

AN ANCIENT ROCKY MOUNTAIN CAVER

CYNDI J. MOSCH

Department of Geological Sciences, New Mexico State University, Las Cruces, NM 88003 USA

PATTY JO WATSON

Department of Anthropology, Washington University, St. Louis, MO 63130-4899 USA

Approximately 8000 years ago, a man in his early 40s entered a small cave at an altitude above 3000 m in the Southern Rocky Mountains. He died there of a cause or causes unknown. His physical remains were found in 1988 by three NSS cavers, who contacted appropriate federal authorities, Native American representatives, and academic and privately based researchers. In this paper we describe and discuss preliminary results of the Hourglass Cave study.

High in the southern Rocky Mountains, a man in his early 40s died ca. 8000 years ago in a small cave. His skeletal remains were discovered in 1988 by three cave explorers. Realizing the implications of their discovery, the explorers initiated contacts to form a research team to study the site. Our team has spent many hours discussing the possible motivations and circumstances bringing the man into the place where his life ended. The simple truth is that we do not know now—and we will perhaps never be certain of knowing—what brought him to the vicinity or why he entered the cave or how he came to die there. We have, however, been able to draw some strong inferences about details concerning the microenvironment where he died, and about the taphonomic processes that contributed to the condition of his remains as found in 1988. We also offer alternative interpretations about why he went into the cave, and about his last hours there.

DISCOVERY OF THE SITE AND DEVELOPMENT OF THE RESEARCH TEAM

After finding the cave, which they named “Hourglass,” on July 31, 1988, the discoverers (C. Mosch, T. Shirrell, and R. Wolfert) initiated exploration, survey, and inventory. They noted the prolific occurrence of organic influx and animal bones on the passage floors and ledges. A week later, while exploring what by all appearances seemed to be a previously untraveled passage, they were startled to find human bones. Because no obvious traces of this or any other person’s previous travel through the cave were evident, they suspected that the bones could prove to be very old. They contacted Patty Jo Watson, knowing of her experience in cave archaeology and her familiarity with the nature and sensitivity of cave environments. She visited the cave in August 1989 with a colleague, Charles Hildebolt, a physical anthropologist and a caver. After examining the site (Fig. 1), they agreed with the initial assessment by the discoverers that the bones probably predated the modern era. Because the cave was on USDA Forest Service land, the group then contacted the regional office. The regional archeologist, Leslie Wildesen, directed the group to the for-

est archeologist, Bill Kight, and the research was formally initiated. An Accelerator Mass Spectrometer (AMS) radiocarbon date of 8170 ± 100 BP (Beta 38554/ETH 6765; this is the conventional, uncalibrated 14 C age) from a single rib of the human skeleton established the antiquity of the remains. Two more AMS dates have been obtained by the NSF-Arizona AMS Facility at the University of Arizona, Tucson, on bone from the tibia (two determinations for the same sample, AA11808): 7714 ± 77 BP and 7944 ± 84 BP.

Due to the nature of the discovery and its setting, a special management/study team of diverse specialists was organized to integrate research findings concerning the whole of the cave’s resources. The team members also share strong interests in preserving, conserving, and managing the cave’s resources, and all were involved in preparing a site management plan. Detailed investigation of the cave’s archeological and anthropological aspects has greatly stimulated study of the paleontology, geology, and biota. Dialogue between people of differing viewpoints and expertise has resulted from this close working relationship, greatly enhancing the team’s collective

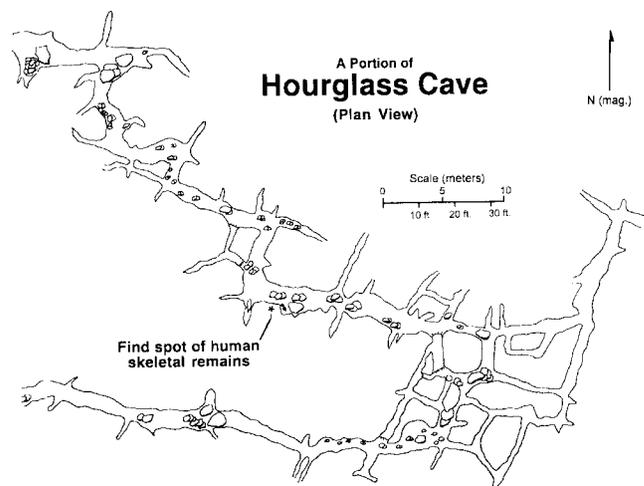


Figure 1.

knowledge concerning the cave and the remains of the special individual found within it.

