THE HUNTINGTON MOUNTAIN MAMMOTH:
The Last Holdout?*

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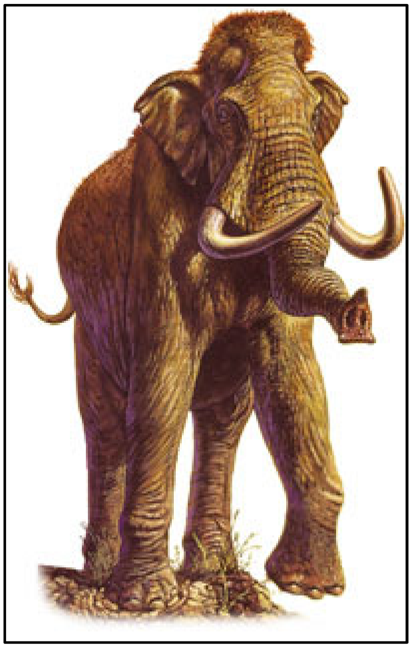


'Survival Through Time' is a theme that occupies all beings in the universe, how to stay alive, how to keep putting food on the table, so to speak. It is a fitting theme from the ecological perspective: how do animals, including humans, survive the rigors of the environment in which they live?

I was no more than 3 months on the job in Utah when I got a phone call at 7:00 a.m. on a weekday in August. The phone call came from my predecessor as Utah State Paleontologist, Jim Madsen who, like myself, is interested both in Ice Age or Pleistocene mammals as well as dinosaurs. Jim told me that, at a construction site for a dam near Fairview in Huntington Canyon, some large bones had been discovered, of unspecified form and shape. He then gave me a phone number to contact the construction operators.

I called Ray Nielson of Nielson Construction Company who had the bones. He told me he had a long bone, 4 feet long and 8 inches around. The bone had been found in the Manti-LaSal National Forest at an elevation of 9,000 feet.

When I arrived at the site there was a tremendous confusion of muck and mud and heavy equipment that was going in all directions. The construction company had run into muck that was 20 feet thick, and were trying to replace it with rock fill to stabilize the toe of the dam. In so doing they uncovered twigs, logs and bones. With every scoop of the bucket, which was nearly large enough to put my pickup truck in, would come up snags and logs, and as the bucket would pivot and turn over and dump, everything would fall out. It was remarkable that Chris Nielson, the operator, could recognize a four foot long bone and distinguish it from a four foot long chunk of log. But he did, and he went out to examine it.

When he realized what he had, probably his first thought was: "What do we do now?" If you work for or own a construction company the temptation might be strong to just bury it to avoid being shut down. Such a scientific discovery could be an economic problem if you have a construction company and you schedule your equipment for so many days; to be shut down for an archaeology or paleontology excavation would delay the project. The delay could cost money, and in order to recover that money you would have to negotiate an arrangement with the land owner, which would pay you for the time lost, or find another solution.

Usually, the other solution is to bury the bones, to get rid of the "evidence." But Chris Nielson didn't do that, quite to his credit. He took the bone to his uncle, who realized that it was unusual. Although he didn't know what he had, through a series of phone calls he finally reached me as State Paleontologist, inviting me to the site.

Even in late August the weather was threatening at this high altitude and the construction people had a short season to work in. it was clear that to be shut down for even a few days or a week would have serious consequences for the project. So when I arrived at the site, I had to walk up to four of the irrigation company supervisors, it was for this irrigation company that the dam was being repaired, all in their bib overalls, big husky laboring folks, with stone faces like Mount Rushmore. They didn't want to see me or hear what I had to say. And so before shaking hands or offering any business cards or playing the "good old boy" where we kick dirt clods and tell stories, my first words were, "We won't shut you down."

I got four smiles in reply. The four men led me down into the pit where the bones had been discovered, but not before looking at the bones that Nielson Company had pulled aside. One was the upper arm bone of an elephant. It was quite a surprise. There was also a fragment of a tuck, which I didn't realize they had found. I had only heard about one bone, but instead they had about a four foot section of tuck from and elephant, and that was a clincher. If I couldn't have recognized the arm bone as elephant, there was no mistaking the tusk.

