

Recreating the Blue Lake Rhino Cave

ARN SLETTEBAK

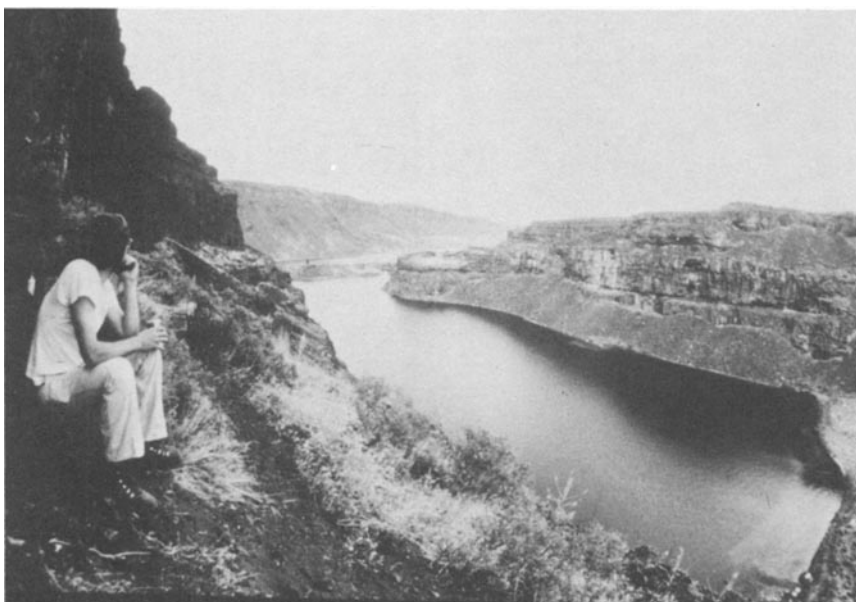
CURATOR OF EDUCATION

THOMAS BURKE MEMORIAL WASHINGTON STATE MUSEUM

SEATTLE

In the basalt rock of Eastern Washington, in a canyon wall of the Lower Grand Coulee, is a unique and famous little cave. It is the natural mold of an extinct rhinoceros of the genus *Diceratherium*, known as "The Blue Lake Rhino." Apparently, the beast was smothered at the base of a massive lava flow by one of the many fissure eruptions which built the Columbia Plateau during the Oligocene and Miocene Epochs. The cave is surrounded by "pillow" basalt, which is thought to have formed when a wall of molten lava encountered a lake and was locally cooled by the water. It is assumed that the unlucky animal was standing (or floating) in the lake when it was entombed. The basalt "pillows," molten on the inside but crusted on the outside, packed closely around the body of the rhinoceros and preserved its basic form for posterity.

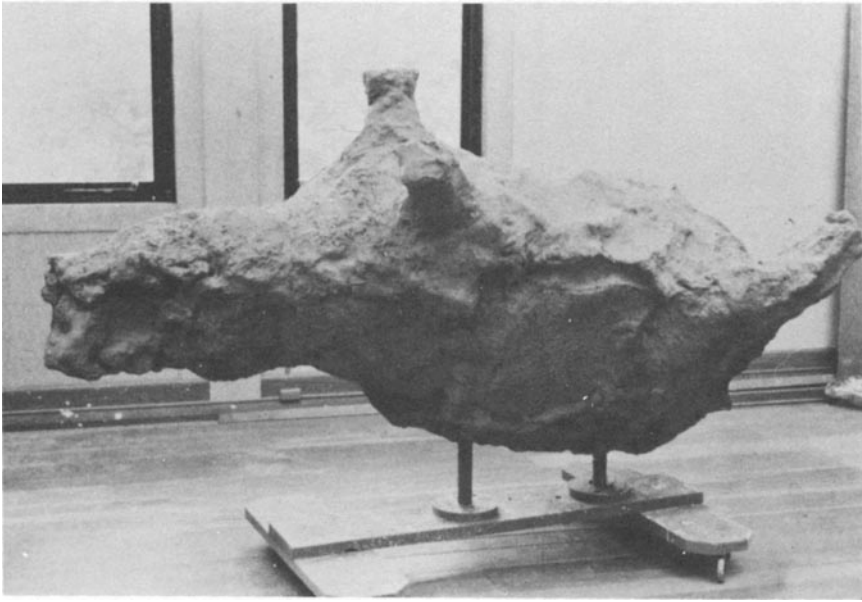
These events occurred some fifteen million years ago, but it was the formation of the Grand Coulee (a deep, irregular scar in the earth with vertical cliffs) which led to the eventual exposure and discovery of the cave. Like the formation of the cave, the origin of the Grand Coulee itself was at one time a controversial topic among geologists. The prevailing view today is that it was gouged out by the periodic and sudden release of many cubic miles of lake water from behind a glacial ice dam (in what is now Montana) during the last Ice Age. Each torrent, on its way to the ancestral Columbia River and the Pacific Ocean, tore up an immense amount of basalt bedrock and carried it downstream. After the last of these floods, a small opening in the Blue Lake Rhino cave may have been created. At any rate, by the time of