THE MAN FROM THE CAVE: PRELIMINARY RESEARCH RESULTS

The physical remains thus far recovered and studied include:

- Skull cap (calvarium with portions of the frontal, parietal, temporal, sphenoid, and occipal bones)
- Right humerus
- Right and left femora
- Right first and seventh ribs
- Seventh cervical vertebra
- Right and left tibial shafts
- Fragments of the right and left pelves
- Eleven teeth

Morphological details of the pelves indicate clearly that the individual was a male. Other morphological and histological traits of the bones and teeth suggest an age between 35 and 45 years, probably closer to 40. He was 162.5 cm (approximately 5 feet 5 inches) tall, with no skeletal signs of poor health or poor nutrition.

Most of the bones show gnawing marks—some quite extensive—left by small animals (probably mostly packrats and porcupines), which frequented the cave in the long period between the man's death and the discovery of his skeletal remains. The bones were also dispersed by these animals, and many skeletal elements seem to be completely missing (e.g., the face, the left arm, the left part of the rib cage, the lower part of the right arm). The bones that remain, however, are mineralized and well preserved, as are the teeth. The cortical bone of the tibiae (the outer layers of both shinbones) are abnormally thick as if perhaps he had hiked and climbed in the mountains a great deal. He also had the beginnings of an arthritic condition in his neck, perhaps from habitually carrying heavy loads on his head and upper back and/or shoulders. In addition, a sclerotic (abnormally hard and dense) condition of the bone is evident in his right hip and leg (pelvis, femur, tibia), but not in the right humerus. The forensic radiologist's initial suggestion was that this condition may have been an unusual, if not unique, pathology that developed during life. After detailed discussion, however, we think that this may be a post-mortem phenomenon. If so, then it might have resulted because the body was lying on its right side in water and mud for some unknown, but presumably rather long period after death, before the bones were scattered.

Preliminary examination of the 11 teeth indicated that eight are from the lower jaw and three are from the upper. All 11 have been heavily and distinctively worn in a manner suggesting to the analyst that the individual was right-handed. People tend to put food or other objects into their mouths on the side of the dominant hand, using that hand. The Hourglass dentition shows heavier wear on the right teeth than on the few left

teeth. The wear is smooth, however, and the teeth are not chipped; this person apparently habitually ate grit-free food. The dental anthropologist does not know exactly what caused the wear that is so clearly evident on the ancient teeth, but suggests that the causal activity involved repeatedly pulling smooth but substantial material, such as hide or sinew, over the anterior dentition.

The team's DNA analyst reported that there is well-preserved DNA in the bone (a small sample from the left tibia), which seems to be original rather than a result of recent contamination, and which shows a 9 base-pair deletion condition. This is the oldest example yet known of this genetic characteristic in North America. Such a condition is lacking in northern Athabaskan populations (several American Indian groups in western Canada), but is present in some populations in regions south of the Canadian border. Details of the DNA work are now in press (Stone & Stoneking, 1996).

In late July, 1993, at a pre-arranged time and place, the physical remains of the Hourglass Cave individual were conveyed by the technical research team to Forest Service representatives who, in turn, gave them to the Native American Cultural Heritage representative, Kenny Frost, of the Southern Ute tribe. Although the bones and teeth are no longer in the public or scientific domain, extensive documentation, including casts, was undertaken.

Suggestions about who this man was, what he was doing at this mountain locale, why he entered the cave, and how he came to die there require initial reference to the geological and geomorphologic setting for the site.

THE SITE AND ITS SETTING

Hourglass Cave is on the western slope of the continental drainage divide within the Southern Rocky Mountain physiographic province. Situated close to the transition between the sub-alpine and the alpine zones, the site vicinity is snow covered between seven to eight months of the year. Both sub-alpine and alpine species have been noted in the site vicinity.