From the section of tuck found, if complete it would have measured about 10 feet long. The upper arm bone and tusk were in good condition, perfectly preserved. We felt around in the muck and I couldn't see any more bone, but I had noticed on the humerus, the upper arm bone, a peculiar gray color that was different from the color in the peat bog, a different kind of stain. And I saw that same color covering some muck in the pit.

Chris Nielson then maneuvered his bucket into place and I asked him to make a shallow sweep right through the position where the stain was. In doing so, he scraped a four inch deep swath right across the surface and pulled of the cheekbone of the still-buried skull. It was like finding gold with the first spadeful when you go to dig a mine. Of all the bones to find in a mammoth or mastodon, the skull is the best. The fact that we broke the cheek bone off was trivial; that could be repaired. The important thing was locating the skull and, with it, the rest of the skeleton. Once we identified where the bone was, we could feel down in them muck, we couldn't see anything, it was so black and so sloppy, and get an overall feel for the size of the skull. And so I went away that day after we had done several more tests, each time striking bone, thinking that we probably had a complete skeleton of a mastodon.

I called it a mastodon because mastodons were known to inhabit forests, with records up to 10,000 feet. It was a rational call on my part: I knew I had elephant; there was tuck, and the arm bone of mastodons and mammoths are not very different. So it was an easy call. Ecologically it should have been mastodon and it would not have been a very great surprise.

The next day as I pulled the muck away from the pallet region of the skull, I exposed a series of plates of one tooth that indicated it was a mammoth. I was quite surprised, because the previous elevation record for mammoths from North America was from a site in New Mexico at an elevation of 7,200 feet. Here we were at 9,000 feet and a great distance farther north, which in New Mexico would have been equivalent to an elevation of around 10,000 feet, considering the difference in elevation and latitude. To find a mammoth at this elevation was astonishing and I was elated at the discovery. We had prospects of a whole skeleton from the work we'd done with the bucket, exploring the limits of the site. In addition, the fact that the skeleton was in place meant that we could get a stratigraphic record, to put it in a proper context. With this introduction to the site, I would like to explain first the differences between a mastodon and a mammoth and then return to the account of the excavation.

**Columbian Mammoth
(Mammuthus columbi)
at the Fairview Museum**

Mastodons and mammoths are part of the fauna that lived during the Ice Age in North America. Dinosaurs, on the other hand, became extinct 65 million years ago. The earliest of the Ice Age animals that we recognize in North America were here from roughly two million years ago until about 10,000 years ago. So mastodons and mammoths are not dinosaurs, nor are the saber-tooth cats, which preyed on the Ice Age elephants. These are all mammals, warm-blooded animals like our modern elephants or cats, or whichever group you are looking at. They all have modern counterparts.

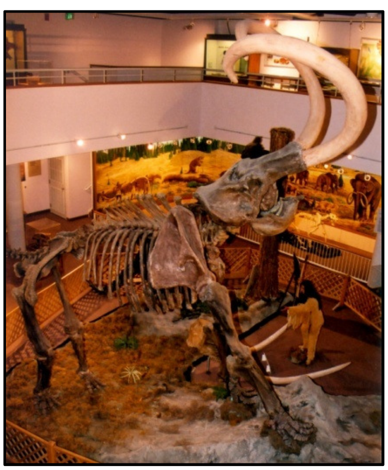
There were at least three species of mammoth in North American. They all belonged to the species ***Mammuthus.*** The mammoth in Utah was not a wooly mammoth but instead was the Columbian mammoth. North American mammoths had high shoulders and a tall domed head with large curved tusks that were at least 10 feet long in mature bulls. They were very tall, maybe a foot taller than our modern elephant, and more slender than the mastodon. The grinding surface of the teeth consists of alternating layers of enamel, cement and dentine, the same composition as human teeth. The difference with mammoth teeth is that the enamel is worn through by the chewing action, exposing dentine. The alternating layers act like a washboard or grinding mill for chewing grasses.

Elephants of all kinds are primarily grass eaters. We know that not only from modern elephants as an analogy, but also because in some sites there are stomach contents from mammoth fossils and the dominant portion of these contents is grasses. In addition, mammoth tooth anatomy reflects their diet. Grasses require an efficient grinding surface, because the silica content is abrasive and tough. Mammoth molar teeth were each about 8 inches ling, and the surface arrangement was an effective device for grinding food. There is only one tooth in each haw at a time, or parts of two teeth. The teeth grow forward and the front part of the tooth falls out, as the rear tooth brows in behind it. When the last molar comes in, it continues to grow forward and when it falls out the individual's feeding ability is lost.