View from the site of the cave, across Jasper Canyon (an arm of Grand Coulee) and Blue Lake.

the cave's discovery in 1935, there was an opening in the rock face big enough for a person to crawl through. Professor George Beck, then of Washington State Normal College in Ellensburg, inspected the cave soon after its discovery and expressed the opinion that it was indeed the natural mold of an extinct rhinoceros. A few silicified bones found in the cavity were the only actual remains of the creature. These were later identified as remnants of a *Diceratherium*.

The story of the replication of the cave for study and display begins in 1948, when a plaster cast of the cavity was made by Professors Donald Savage and J.W. Durham of the University of California at Berkeley. They applied jellied soap to the rock as a separator, followed by burlap strips dipped in plaster as a casting medium. Lines were chiseled into the plaster to subdivide it into easily removable pieces. Inter-connecting wooden struts were positioned inside the cast before removal of the various pieces, and these struts were later re-positioned for dimensional accuracy during assembly of the cast. The bulky, seven-foot-long replica of a "cooked rhino" was studied and then stored at the University of California Museum of Paleontology. It was later given to the Thomas Burke Memorial Washington State Museum in Seattle by Professor Savage. There it re-



Plaster cast of the cave made in 1948 by Savage and Durham.

mained in the basement until 1979, when it was decided that the cast should be cleaned and prepared for display. As Curator of Education, I had an interest in the best way in which to tell the rhino's sad but fascinating tale. Our Exhibition Division staff had their doubts about the display potential of the cast, and I therefore suggested that a piece mold be made from the cast in order to reconstruct the appearance of the original cave and thereby make the exhibit more understandable and exciting. The mold pieces themselves would become, when assembled, the walls of the cave replica. This plan was eventually accepted, as long as I was willing to undertake the project. I was, and began to plan the exhibit.

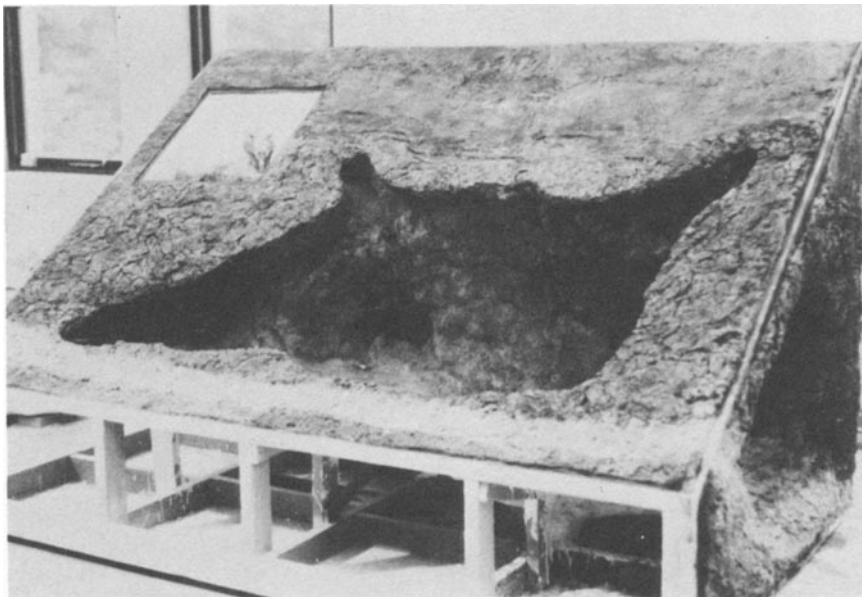
I decided to construct the cave as a cutaway view along its length, which would show the outline of the animal's head, body, and two stubby limbs (pointing upwards, since the rhino was on its back when covered by lava). One end of the display would be a replica of the natural cave entrance, and the texture and color of four distinct rock layers surrounding the cave would also be duplicated. Finally, casts of the bones found in the cave would be added, as well as a miniature habitat group reconstructing the rhino's appearance in life.

So as not to harm the original cast (the only one in existence),



Making the pieces for the cave replica from the original cast; note finished pieces above, clay dike and clay-filled undercuts on cast below.

