File under RMG native category

# *OREAMNOS* IN COLORADO

## INTERNATIONAL ORDER OF ROCKY MOUNTAIN GOATS
**February 5, 1999**

365-487

**PORCUPINE CAVE**

**Discovery:** Initially opened by miners in the 1800's, it was discovered as a fossil site in 1981. Dr. Don Rasmussen and his son Larry. Don contacted paleontologists at the Carnegie Museum of natural History in Pittsburgh and, together, they began working the site.

Since then it has been worked by paleontological groups from Carnegie, U of California at Berkeley, U of Kansas, Northern Arizona University, and the Denver Museum of Natural History.

**Location:** on private property about 35 miles south of Fairplay – on the west face of the ridge that extends southward from Trout Creek Pass on Colorado 285, south of Fairplay – Dissolved into the Ordovician Manitou Fm., same as Cave of the Winds at Colorado Springs

**Elevation:** about 9500 feet (2900 meters) above sea level – Highest Pleistocene fossil locality in North America

**Size:** Contains several rooms, and is completely mapped. It is a relatively small cave with the usual tight crawls connecting large rooms.

**Age of Deposits:** Age determined by microtine rodent fauna and by paleomagnetic signals -- Blancan and Irvingtonian Land Mammal Ages – About 350,000 to 1,800,000 years ago – Brunhes/Matuyama Boundary = 780,000 years ago lies within the deposits --

The cave was closed when entrances were sealed aroung 350,000 years ago. It ws opened in the late 1800's by miners searching for copper or gold and silver. They quit when they entered the cave.

**Origin of Deposits:** 1) water brought sediment and specimens into the cave through several entrances throughout the 900,000 year span of time – 2) carnivores such as coyotes, bears, cheetahs, skunks and weasels brought in bones – 3) carnivore scat and owl pellets brought bones into the cave

Many of the deposits are stratified, so we can collect them one layer at a time, beginning with the most recent

**The Fossils:** Contains the richest Irvingtonian fauna in North America – Unique with 23 carnivore species – Contains over 75 species of mammals, as well as representatives of 13 bird families (36 species) and several reptiles, amphibians, fish, and molluscs.

Trout, salamanders, toads, frogs, horned lizards, garter snakes, rattle snakes, geese, ducks, eagles, hawks, falcons, grouse, shorebirds, owls, woodpeckers, swallows, magpies, crows, sparrows, and finches.

Mammals include shrews, bats, ground sloths, rabbits, pikas, mice, beavers, gophers, muskrats, fishers, weasels, martens, ermines, ferrets, mink, otters, skunks, badgers, bears, coatimundis, wolves, coyotes, foxes, cheetahs, bobcat, and a unknown large cat, camel, peccary, elk, deer, pronghorns, musk –ox, and one rocky mountain goat.

Of over 10,000 specimens collected, one is positively identified as *Oreamnos*, the rocky mountain goat. We are looking for more.

## THE ROCKY MOUNTAIN GOAT PALEONTOLOGICAL HISTORY

The rocky mountain goat, *Oreamnos*, is the only member of its tribe in North America, living or fossil. It is a specialized bovid that presumably evolved from Asian stock, perhaps after its ancestor migrated to North America. Its closest living relative is the chamois, *Rupicapra*, of Eurasia.

Oreamnos fossils are relatively rare, represented by only two species, the living *O. americanus* and the smaller, extinct *O. harringtoni*. The area of North America with the best preserved *Oreamnos* specimens are caves in the Grand Canyon. This is presumably because of the arid conditions there.

Until the discovery of *Oreamnos* in Porcupine Cave, its fossil record went back only about 39,000 years and its geographical area included British Columbia, Canada; northeastern Mexico; and northern California, southern Idaho, southeastern Wyoming, eastern Nevada, southeastern Utah, northern Arizona, and southeastern New Mexico. Map evidence indicated it was only a matter of time before *Oreamnos* occurred in Colorado.

## THE CONCLUSION ABOUT ROCKY MOUNTAIN GOATS IN COLORADO

**The Fossil**: A horn core, not round in cross section, with a fairly straight, smooth orientation, lacking longitudinal grooves and ridges, and lacking spiral twisting and curvature. These characters exclude the horn core from every group of artiodacyla save Rupicaprini.

**The Location**: "The Pit," a Carnegie Museum of Natural History locality within Porcupine Cave.

**The Age**: The Oreamnos horn core is from strata above the Brunhes/Matuyama (780,000 years ago), and fall within the 365,000 to 487,000 years ago range, based on microtine rodent biostratigraphy.

**The Significance**: *Oreamnos*, most likely *O. harringtoni*, not only existed in Colorado, it was here over 365,000 years ago.

**The Future**: We anticipate that other *Oreamnos* specimens will be found in other parts of Porcupine Cave. In the meantime, we are following-up on the possibility that rocky mountain goat fossils were collected from two Colorado caves in the late 1800's, but the specimens were reportedly lost.

