

Agate Beds Story Reads More Like Agatha Christie

By Jean Matthews

Mystery fans who like their thrillers laced with a dash of the ancient and exotic will find these tastes well served at Agate Fossil Beds National Monument in Nebraska. There, a 20 million year old story of the carnivorous "bear dog" is being unearthed and pieced together by means of modern research effort that spans eight decades.

The scientific Sherlock Holmes in this remarkable unraveling of the ages is played by Dr. Robert M. Hunt, Jr., Department of Geology and State Museum at the University of Nebraska. Dr. Hunt began to suspect in 1977 that he might have found, on Beardog Hill within the park, the location of Carnegie Quarry 3 — discovered in 1905 by O.A. Peterson and then lost again in the mists of intervening time and waning paleontological interest.

The Agate Spring Quarries, as they have been known for 80 years, constitute one of the greatest fossil mammal deposits in North America — a 20 million year old bone bed buried in stream-laid sandstone of Miocene age and exposed in two hills (Carnegie and University) overlooking the Niobrara River valley of northwest Nebraska.

"So abundant are the fossil bones of mammals," Dr. Hunt was written, "that a man could walk on a pavement of bones without touching the sediment in some areas in these quarries."

What constituted the mystery was the significantly atypical distribution of numerous carnivore bones compared to the rare and fragmentary bones of herbivores in one particular site — the site dubbed in 1905 Carnegie Quarry 3. Olaf Peterson of the Carnegie Museum, who discovered the site, had reported it to be in the same Miocene stream channel deposit as the quarries in the main hills, but unfortunately he had left no pictorial or written record of the Quarry's exact location. A photograph published in 1910 indicated it was somewhere on Beardog Hill.

Intrigued by the record of what he considered this unusual aggregation of extinct carnivores, Dr. Hunt applied in 1981 for National Park Service permission to do a preliminary excavation at Beardog Hill. A complete and detailed description of the search — its trials, errors, failures and eventual success, of the logic behind each move, and of the evidential reasons for the moves — can be found in the Winter 1984 issue of the George Wright Society FORUM.

Eventually, after repeated attempts and the reluctant conclusion that "there was little probability of ever locating the exact site," Dr. Hunt adopted a routine procedure of field paleontology — screening the surface soil for bone fragments — that led to discovery of the elusive site.

The first two trenches worked produced nothing of interest, no bone or bone fragments, no sign of earlier digging. The third attempt led to a most amazing result. In Dr. Hunt's own words, this is what took place:

"Upon sieving the soil, carnivore bone fragments appeared on the screens; part of the pelvic bone, a partial arm bone, and the upper part of the shin bone or tibia. These were recognized as bear dog bones, in fact the same species found by Peterson, and the work continued in some excitement. The probability that we had located the quarry was high, for since carnivore bones are scarce in most field settings, bear dog bones of the kind found by Peterson in Quarry 3

were an improbable and thus a strongly confirming find . . .

"When we sieved the surface dirt and recovered the fragmentary bear dog bones we had no thoughts that one of these pieces would match one of the Carnegie bone fragments found in 1905. One of the most exciting moments of the work was Carl Swisher's match of the partial tibia with one of the Carnegie fragments, proving that they were once part of the same bone . . . The two pieces were collected 76 years apart!"

On the third day of the 1981 excavation, two large burrows were discovered, each filled with a fine gray ash-rich sediment that contrasted sharply with white sandstone bedrock intruded by the burrows. When the scientists examined the bedrock below the burrows, to their surprise there appeared a shallow depression similar in shape to pits left by professional paleontologists.

"Immediately, we remembered that Peterson had removed the two nearly complete skeletons of the rare bear dog (which he named *Daphoenodon superbus*) in a single large block of sandstone," Hunt recalled. "If this was the place from which the sandstone block had been collected, the two nearby burrows could explain why the two skeletons had been found together — one an adult female, the other a juvenile male about 6 months to 1 year old. Proof was lacking, but the circumstantial evidence seemed compelling."

The burrows discovery provided the scientist with their first hypothesis for why Quarry 3 had produced so many carnivores. Possibly it had breached an ancient den complex. The professional thoroughness with which the group went ahead to confirm this hunch makes up the rest of the story. The significance of the den complex lies not only in the wealth of extinct Carnivora found there but also in what was learned about the way of life of these animals. In addition to throwing new light on the ability of amphicyonids (bear dogs) to burrow and use dens as long as 20 million years ago, the research confirms that species members of two diverse lineages used the burrows and suggests that many amphicyonids could burrow and use dens upon occasion.

Work on Quarry 3 is continuing, with high probability that more dens will come to light. The hope is to discover the extent of the dens, and thus come to an understanding of their content and manner of filling. The results of these research efforts — the hardwon understanding of the fossils at Agate — are contributing to the overall comprehension of the prehistory of this plains site and to the larger picture of the evolution of life on Earth.

An article on "Miocene Burrows of Extinct Bear Dogs: Indication of Early Denning Behavior of Large Mammalian Carnivores," by Dr. Hunt, Jr., Xue Xiang-Xu, and Joshua Kaufman appeared in the July 22, 1983 issue of Science, pp. 364-6.

PLAN MAP of early Miocene carnivore dens, Quarry 3, Agate Beds National Monument. Stipple pattern indicates Miocene burrow fill that also surrounds beardog skeletons. Dens I and III contained the beardog *Daphoenodon*; Den II produced a rare temnycyonine beardog. Excavation grid is in square meters.