I used heavy aluminum foil as a separator. For the mold pieces, I chose the same materials which had been used for the cast, plaster, and burlap. Plaster is inexpensive and strong, especially when laminated with burlap. Also, the seams between mold pieces could be easily disguised and reinforced with more plaster, and the surface of the cave could be convincingly textured with plaster on a damp sponge. I marked with chalk the area of the cast that was to be molded, and began by making fairly large pieces (one at a time) designed to minimize undercut areas. Water clay was used to fill small undercuts on the cast. Each piece of the mold was made with two-inch-high flanges all around its edges. This continuous flange strengthened each piece and allowed it to be bolted to neighboring pieces through their adjacent flanges. Clay dikes were used when needed to form the flanges. When all sixteen mold pieces were assembled in this manner, they formed a strong, self-supporting structure. A sturdy frame of two-by-fours was then made to further support the mold and to delineate the areas that would become the cave entrance, the cutaway rock surface, and the miniature habitat group. Galvanized wire cloth with one-half-inch squares was used as a base for the cave entrance and cutaway rock face, and was then covered by plaster-soaked burlap.



Same as right, except covered by tinfoil separator prior to making the next piece of the mold.

While the cave itself was to be artificially textured, I wanted to make all other areas as realistic as possible for educational and aesthetic purposes. To this end, it was decided that Steve Nelson (a museum volunteer and long-time student of paleontology) and I would visit the actual cave site and make flexible molds of the strata surrounding the cave. These would then be used to cast plaster replicas of the rock that would cover the framework of wood, wire, and plaster which had been created at the museum. The material used for the molds was polysulfide rubber. This is a compound which vulcanizes at room temperature when the polymer is mixed with a catalyst or curative. I do not recommend that this compound be used in the field. It smells horrible, is impossible to remove from clothing, and is slow to set outdoors (where room temperature does not often occur). It is, however, quite durable when set, and each mold may be used many times. In retrospect, latex would probably have been easier to use. Furthermore, we learned from experience that a separator on the rock is an absolute necessity when using polysulfide. We used a mixture (one-to-one by volume) of petroleum jelly and kerosene very successfully.

After hauling our gear from Blue Lake up a two hundred foot talus slope several times, we came to appreciate the problems



Close-up view of miniature habitat group installed in the cave replica.

that Savage and Durham must have faced in carrying their plaster and water in 1948. Eventually, we had seven flexible molds of different sizes as a result of our considerable efforts. These were used some fifty times in all to produce a convincing rock texture on the exhibit, rotating the molds a bit each time to avoid repetitive patterns.

After filling, carving, and other localized touch-up work (including sponge-texturing of the cave walls), all plaster surfaces were painted with latex colors under the direction of Beverly Witte, Geological Preparator. We first applied a base coat of very dark gray, using simple, hand-pump spray bottles. Working from dark to light, various colors were added with sponges and by spatter painting with stiff brushes. All in all, we were quite satisfied with the results.

After the completion of the cave and rock faces, a miniature habitat group was made with a rhino figure as the main attraction. I sculpted the figure in oil clay over an armature of styrofoam and wire. It was then molded in latex, with a plaster piece-mold (i.e., mother mold) surrounding it. The final model was cast in dental plaster and painted with acrylics. The base of the habitat group was built-up of carved, laminated styrofoam slabs on a plywood base. This was made to look like the rocky shore of the lake where the rhino had been standing or floating

when covered by lava. Grass was simulated by wire-brushed fragments of a bath towel, rushes were made from the bristles of an old cleaning brush, and mosses were suggested by pieces of an old sponge. Acrylic modeling paste and colors were applied to the styrofoam and artificial vegetation. Epoxy resin tinted with oil color was poured about one-eighth of an inch thick to produce lake water. Lily pads were cut from stiff paper, painted, and glued to the surface of the resin. Laminated blue plastic was used to simulate the sky. A fluorescent light fixture was concealed just above the model.

Beverly Witte made replicas of the actual fossil bones found in the cave by casting the originals in plaster from latex molds. (The original bones were borrowed for this purpose from the University of California Museum of Paleontology.) The replica bones were attached to the floor of the cave model with transparent silicone building sealant. A large, illustrated, silk-screened label on plastic-covered particleboard was also added to the exhibit.

Finally, a dried specimen of a fairly large scorpion was placed in the mini-cave formed by one of the rhino's forelimbs to attract our younger visitors, a trick which seems to have succeeded.

I estimate that some 450 hours were required to create the "Blue Lake Rhino Cave" exhibit. The cost of materials was minimal, since we used re-cycled lumber and onion sacks discarded from a local restaurant. The exhibit, now open to the public, is quite popular.