# Goat fossil found in cave

The following article was prepared specifically for the *Gazette* by Dr. Lou Taylor, a Denver Herd Ol' Goat since 1989. Lou is a professional paleontologist and president of Standard Geological Services, Inc., and was also serving as a research associate for the Denver Museum of Natural History for his work on the Rocky Mountain Goat.

His just-published report proves conclusively that our Rocky Mountain Goat is native to Colorado, and raises the possibility that it may have spread from Colorado to the other Rocky Mountain areas!

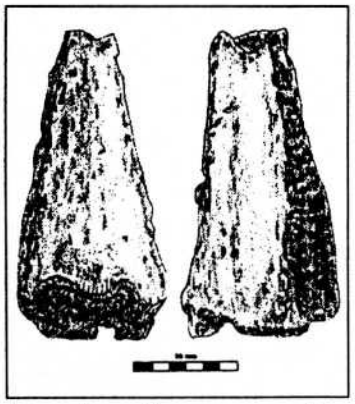
**— Bruce Hartel,**
**Second Assistant Grand Herdsire**

Until recently, Rocky Mountain Goat fossils were known from several Western states, but not Colorado. Fossils of the Ice Age (Pleistocene) Rocky Mountain Goat, *Oreamnos harringtoni*, have long been known from New Mexico, Arizona, Utah, Nevada, and even from Mexico, but not from Colorado. Fossils of the more recent Rocky Mountain Goat, *Oreamnos americanus*, have been found in California, Idaho, Montana, and British Columbia, but no farther south.

Today, however, we have a small fossil that indicates that the Ice Age Rocky Mountain GOAT (*O. harringtoni*) did, indeed exist in Colorado. The fossil from Porcupine Cave, in Park County, Colorado, not only proves the existence of Rocky Mountain GOATs, it indicates that the history of this animal goes back much farther in time than suspected. The Colorado specimen is more than 300,000 years older than any previously known Rocky Mountain GOAT fossil.

Let me tell of the Porcupine Cave Rocky Mountain GOAT by posing and answering some common questions about the specimen that represents it.

What is the specimen? The only known evidence of the Colorado Ice Age Rocky Mountain Goat is a single specimen, a portion of the inside of one horn. The length of the somewhat conical horn core is about 1-3/4 inches; just long enough to be identified as a skull fragment that once fit beneath the black outer covering on the horn of an Ice Age Rocky Mountain Goat.



**Drawing shows opposite sides of the horn core fragment that indicates the presence of the Ice Age Rocky Mountain Goat in Colorado over 350,000 years ago. Drawing by P. J. Kremer.**

Who found the fossil specimen? We do not know who originally found the specimen, because nobody paid much attention to it for years. The specimen was collected several years ago by paleontologists from the Carnegie Museum of Natural History in Pittsburgh, Pa., who were working in Porcupine Cave. Little attention was paid to the nondescript piece of bone, as it was moved from Pittsburgh to Berkeley, Calif., then on to Bozeman, Mont.

It was in Bozeman that fellow paleontologist Don Rasmussen and I picked it up and wondered what it was. We agreed that it was probably a piece of horn or antler, and brought it back to the Denver Museum of Natural History for further study.

How do we know that the specimen is from a Rocky Mountain Goat? Once the specimen was cleaned up a bit, I asked an expert on Pleistocene Rocky Mountain Goats to look at it. Jim Mead, then chairman of the Geology Department of Northern Arizona University in Flagstaff, Ariz., had been researching Ice Age Rocky Mountain Goats since the early 1980s. He immediately thought our fossil was a piece of horn core from *O. harringtoni*. To make a positive identification, Jim and I measured the specimen carefully, and compared its size and overall characteristics with every other animal that it could possibly represent. We included the possibility that it could represent a previously unknown animal, an animal new to science.

Our specimen is significantly non-circular in cross section. Its surface is relatively smooth and straight, with no deep longitudinal grooves or ridges. Also, the horn core shows no spiral twisting or bending. These characteristics indicate that it cannot belong to a sheep (greatly flattened in cross section) or a goat (angular in cross section). It is also excluded from a number of other specimens known from fossil evidence. It compares most favorably with known specimens of *O. harringtoni*.

How did the specimen get into the back reaches of Porcupine Cave? We cannot be positively sure at this time, but it probably was carried into the cave by moving water or by a carnivore. There are plenty of carnivore fossils from the cave, even evidence of cheetahs. Once inside the cave, the specimen could have been carried even farther into the cave by water or by pack rats. These rodents carry material long distances into modern caves and their fossils are known from Porcupine Cave.

Did the Ice Age Rocky Mountain Goat live in a cold climate? We are still trying to learn this. We do know that Porcupine Cave sediments reveal a record of chang-

**See GOAT, page 5**

# Goat more than 350,000 years old

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ing climates, probably ice ages and the warmer periods that separated them. Where the Colorado Ice Age Rocky Mountain Goat fits exactly into this climate record is a goal of our ongoing research. The elevation of the cave during the ice ages was similar to the elevation today, about 9,500 feet above sea level.