In contrast, there were three molar teeth in place in the mastodon's jaw throughout its life, and each tooth had high cusps and valleys. Human teeth, if they were not worn down through use, would look much the same as mastodon teeth.

When I first saw the skull at Huntington Reservoir, I was looking at the side of a tooth. Because it was an old individual with heavily worn teeth, I just thought that it was an old mastodon. I didn't examine the grinding surface because it was hard to reach in the mud. So when I finally exposed the grinding surface and realized we had a set of parallel plates, rather than the mastodon type of dentition, I was dumbfounded, and delighted.

The habitat near Huntington at 9,000 feet was not much different then, around 10,000 years ago, from what it is today. The only major difference was that up some of the valleys there were active glaciers. Glaciers did not extend down the valley to where the animal died, but the toe of the glacier was probably a mile or so away.



**Columbian Mammoth
(Mammuthus columbi)
at the College of Eastern Utah**

Prior to the death of the mammoth, two glaciers in the valleys above the site came together to form a larger glacier just downhill from this site. But during the time when the sediments of this site collected, the two glaciers had retreated so they were no longer in contact with each other; they were simply supplying sediments by glacial run-off. Water and sediments collected in the lake behind a recessional moraine. Bog conditions developed in this setting, where sediments consisting of mud and a heavy accumulation of plant material were deposited and became saturated by ground water.

To maintain scientific control, the entire skeleton location was covered by a grid, which was mapped. Then, because the muck was too sticky to use shovels in the excavation, everything had to be done by hand, literally. We had as many as 15 to 20 people in the quarry, using this new technique: "fingertip excavation."

The skull was found lying on its side. Except for the cheekbone torn off by the bucket, it was complete and unbroken. Tusk fragments next to the skull were recovered on the first day, and part of one tusk was still in the tooth socket.

The vertebral column was still articulated. That was quite remarkable preservation, finding the bones still connected. It was also quite remarkable that these bones should still be so fresh, as if they had been simply refrigerated for 10,000 years. And indeed that was the case. The bones had accumulated in the bottom of this bog when the animal got mired and died there. The sediments in the bottom were probably cold; 32^0F would be a fair guess at the water temperature, because it was melt water running off from the glaciers. Once the animal's carcass became buried in the muck it went into a stage of refrigeration. At the excavation, it was so fresh that we thought we could smell rotting meat in one place.

We had to plaster the skull because the bone there is only ¼ inch thick and easily damaged. If we had moved the skull out on its own, the muck and moisture that were in the skull would have caused it to crush. Other bones that we removed could be carried without reinforcement, but the skull needed a rigid plastic jacket.

We also had to plaster out the hip bones, which were more than 6 feet across and still connected at their midline, because they were exceptionally heavy and we were afraid they would also crush under their own weight when moved.

When the animal died, its legs became tangled underneath; one leg buckled so the toes projected upward. In the middle of the pelvis was an upside-down foot of the mammoth. When this animal died, in the settling process, its foot got trapped in this opening in the pelvis. The leg bones, still attached to the hip socket, were lying just below the pelvis.

We had to keep the bones wet during the entire excavation because we found that as soon as they dried at all they began to curl. One of the nightmares of paleontologists working in bog sites is that occasionally bones have lost just enough of their protein material to react to drying by curling into "pretzels." Ribs will turn into coiled, uncontrollable bones that can never be repaired. On the first day, one of the ribs had been broken by the bucket and we had inadvertently let it dry out, not realizing we were going to have this problem. Before our very eyes we saw one edge of the rib begin to curl. So we had a great fear during the entire excavation that the bones were going to be damaged because of drying. One of the reasons we had so many people on the site was just to keep the bones wet; people sprayed the bones constantly during the entire excavation.

We recovered about 95 percent of a complete skeleton, all the way down to the small toe bones, and the bones of the tail. We missed the tip of the tail, and we only got tusk fragments. The tusks might have been removed by the bucket before the site was recognized. Otherwise it is a complete skeleton.

