



Many people ask how long it took to build this exhibit. The answer has several parts which include answers to most of the other questions asked: discovery of the fossils, excavation, transportation, restoration, replication, research, design and construction of the exhibit are all vital parts of the "mammoth undertaking" resulting in this unique exhibit.

The Mammoth

History of the find.

The mammoth was first discovered in 1979 by an Oregon logger, Steve Wallmann. He reported it to Dr. William Clewlow, Jr. of Ancient Enterprises, an archaeologist with extensive experience in Black Rock Desert archaeology, and a Nevada State Museum research associate. Dr. Clewlow examined the exposed tooth in 1981 and did a small test excavation to determine scope of the find. Finding evidence of extensive partially articulated bone, he reburied the bones and planned a more extensive excavation for the next field season. In the summer of 1982 Dr. Clewlow and his crew exposed the entire skeleton, with the help of several volunteers and the expertise of The Nevada State Museum Curator of Anthropology, Donald R. Tuohy and University of Alberta's Dr. Ruth Gruhn.

The bones were excavated and left on columns of dirt, called pedestals, so the entire skeleton could be viewed, mapped and photographed. In order to protect the brittle and heavy bones, field jackets of plaster and burlap were carefully built up over the exposed bones and under the edge to the pedestal. This allowed the bones to be turned over and what was the bottom side was also covered with plaster. Steel fence posts and reinforcing bar were incorporated in the plaster jackets for support and as a place to attach chains for lifting the jacketed bones.

The mammoth was on Bureau of Land Management land, and the BLM provided a large dump truck with a bed of sand to protect the bones during transport, and a backhoe to lift the heavy field jackets into the dump truck. Back at the museum, the Nevada Department of Transportation provided a front end loader to unload the huge bones into the museum warehouse.

At a cost of \$11,000 for labor to Dr. Clewlow's consulting firm, plus hundreds of volunteer hours, and \$2,500 to the Nevada State Museum for supplies and donated equipment, the excavation was accomplished. But this was no small mammoth, and now that we know he may be the largest mammoth on display, all involved feel it was worth the effort to carefully collect and stabilize the great bones. But collecting is only the first step in bringing such a beast into a museum exhibit.

The Lab Work

Once out of the field, the first step was restoring and stabilizing the original bones. The bones were shipped to the Nevada State Museum and Archive in Las Vegas where retired paleontological conservator Ralph Danklefsen, assisted by Betty Stout, removed the bones from their field jackets and mended all broken bones he could, building up areas that were missing with plaster. He built a framework for the skull and reconstructed about half of the skull, which had been severely damaged by natural exposure. He used plaster to rebuild the missing parts and painted the final product to look like the original bone, a light yellowish white.

The Exhibited Mammoth

The skull, with copies of the incomplete tusks, and the complete right femur, were placed on display in Las Vegas for several years. During this time, preliminary plans for the new Earth Science gallery in Carson City were being developed, with the long range goal of putting the entire mammoth on display.

The bones were shipped to Carson City in 1990. The heavy bones are too brittle to display safely in an articulated framework, and their scientific value requires access for further study. Therefore, all the bones were prepared for the copying process in 1990. Exhibit technician Hazel Wald was hired to prepare the bones for the mold making process and to obtain expert identification of the species involved. She also attempted to locate available examples of the missing elements in other museums. She was only partially successful, and Museum staff exhibit technician Larry Tanner, helped by sculptor John Douglass, expertly sculpted many incomplete portions or missing bones using the complete bones from the opposite side as

examples.

Larry created the tusks using photographs and consultation with Amy Dansie, the technical advisor for the skeletal reconstructions. The vertebrae, except the neck, were bought from the Utah Museum of Natural History and represent a Columbian Mammoth from the Wasatch Mountains. Although from an older individual, these vertebrae are too small for the much larger Imperial Mammoth from Nevada. Imagine the spines of the vertebrae 4 to 6 inches longer to get an idea of how much taller he would be.