How do we know how old the specimen is? So far, we have used two techniques to date the material from Porcupine Cave. The first is biostratigraphy ("study of life through rock layers"). In this technique, we identify animals that are known to have lived during a specific period of time. In Porcupine Cave, we use voles — small, mice-like rodents. We can identify the vole species and then relate them to their known times of existence elsewhere. According to this method, the Colorado Ice Age Rocky Mountain Goat lived in South Park between 365,000 and 487,000 years ago. The time span represented by fossils from Porcupine Cave is from about 350,000 years to at least 1.2 million years, perhaps even longer ago.

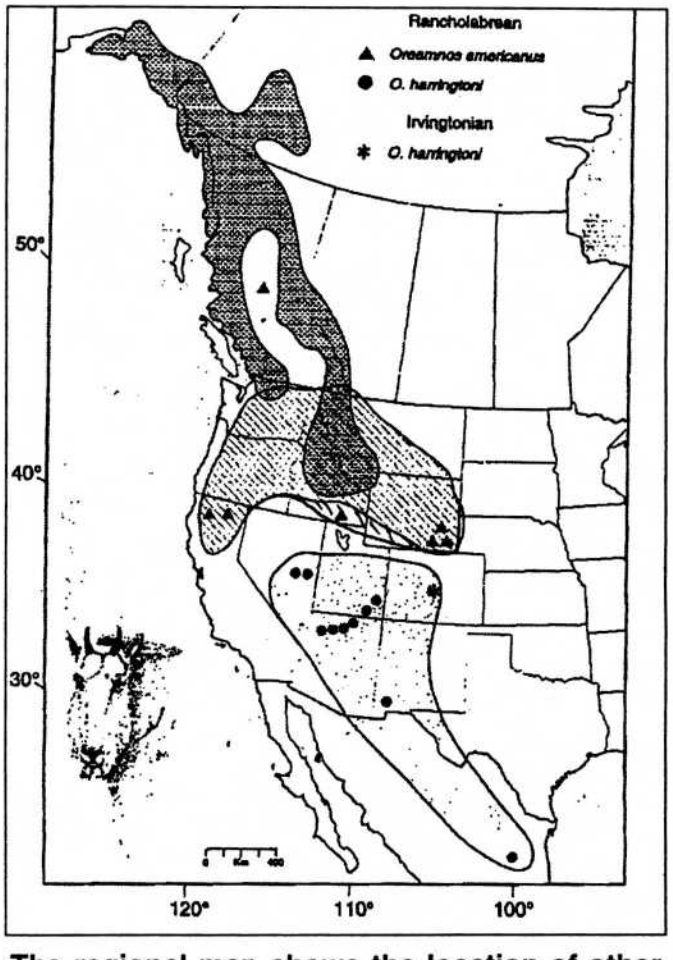
The second technique of dating we use is paleomagnetism. Geophysicists have demonstrated that the Earth's magnetic poles occasionally reverse. That is, the north magnetic pole becomes the south magnetic pole, and vice-versa. The last reversal occurred 780,000 years ago.

The sediments in Porcupine Cave record this most recent reversal, indicating that some of the rocks are younger than 780,000 years old and others are older. The *O. harringtoni* horn core from Porcupine Cave was found in sediment above the reversal, indicating that it is younger than 780,000 years old, as indicated by the biostratigraphy.

Where is Porcupine Cave, and what is its history? Porcupine Cave lies on a ridge in South Park. It is on private land, and the owner has graciously allowed paleontological work to continue on his ranch. All specimens now collected are stored in the Denver Museum of Natural History.

The cave was formed sometime around 60-70 million years ago, when the ridge was pushed upward and exposed to the elements. Water began to dissolve some of the dolomite rock in the ridge. The rock that was dissolved to form Porcupine Cave is the Manitou Dolomite, the same rock in which Cave of the Winds is formed. The dolomite represents material deposited in a sea about 480 million years ago.

The cave was open from just over 1 million years ago until 350,000 years ago. During that time, the animals that lived in the area, or portions of them, were washed, carried, or walked into the cave. Many of them died there, to become the fossils we now collect and study.




**The regional map shows the location of other Rocky Mountain Goat fossils.**

The cave remained closed until the late 1800s, when miners dug their way into it. The scientific significance of the cave was discovered in 1982 by Larry Rasmussen, who discovered some bones when he was caving. Those bones belonged to a fossil horse, and struck the curiosity of Don Rasmussen, the first paleontologist to collect at Porcupine Cave. It was Don and I who brought the specimen to Colorado to ultimately be identified as the only fossil Rocky Mountain Goat from Colorado and the oldest Rocky Mountain Goat fossil yet known.

*This article presents material from a technical paper currently in press. The paper by Jim Mead and Lou Taylor is part of a book being published by the Tokyo National Museum, Japan. Copies of the paper will be made available to the International Order of Rocky Mountain Goats.*