Just underneath the pelvis was a stick that had not been disturbed by the excavation. It got caught between the leg and the pelvis and was deposited at the same time as the mammoth. We sent it off immediately for a radiocarbon date and quite to our surprise, it dated to 9,440 years ago. This is a minimum date, establishing the most recent possible date for the find. Of course we must be cautious because the stick could have been deposited 2,000 years after the animal died and somehow just got caught in the body. Eventually we will get other samples dated from below the skeleton, giving maximum or oldest possible age. Our guess is that we will get a bracketed date similar to 9,440 for the older date.

The dates are very important to us because mammoths were supposed to have been extinct more than 10,000 years ago. By some calculations, around 10,500 or 10,200 years ago, all the mastodons and mammoths and all the mega fauna of the Ice Age were thought to be extinct, all across North America. But here we have a very tightly calculated radiocarbon date with very small plus or minus factor for possible error.

Apparently at the time this mammoth died it was living in a refugium area in the high mountains, after the major extinction of all the mega fauna elsewhere in the continent. If our interpretation is correct, this is the first well-documentated record of post-extinction mammoths. If our next date, from a stick below the skeleton, turns out to give us an equally young date, then we have quite a remarkable record; not only was this mammoth living at a high elevation, but it was also a hold-over by maybe 500 to 1000 years at least, compared to all the other mammoths that lived in North America.

Other materials from the site included water-logged sticks and logs, like ones you find in a lake today, mainly from spruce. Sedges and grasses were also found in the bog, as well as what we think is part of the stomach contents of the mammoth. Surprisingly, we found a lot of pine needles in the stomach. Mammoths were not supposed to be browsers; they were supposed to have fed on grasses. Apparently this mammoth had been feeding on pine needles, which were probably very poor in nutrition for mammoths. Perhaps this mammoth was feeding on anything it could find during a heavy winter and became so emaciated that when it got trapped in the bog, it was too weak to get out. That's one scenario we developed for explaining why the animal died. Another idea that can never be substantiated is that it had fallen through ice, during spring melt, and got trapped in the bog.

On the second day of the dig we realized that this was a site that the public could visit. Sometimes in excavations it's not appropriate or even possible to open it to the public, for reasons of safety or to protect the site. In this case, the construction manager and officials from the Forest Service agreed that we should notify the media, thinking maybe a television crew might like to record the excavation. After television coverage the second night, we had several thousand people each day, during the rest of the week.

The story attracted a great deal of attention. We had wonderful response from the public, largely because the Utah State Archaeological Society chapter in Price helped manage the visitors, who require some supervision. The cooperation between several institutions was a nice experience in bringing paleontology to the public.

Upon examination, the mammoth turned out to be an old individual. In almost every bone we see conditions that indicate severe bone disease of some sort, mainly arthritis. For example three vertebrae from the lumbar region in the lower part of the back show a sheath of bone that locked all three of these together. The diseased sheath of bone rendered these vertebrae totally immobile.

We had trouble with one of the femurs that had been allowed to dry out in handling and began to crack. If the bones dried too fast, we found that they would, indeed, twist and crack. We took the bones back to Salt lake City wrapped in plastic bags, so that the drying would be slow. We punched holes in the plastic and, using outside atmospheric pressure, allowed the air and with it, the moisture, to move back and forth through those plastic coverings. At this writing, the bones are still wet. We want them to dry slowly, for evenness, rather than drying on the outside and remaining wet on the inside, which causes the cracking and shrinkage problems.

In summary, this mammoth was a large, old bull, maybe 60 years old, that died in the bog. Its carcass settled into the sediments, leaving the skeleton largely undisturbed. It is remarkable for the perfect preservation of the bone, the completeness of the skeleton, and the high elevation of the site. The implications of the early date await further analysis.

NOTE: Repository designation and mold/casting decisions were still pending by USFS at the time this went to press.

SUGGESTED READING:

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**In this article Dr. David Gillette offers the first written account by one of the researchers of the Huntington Mammoth discovery. For this popular article, he employs a personal narrative style that lends an unusual perspective and captures the flavor of the unique circumstances of the find. Detailed scientific analysis is underway and full, professional reporting is planned.*

David D. Gillette has a PhD from Southern Methodist University, and is the current Utah State Paleontologist. He is a specialist in vertebrate paleontology, with focus on Pleistocene mammals.