Three summers or about nine months were spent making molds and casting fiberglass resin copies of these giant bones. Because the resin is toxic, an outdoor work area was built, and all resin work was confined to the warmer months of the year. Other work on the bones was done over the three year period as time permitted between other projects.

Framework construction and final design of postures took another six months. Staff visits to Bertha and Angel, the performing elephants at the John Ascuagas Nugget in Sparks, were very helpful, as the trainer kindly put the patient Bertha through all the possible postures we were considering, showing us the range of motion in a modern elephant as guidelines for our Mammoth reconstruction. Starting with the skull at the ceiling, the rest of the posture was designed to depict a death scene within the space available.

The painting of the mural by museum artist Barbara Herlan took 8 months in 1989 and 1990, and the basic mud pit was built during that same period. The final assembly in 1993 included designing the mud, a combination of plaster, water, pigment and epoxy resin for the wet-look. From its discovery in 1979 to the opening of the exhibit in 1993, fourteen years had elapsed, with much untold work by many other people being done over the years.

What kind of Mammoth is it?

Understanding of the relationships of various types of mammoths has changed as more examples have been discovered. As a result, there has been considerable confusion regarding the identity of many mammoth specimens. When the animal before you was prepared for exhibit, the best available interpretation of the evidence indicated it was an Imperial Mammoth (*Mammuthus imperator*). These debates have continued until fairly recently. Beginning in the early 1990s most researchers have come to accept that specimens such as this one should actually be called Columbian Mammoths (

Mammuthus columbi

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We also do not have a firm date on this mammoth, but a nearby site dated by the Desert Research Institute suggests a date between 15,000 and 17,000 years ago. A radiocarbon date on the bone, submitted by Betty Stout, appears too young at 11,000 ago.

His size, about 13 feet tall at the shoulder, falls within the upper range of the Imperial Mammoth, a species larger than most Columbian mammoths. As noted above, the vertebra from an old Columbian mammoth bull are significantly smaller than the Black Rock mammoth. In life, this Imperial Mammoth would have weighed about six and one half tons.

Mammoths, like their elephant relatives, were grazers and browsers, meaning they ate grass and trees or shrubs. It is hard to imagine herds of elephants being able to find 400 pounds of food a day, each, in Nevada, but they lived here so they must have eaten what plants were available, such as willows, tules and cattails, and grass. We know Utah mammoths ate grass, sedges, reeds, and even sagebrush, saltbush, birch, rose and cactus. They could have torn down the massive Fremont cottonwoods in the river valleys to get the bark and leaves when times were hard, like elephants in Africa who destroy many trees during drought. They could probably reach well over 20 feet above ground for food.

Three ribs show healed fractures, probably from a fight with another bull during mating times.

What is the Difference Between a Mammoth and a Mastodont ?

The mastodont (Mammut) was a relative of mammoths (Mammuthus). It was an elephant-like beast with a shorter, stockier build. The main difference is the teeth. Mastodont means "breast tooth" because the cheek teeth have several pairs of large pointed cusps suited for browsing on shrubs. In contrast, the mammoths had teeth composed of flat plates of enamel-lined dentine cemented together with cementum, with a relatively flat chewing surface composed of many low ridges across the tooth. Mammoth teeth are suited for grazing on grasses. Mastodonts lived from 20 million years ago until about 10,000 years ago, and mammoths arose in Africa about 3 million years ago, spreading to the new world and becoming extinct 10,000 years ago. Both are relatively common in Nevada.

The Horse

History of the find

The horse was discovered by a friend of the man who found the Mammoth, Jack Harrelson, also from Oregon. While walking the mud flats near Pyramid Lake, he had previously found two camel skeletons which were reported and excavated by the Nevada State Museum in 1983 and 1984. The horse was found in 1985, exposed on the surface, lying on its left side, fully articulated with most of the bones relatively intact. Working with a representative of the Pyramid Lake Tribe, these fossil skeletons, the camels and the horse, were excavated by the Nevada State Museum anthropology department staff, Donald R. Tuohy and Amy Dansie, with assistance from three volunteers. Frost action and sun light had fractured many of the horse bones in place, but all bones except the splintered ribs were restored into a complete skeleton of an Ice Age horse.