The range of ages for nearby geologic units is extreme, from Precambrian to Quaternary. The local Paleozoic strata (Leadville, Molas, Dyer, and Minturn Formations) are of significant interest because they could have been sources for knappable chert nodules and vein fillings. Black (1986: 172-174) notes that these units have supplied usable toolstone in the northern Sawatch Range. A prominently situated outcrop of silicified dolomite 2.5 km from the site contains siliceous vein fillings and a sizable (1 x 2.5 m) deposit of chert.

The local base level drainage is currently 650 m below the site, although intermittent springs and seeps do occur in the vicinity. Local topography consists of resistant beds that crop out as bluffs and cliffs between slopes of less resistant bedding. A thin soil (1-1.5 m) covers slopes over less resistant units. According to the team geomorphologist, solifluction features are evident in the vicinity, but the process has probably not dismantled slopes so effectively that significant karstic features

(such as collapse sinks or additional cave entrances) have been masked in the past 8000 years. This, and his observation that no significant talus has accumulated below the entrance outcrop, suggests that the general surface topography at the cave entrance is much the same as it was ca. 8000 BP. The team stratigrapher does note, however, that some blocks of rock may have collapsed more recently along the margin of the outcrop in which the cave entrance is located. About 2 m from the cave entrance, resistant beds roof a low overhang (less than 1 m in height), which shelters an area of approximately 6 m squared. Beneath this overhang are blocks of rock that have fallen from the roof overhead. They are not well weathered or indurated, and fresh exfoliation scars can be seen on the overhang. If these blocks have indeed fallen relatively recently, then the area sheltered may have been more extensive at the time when the ancient man visited the site than is now the case.

The cave is situated within beds of a lenticular, highly dolomitized limestone. Passage morphology and orientation in Hourglass Cave reflect strong structural control. Passages are primarily solutional along joints and bedding interstices with some vadose modification. The passages are narrow and change direction abruptly, with sharply angular turns that follow the strongly orthogonal joint pattern. The cave is maze-like, with numerous narrow side passages of limited length that terminate as upwardly pinching, mud-filled infeeders.

THE ANCIENT CAVER'S LAST HOURS

Because the processes (other than occasional rock fall) that have most rapidly changed the geometry of the cave passage have been rendered effectively inactive with the drop of the base level water table long ago, negotiating passages today is probably very similar to the ancient man's maneuvers as he moved through the cave.

Entering the cave almost immediately requires one to crawl, first on hands and knees, and then prone, body flattened completely into the animal-midden covered floor. It is 18 m before there is sufficient clearance to stand upright. Before being able to stand, one must squeeze through a constricted, sharp angled turn, out of the entry room into the complete darkness of a low, descending, clay-floored passage of barely body width. The cave temperature is noticeably cold (4-5°C), and the humidity is high.

The first hint that this route might have been followed by an early explorer is found approximately 33 m into the cave. At that point, charcoal fragments are visible on the damp clay floor. Seven meters farther along the passageway, charcoal marks on the walls occur above charcoal fragments on the floor. The wall marks may be smudges from light sources carried on one or more prehistoric trips.

In April 1995, we obtained radiocarbon determinations on two of these charcoal fragments: 1960 ±80 BP (Beta-81202) and 2330 ±50 BP (Beta-81202/CAMS-19328). Clearly, these charcoal fragments are younger than the trip made by the Hourglass Cave man, and must represent a later prehistoric

journey into the cave, or perhaps simply transport of two thousand year-old charcoal by animals and/or hydrologic factors (see discussion below). We think the wall smudges are indeed torch marks, but do not know yet whether they were left by the Hourglass Cave man or by some later prehistoric visitor. We are awaiting results of AMS dates on samples of the smudges, and also plan to obtain more determinations on charcoal fragments from deeper inside the cave.

At least 58 such smudge marks have been noted between the entrance and the locale where the Hourglass Cave man was found (some 300 m from the entrance). The marks are distributed along 280 m of passageway, and the 58 sites include 122 individual smudges. At 12 sites, marks occur in clusters ranging from two to eight smudges. At seven of the sites, marks on the wall are associated with charcoal fragments on the floor below. Approximately 20 occurrences of charcoal fragments on the floor have been noted between 33 m and 357 m from the entrance. The marks and charcoal fragments are not evenly distributed between the points where they are first and last observed. Most of the marks are found along the main passageway 40 m in from the cave entrance and in a narrow side fissure that branches from the main passage at 164 m from the entrance. Small fragments of charcoal are scattered intermittently on the cave floor along this entire route.

