Clovis Flintknappers? Paper to be presented at the Society for American Archaeology Conference, St. Louis, MO. April 2010.

Kathleen Holen and Steven R. Holen. The Mid-Wisconsin Peopling of North America. Paper to be presented at the Society for American Archaeology Conference, St. Louis, MO. April 2010.

How You Can Help

The DMNS Paleoindian research program has a number of important activities planned in the coming year including field excavations and collections research. We continue to successfully conduct important research, while competing with larger, better funded programs. But to remain competitive requires the on-going support of volunteers and supporters. Please help by donating your time, providing leads on important archaeological sites and supporting the programs needs through cash donations.

Cash donations of \$50, \$100, \$500, \$1000, \$5000, or \$10,000 will enable us to successfully pursue research throughout the year. All donations are tax deductible. If your gift is by check, please make it payable to the **Denver Museum of Nature & Science** and send it to:

**Attn. Development Department
Denver Museum of Nature & Science
2001 Colorado Blvd.
Denver, CO 80205**

Please note on the check that it is for "Steven R. Holen Paleoindian Program Research Fund". If you have questions about your donation, please contact Steve Holen at (303) 370-8261 or Vicki Wilson in the DMNS Development Department at (303) 370 8251

Acknowledgement: We would like to thank Pete Laux for copyediting the final version of the newsletter.