Originally these Wizard's Beach skeletons were thought to be terminal Pleistocene in age between 11,000 and 9,000 years old, due to the low elevation of these skeletons in the Lake Lahontan basin. When one of the camels was dated at 25,500 years old using an important new dating method, the results surprised most students of the prehistoric lake history and geology of Nevada. At 25,500 years ago, it was thought there was an extensive, relatively shallow lake system in all the western Nevada basins, lakes that rose rapidly less than a thousand years later.

Lake Lahontan expert, the late Dr. Jonathan O. Davis of the Desert Research Institute, and bone expert Amy Dansie of the Nevada State Museum wove together the facts of these three skeletons into a new reconstruction of the history of Lake Lahontan (see Anthropological Papers No. 21, available in the bookstore, for details). A very brief lake recession, when the lake lowered to the modern Pyramid Lake elevation, was the scene of large land mammals seeking water during a drought.

These three animals were so well preserved, that in one of the camels, fossilized stomach and lung matter still lay within the body cavity. The chemist who dated the camel reports that 70% of the original protein was perfectly preserved in the bone, and he was able to extract several different amino acids from the bone, and date them individually using an atomic mass spectrometer. The date of 25,500 years ago is assumed to apply to the other camel and the horse until further tests determine otherwise. Their setting and bone condition are identical. They were covered with up to 800 feet of cold fresh water for 14,500 years while sediments

gently buried them, and they were not exposed to surface weathering until the 1980's.

The Exhibited Horse

The horse was originally restored by Amy Dansie, Museum Anthropologist, in 1986 for the Wild Horse in Nevada Exhibit (see the booklet by that name in the gift shop for more information). Repairing the fractured bones and reconstructing the skull took six months of full time, literally back breaking work. In that temporary exhibit, the original bones were displayed in a special steel framework that did not damage the bones. Due to his exceptional preservation, this horse is still important to science, and the bones are very brittle despite their excellent appearance. Therefore, a complete fiberglass resin copy of the skeleton was made, by Ralph Danklefsen and Betty Stout who restored the mammoth, and mounted in a new framework for the traveling Wild Horse exhibit.

Now retired exhibit technician Jim Huntington, working for a year with Amy Dansie, fabricated the two fossil horse frameworks, as well as a modern horse skeleton mount. As the plans for the permanent Earth Science Gallery were finalized, a fourth horse mount was created by Huntington and Dansie. Using video tape of an Arabian stallion as a model, the posture of a rearing, angry stallion was designed to fit the combined scene of the dying mammoth and a horse seeking water in a drought.

The horse shown in the exhibit is a true horse (*Equus pacificus*), not an onager, zebra or ass which were also common in Ice Age America. He was massively built and was almost five feet high at the shoulder. His head is much larger than a domestic horse, with a thick short neck. His round hoof bones may look delicate, but with the hoof covering, his foot print, as shown in the exhibit, was average size by today's standards. These horses probably lived in herds, like all horse relatives do, with a dominant mare and a stallion who fought off other stallions. Bachelor herds of stallions were probably common. Found alone, this mature stallion was not old, and there is no sign of injury or sickness in the bones. The canine teeth are typical of male horses even today.

The Exhibit Scenario

The exhibit scene shows a dramatic interpretation of the Black Rock Desert as it might have looked for a brief period 25,500 years ago, intermittently 15,000 to 17,000 years ago, or

possibly 11,000 years ago when the lakes evaporated for the last time when mammoths and native horses still lived in the New World.