If the smudge marks and charcoal fragments are a result of natural processes (e.g., if charcoal were washed in after brush fires or forest fires), then the distribution of occurrences should be greater near avenues of influx (such as infeeders, or the entrance), and smudge marks should occur on wall surfaces below points of influx. The cascade of influx would be expected to accumulate on upward-facing surfaces (and not within sheltered recesses) over a wide range of heights above the floor. Overall, the occurrences do not fit the natural influx mode. At a distance of 41 m from the entrance, for example, an individual mark (15 mm x 9 mm) is situated well within a wall scallop cup, inaccessible to influx from above. The majority of infeeders observed along the main cave passage do not contain charcoal fragments. Median height from the floor of the 122 marks is 1.5 m (4 feet 11 inches), the highest is found at 2.9 m and the lowest at 0.46 m.

Both the lowest and the highest of the possible smudge marks were found in the fissure that branches from the main passageway 164 m into the cave. Entry into this fissure is accomplished by crawling on one's side for about two body lengths across a rocky, mud-covered floor. The ceiling rises abruptly to a maximum of 4 m, although the fissure remains not much wider than one's body. The low marks correspond to crawlway-sized passage, whereas the highest of the marks are situated in a part of the fissure that is accessible only by chimneying. This side fissure is a dead end passageway, so one must backtrack through it to regain the main passage.

The farthest extent from the entrance that charcoal fragments have been found is 357 m. If the charcoal traces correspond to the path the prehistoric man traveled, then he may have explored the cave at least 36 m beyond where his skeletal

remains were found. Except for a climb over a nearly 2 m high boulder, requiring two free hands to ascend or descend safely, this 36 m stretch is a moderately spacious walking corridor.

At the site where the bones were found, a large collapse-block is pendant in the passage above, wedged between the two walls, forming the most conspicuous low point of the otherwise high-clearance passage. Numerous large, breakdown rocks form collapse rubble on the floor at this point. A recent survey of the area directly above this point revealed a number of still precariously balanced rocks that could easily be tipped to fall to the floor.

Much of the passage between the entrance and the site where the bones lay cannot be traversed by simply walking upright. Hands and knees crawling, climbing under and over large fallen boulders (over 1 m high), and twisting one's body to fit through awkward, narrow squeezes in sinuous passages are all required to navigate the route. Determining the best route through the maze-like area near which the early explorer was found is quite difficult. Adding to those challenges are the additional hazards of unstable floor and ceiling rock, slippery wet and muddy surfaces, and low temperature. This ancient caver must have been agile and strong, as well as driven by an intense sense of purpose—or of curiosity—to have gone where he did, especially if he were alone.

COMPARATIVE ARCHEOLOGY

In a recent summary, Steele and Powell (1993) note that osteological remains of the first humans to enter the Americas are very few, totalling no more than some 21 fragmentary individuals. Although the Hourglass Cave remains are a little younger than most of the skeletal finds they list, he and the newly-dated 9400 year old man from Spirit Cave, Nevada (Kirner et al., 1996; see also Goldberg, 1996) can be added to Steele and Powell's series (1993: Table 1: 140). Besides the Hourglass Cave man, the only other discovery within Colorado is a burial from Gordon Creek in the north central part of the state (Breternitz et al., 1971). The burial—seemingly an isolated occurrence with no associated occupational deposit—was found in the bank of an arroyo tributary to Gordon Creek at an altitude of 6850 feet (2110 m). Two dates were derived from the left ilium: one on collagen (9700 ± 250 radiocarbon years BP) and one on carbonate (3540 ± 130 BP). The lab rejected the carbonate date on the grounds that interaction between the ground water and the bone carbonate had probably taken place post-depositionally, resulting in an erroneous determination (Breternitz et al., 1971: 172). The collagen date was accepted.

