

Researcher unravels century-old woolly tale to find truth behind massive bones

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Animals go extinct, places too. And stories change. Boaz, a small village in Richland County, Wis., has only 156 people these days. There are a half-dozen streets, a couple of taverns, a small park with a baseball diamond and, on the outskirts, a historic marker describing the village's lone claim to fame: "the Boaz Mastodon."

The story on the marker is the one that's been told to schoolchildren for almost a century as they stare up at the mastodon skeleton, enshrined in the University of Wisconsin-Madison Geology Museum.

It is a story that, until now, has endured largely unchanged:

One July day in 1897, after heavy rains, four young farm boys, Chris, Harry, Clyde and Verne Dosch, went out to examine a floodgate on the family farm and found a large bone sticking out of a muddy bank on a tributary of Mill Creek. Soon they found another bone and another and another. The bones were later identified as those of an extinct American mastodon, a 9-foot-tall, 8-ton, hairy relation of the modern elephant. A quartzite spear point was found nearby, suggesting that early residents of Wisconsin had hunted and perhaps even killed the mastodon.

The Dosch boys initially showed their find to the mailman, before hiding the bones away in the farm's milkhouse. Their attempt to keep the discovery quiet failed, however, as the mailman spread the news to just about everybody on his route. The bones were later sold to the State of Wisconsin and displayed in the UW [museum](#) as the Boaz Mastodon.

Unmentioned in the story of the mastodon was the role played by an even smaller place called Anderson Mills, about 30 miles southwest of Boaz. The tiny hamlet, named for John Anderson's mill, no longer appears on any maps or anywhere on the Internet beyond the occasional obituary or ancestry search. No historical marker stands to signify there ever was such a place.

Recently, however, the stories of Boaz and Anderson Mills have become intertwined, threads in a geological investigation pursued in secret over the last two years by Carrie Eaton, curator of collections for the museum. The investigation took Eaton, 35, deep into the university's archives to old Board of Regents minutes, departmental letters and the field notebooks of a long-dead geologist. The search also came to include tools of modern science: DNA sequencing and radiocarbon dating.

In the course of those two years, Eaton thought often of the Dosch boys and their descendants, and it sensitized her to the implications of what she found.

"There's a family out there," she said, "that's been very connected to these bones for a very long time."

On a recent morning in May, Eaton rose from her desk and pointed to a massive, fossilized left femur, 48 { pounds, polished dark chestnut.

"This is where it all started," she said, "with this bone. And the sweater just unraveled the more I pulled on it."

The unraveling began in 2013. Eaton had just returned from maternity leave. She was excited to be back at work because, in just two years, the museum would be celebrating the centenary of its signature exhibit. The bones of the Boaz Mastodon were assembled and put on display in 1915.

Eaton wanted to learn everything about them, how much they cost the state, when they came to the museum, how they were assembled.

Almost immediately, threads in the official story began to come loose.

In the University of Wisconsin archives, Eaton discovered a curious letter written a year after the university purchased the Boaz bones for \$50 (a considerable sum at a time when a cast-iron stove cost about \$20). The letter, dated July 29, 1898, explained that a state official named Ernest R. Buckley had been dispatched to an area near Fennimore where heavy rains had revealed the bones of a second mastodon. The new mastodon had been found by young Harry Anderson in the hamlet of Anderson Mills.

When Buckley went to investigate the Anderson Mills discovery, he was 25 years old, an assistant geologist for the state Geological and Natural History Survey. Reading further into the letter, Eaton learned that Buckley had paid \$75 for the bones and the digging rights at the new site, because the chairman of the geology department "was desirous of obtaining mastodon bones with the design of accumulating enough to make a complete skeleton."

Eaton stopped. Hadn't the department acquired a skeleton from Boaz a year earlier?

Museum staff had always known that the skeleton contained some plaster replicas to fill gaps where bones were missing or incomplete. Now Eaton wondered if the skeleton in the museum might be a composite, the remains of more than one mastodon from more than one place. That question led her to the skeleton's fossilized femur, which had a fracture. Eaton realized that she'd seen that same fracture pattern in an old photograph.

But that photo was of the bones from Anderson Mills.

Eaton examined the fracture in the photo and the one on the bone in front of her. They matched.

Her curiosity deepened.

Eaton had grown up outside Chicago under the spell of the bones she saw at the city's famous Field Museum. From the age of 4, whenever her mother ventured into the backyard to garden, she followed, digging up rocks, collecting them in a bucket, always hoping to find something.

At the University of Iowa, Eaton studied geology and fell in love with the Quarternary Period, the most recent 2.6 million years on Earth. It was a time marked by ice ages, the rise of mammoths, bison and giant ground sloths, and eventually the appearance of modern humans.