Excavations of the Wallmann Mammoth revealed the edges of a round hole or depression, the bottom three feet or so of which were still buried. The original land surface the same age as the hole was blown away thousands of years ago, along with much of the vast Black Rock Desert playa, probably during the Altithermal arid period 7,000 to 4,000 years ago. The top of the younger material filling the depression is also gone, but the bottom of the hole was filled with a mammoth skeleton and water-born silt. Meticulous excavation of the contact between the older material and the fill of the depression revealed vertical channels or flutes suggesting the scraping of the wet clay slope by mammoth feet and small water channels from splashing water running back into the depression.

A Brief Look at Pleistocene Nevada

Some of the other now-extinct animals found in Nevada which might have been seen around this site in the Late Pleistocene include the giant "Yesterday's Camel" *Camelops hesternus*, smaller llama-like camels, smaller horses or asses, and giant bison (*Bison antiquus*, *Bison latifrons*) some with six foot horn spans. To eat them were dire wolves much larger than timber wolves, saber tooth cats as large as lions, the great American lion, and even an American cheetah, the first one of its kind found at nearby Winnemucca Lake, Nevada.

Lumbering vegetarian ground sloths larger than Kodiak bears, Cave Bears larger than Kodiak bears, and giant short-faced bears with long legs (for running fast) all presented imposing sizes not found in wild American animals today. As you might expect, even the vultures were bigger! The 30 pound Ice Age condor relative of Nevada, *Teratornis* had a 14 foot wingspan, and ate any thing it wanted, actively hunting prey on the ground and swallowing it whole.

Of these other Ice Age animals, only the saber tooth cat (*Smilodon*) has been found associated with the Black Rock Desert mammoths. An isolated deciduous canine was found in the pit with the exhibited mammoth, and could represent a young cat who tried to bite off more than he could chew, and left his tooth in the thick hide of the mammoth.

The tree line was about 300 feet lower than today, as shown on the mural behind the skeletons, and there was more grass than today among the scattered trees in the uplands. Although the plants were essentially the same as we know today in Nevada, there were more grazing and browsing plants to support the vast herds of diverse animals. The juniper and pine trees (not pinion) in the mountains would grow down to the valley floors and the lake shore, depending on the lake elevation at any given time.

The nearly barren, alkali-white terrain at the mammoth site today is much like it was in the past when the lakes were dried up. Slough or shallow river channels braid through the nearly flat valley bottom. Though often dry, they swell in flash floods like any other desert water course, carving deep, smoothly sloping depressions into the ancient lake clay at bends in the river. Even today these slippery sided slough holes trap cattle (and unwary archaeologists) who cannot get traction in the dense wet clay.

Everything was larger in the Ice Age, so larger flash floods carved deeper sloughs and larger animals were caught in the slick traps of the lake bed mud. Between events of flowing water, the large holes were the last surface water to dry up on the vast valley bottoms. If the rivers had been flowing often enough, there would be a riparian plant community along the new river beds, with cattails, tules, perhaps willows, salt grass and forbes (weeds good for grazing). These resources would attract countless animals, during droughts especially. The thirsty horse discovering a dying mammoth in the last water hole is depicted in the exhibit, although the two animals lived at different times in the past.

What Caused These Animals to Become Extinct?

The last of the great Pleistocene extinctions happened around 11,000 years ago as the Ice Age declined into the modern climate. As precipitation decreased, the extremes between summer and winter increased, southern summers became much hotter, and northern winters became relatively colder. Many plant communities shifted hundreds of miles over a relatively short time, and the constant stress on the life communities was probably the main cause of extinction. But some fairly large land mammals, such as mountain sheep, bison, deer and antelope survived, so why did so many other animals become extinct? No one really knows, but some scientists have suggested that humans, who had entered the New World by 12,000 years ago, were responsible for killing off the remnant herds of large mammals (megafauna) during the critical stress period around 11,000 to 10,000 years ago. Because many small species, such as birds, also became extinct at the same time, other scientists are certain it was climate change only,

and not human intervention that caused this mass extinction.

The wild horse of today is a descendant of European domestic horses brought over by the Spanish and later settlers of the New World. All native wild horses in North and South America became extinct by 10,000 years ago. Only the South American llamas, alpacas and vicunas survive of the various native American camels.

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