The bones are fragmentary, but portions of the entire skeleton are present, including skull with face. The individual is a female, 25 to 30 years of age. She had been laid to rest in a 1.0 m-deep by 0.75 m-wide pit, liberally sprinkled with red ochre and accompanied by nine lithic and six bone artifacts. The Gordon Creek woman was shorter (4 feet 10 or 11 inches; 145-148 cm) and more lightly built than the man of Hourglass Cave

("the length and overall size of the bones is small," Breternitz et al. 1971: 174), but her muscular processes were well developed.

James Benedict (1992) provides a summary of early prehistoric sites at altitudes above 3000 m in the Front Range of the Rockies. After reviewing Husted's earlier syntheses (1965, 1974), Benedict adds information from three sites excavated in the late 1960s and early 1970s: 5BL70, 5GA22 (the Caribou Lake site), and 5BAL120 (the Fourth of July site). Archeological materials from those sites date to periods ranging from 8460 ± 140 radiocarbon years b.p. at the Caribou Lake site, to 7650 ± 190 BP at 5 BL70, to 6045 ± 120 BP and 5880 ± 120 BP at the Fourth of July site. The average of the two determinations for the latter site— 5960 ± 85 BP—is accepted by Benedict as the best approximation of site age.

Benedict suggests that these Late Paleoindian to Early Archaic locales represent camp sites of hunting and gathering parties, or of groups simply in transit through the mountains. He believes two contemporary, but culturally distinct, populations were using the Front Range at the indicated time. One such group ranged widely from the High Plains to the Front Range, while the other had stronger ties to the mountains, was more insular, and seldom moved east of the Front Range. Both groups knew and used the timberline and alpine tundra portions of the Eastern Rockies, however.

Kevin Black (1991) has recently published a detailed consideration of high-altitude archaeology in the Colorado Rockies in which he comes to conclusions that differ somewhat from Benedict's. Black thinks that by 9000/8000 BP (and possibly as early as 10,000 BP), there were human groups who lived in the mountains all year around, participating in a Mountain Tradition that was distinct from Plains and Great Basin cultural developments. Black believes the postulated Mountain Tradition originally derived from the Great Basin, however; thus his interpretation differs from George Frison's account of Late Paleoindian foothill-mountain groups (e.g., Frison, 1992). The part of Black's formulation that is especially interesting in connection with the Hourglass site is his discussion of diverse mountain subsistence resources (including plants); seasonal transhumance in the foothills, montane, subalpine, and alpine zones; and overwintering in the warmer, drier mountain and foothill valleys.

The most recent contributor to relevant archeological research is Bonnie Pitblado of the University of Arizona, who is carrying out dissertation field work at the Caribou Lake site (5GA22) referred to above (Pitblado, 1996). Her work has just begun (a 2-week field season was completed in August 1995 with another season proposed for August 1996), and we await with considerable anticipation new ^{14}C determinations and further information on the late Paleoindian/Early Archaic occupation of this high-altitude site (11,300 feet; ca. 3400 m) in the Rocky Mountains.

Finally, we note that Gunnerson (1987: 133) describes long, dry-laid rock walls—well above timberline—of the Early Archaic Mount Albion Complex as game drive sites; and that

Benedict (1992: 353) refers to game-drive installations at 5BL70 ("a U-shaped drift fence" incorporating a series of rock cairns). Frison et al. (1986), in describing a prehistoric net from the Absaroka Mountains in Wyoming, discuss the systematic hunting of deer and/or mountain sheep with the aid of nets, fences, pens, and corrals. The net was found in a small cave on Sheep Mountain (approximate altitude 2400 m), and dates to 8860 ±170 radiocarbon years BP.

Possible game drive installations have been noted 2.5 km from Hourglass Cave, but we do not know how old they are or whether they were associated with the man who died in the cave or with his community.

CONCLUSIONS

Based on the radiocarbon determinations, we can assign the man from Hourglass Cave to the late Paleoindian/Early Archaic time period. The closest high altitude comparisons at present are probably with the Caribou Lake site (5GA22) near Arapaho Pass. Some 25 years ago, Benedict (1992: 348-351) found two Paleoindian workshops there, one of which was associated with a hearth radiocarbon dated to 8460 ±140 BP. Pitblado is now carrying out further field work at Caribou Lake to expand the information Benedict made available.

The man in Hourglass Cave may have found the cave while visiting known resources in the vicinity, or while prospecting for new ones on his own behalf or that of his kin group. Such resources could have included lithic outcrops, herbal foods and medicines, or big game such as elk, deer, and mountain sheep. If the man from the cave were a lone hunter-gatherer of high altitude resources who chanced upon the cave opening, then he may have decided to explore the interior, suffered a mishap while inside (e.g., became disoriented and lost, injured himself, lost his light) and died there involuntarily.

Kenny Frost (Cultural Heritage Representative for the Southern Ute Tribe and for our management team) suggests alternatively that the man in the cave went to an important ritual locale, well known to him, to die. Frost believes this man was not simply a hunter and gatherer, but also a wise man or elder of his group who knew about the cave and had used it and other local features for ceremonial purposes. He might have been inside the cave at least part way on more than one previous occasion. Ultimately, he deliberately chose the cave as his final resting place; when he entered it for the last time he fully intended to die there, and did so.

Although each member of the research team has her or his own convictions, the evidence currently available can partially support any one of these scenarios. Thus, as a group, we do not advance one interpretation over another to explain why this man, who was adapted to the rigors of the high country, chose also to explore the earth's inner realm.

REFERENCES

- Benedict, J.B. (1992). Along the Great Divide: Paleo-Indian Archaeology of the High Colorado Front Range. In Stanford, D.J. and Day, J.S., eds. *Ice Age Hunters of the Rockies*. Denver: Denver Museum of Natural History and University Press of Colorado:343-359.
- Black, K.D. (1986). *Mitigative Archaeological Excavations at Two Sites for the Cottonwood Pass Project, Chaffee and Gunnison Counties, Colorado*. MS on file, National Park Service, Interagency Archeological Services, Denver, CO.
- Black, K.D. (1991). Archaic Continuity in the Colorado Rockies: the Mountain Tradition. *Plains Anthropologist* 36: 1-29.
- Breternitz, D.A., Swedlund, A.C. & Anderson, D.C. (1971). An Early Burial from Gordon Creek, Colorado. *American Antiquity* 36: 170-182.
- Frison, G.C. (1991). The Foothills-Mountains and the Open Plains: the Dichotomy in Paleoindian Subsistence Strategies Between Two Ecosystems. In Stanford, D. & Day, J. eds. *Ice Age Hunters of the Rockies*. Denver: Denver Museum of Natural History, and University Press of Colorado: 323-342.
- Frison, G.C., Andrews, R.L., Adovasio, J.M., Carlisle, R.C. & Edgar, R. (1986). A Late Paleoindian Animal Trapping Net from Northern Wyoming. *American Antiquity* 51: 351-361.
- Goldberg, C. (1996). Oldest Mummy in North America 'Found'. *New York Times*, April 27, 1996: 1, 9.
- Gunnerson, J.H. (1987). *Archaeology of the High Plains*. Cultural Resource Series, No. 19. Denver, CO: Bureau of Land Management, Colorado State Office.
- Husted, W.M. (1965). Early Occupation of the Colorado Front Range. *American Antiquity* 30: 494-498.
- Husted, W.M. (1974). Prehistoric Occupation of the Alpine Zone in the Rocky Mountains. In Ives, J.D. and Barry, R. G. eds. *Arctic and Alpine Environments*. London: Methuen.
- Kirner, D.L., Burky, R., Taylor, R.E., Dansie, A. & Tuohy, D. (1996). AMS Radiocarbon Dates from Spirit Cave, Nevada: Implications for the Early Holocene Occupation of the Western Great Basin. Paper presented at the 61st Annual Meeting of the Society for American Archaeology, New Orleans, LA, April 10-14, 1996.
- Pitblado, B. (1996). The Caribou Lake Site Revisited: Excavations at a High Altitude Late Paleoindian Campsite. Paper presented at the 61st Annual Meeting of the Society for American Archaeology, New Orleans, LA, April 10-14, 1996.
- Stone, A.C. & Stoneking, M. (In press). Genetic Analyses of an 8000 Year-Old Native American Skeleton. *Ancient Biomolecules*.
- Steele, D.G., & Powell, J.F. (1993). Paleobiology of the First Americans. *Evolutionary Anthropology* 2: 138-146.