After college, Eaton worked a year for the National Park Service at Carlsbad Caverns in New Mexico. She then earned her master's degree from UW and, in 2009, became the museum's curator/collections manager.

As Eaton looked deeper into the story of the Boaz Mastodon, more loose threads appeared. Newspaper accounts differed on a basic fact: precisely what had been discovered in Boaz.

Under the headline "A Rare Find," The Richland Center Republic-Observer of July 15, 1897, declared that the skeleton of a mastodon had been unearthed by storms. A day later, however, The Viola Intelligencer wrote, "What appears unmistakably to be parts of the skeleton of some prehistoric mammoth were unearthed on the farm of John Dosch."

More than a week later, Ernest Buckley, the assistant geologist, told the

Milwaukee Sentinel that although the bones had first been thought to be those of a mastodon, further examination showed them to be those of a mammoth.

Mammoths and mastodons diverged from a common ancestor. Both went extinct in North America at the end of the Pleistocene Epoch about 11,700 years ago; an isolated colony of mammoths survived on Wrangel Island in the Arctic Ocean until about 4,000 years ago. Eaton knew distinguishing certain bones of a mammoth and mastodon, "can be notoriously difficult."

The mammoth has a high peaked forehead; its tusks are longer and more curved than those of the mastodon. But the clearest difference between the two is in the teeth. The mastodon's teeth have cone-shaped cusps suitable for munching through twigs and leaves. Mammoth teeth are flat-topped and serve as a grinding stone for grazing. There is no evidence the Boaz site yielded any teeth.

The question Eaton's research raised was not trivial: Had the museum mislabeled its signature exhibit for the last century? Perhaps the Boaz Mastodon was neither a mastodon, nor from Boaz alone.

Eaton searched for Buckley's original field notebooks. Buckley had gone on to become assistant superintendent of geology in 1899, before moving to Missouri where he was appointed state geologist in 1901. He died of pneumonia at the age of 39, three years before the UW Geology Museum would display the bones he'd acquired, whatever they were.

Eaton tracked down Buckley's century-old notebooks, preserved in a series of steel file drawers at the Wisconsin Geological and Natural History Survey. She read dozens of the notebooks, but found no reference to the bones from Boaz.

She was ready to give up when she checked one last drawer and found a lone notebook labeled "Buckley, Observations to be made on quarries. Cautions to be observed." As she walked over to a desk, she flipped through the pages and suddenly, there it was, tucked between entries on quarries and building stones, Buckley's notes from Boaz.

At the top of the page, he had written mastodon, then crossed it out and scribbled mammoth.

"I literally froze in place," Eaton recalled. "The word mammoth just jumped off the page."

The museum had long intended to have the bones radiocarbon-dated to determine their age. Now Eaton knew they would need to sequence DNA from the bones to determine once and for all whether the Boaz remains were those of a mammoth or a mastodon.

Buckley's notebook from Boaz helped explain why he was sent to Anderson Mills a year later. His inventory revealed that only about 30 bones, many of them fragments, had been recovered in Boaz - far short of the more than 300 bones in a mastodon.

At Anderson Mills, about 60 bones were unearthed, and they were in better condition than the ones from Boaz. An old photograph showed Buckley in a vest and bow tie at the Anderson Mills site along with the rail workers and farmers he'd persuaded to help with the excavation.

During the spring of 2014, Eaton took several bones to the imaging center at the Wisconsin Institutes for Medical Research to get CT scans. The scans would allow researchers for the first time to see how the bones were augmented with plaster to reconstruct missing portions. They would also allow her to check for hidden fractures, so that she could select safe places to remove cores for DNA and radiocarbon analysis. The last thing

she wanted to do was drill into the wrong section of bone and damage the exhibit.

The first scans brought another surprise.

"Whoa, what's this?" Eaton remembers saying as she looked at a ghostly, hairlike image inside the bone. It was a thin metal wire inserted to hold a reconstructed portion in place. Although she'd seen the plaster reconstruction from the outside, she'd never known how it was all held together.

The long twisted metal wires told the story of how Eaton's predecessors had put together their prize exhibit.

The radiocarbon dating and DNA work were done later, with the last DNA results returning early in 2015. The samples from the bones went to Hendrik Poinar, a professor at McMaster University in Canada, considered a guru in the study of ancient DNA. Ancient [bone](#) samples don't preserve a full complement of an animal's genetic script but often contain fragments of the script that can be compared with known mastodon and mammoth genomes.

Poinar's team sequenced DNA fragments from the mitochondria, the powerhouses that generate a cell's energy. The results from McMaster settled the species question.

The bones from both Boaz and Anderson Mills came from mastodons. The Boaz Mastodon was indeed a mastodon.

The first left rib and right tibia are the only bones they can attribute to the Boaz mastodon find at this time.

But was it from Boaz?

Eaton's research largely put the matter to rest: The majority of the bones in the museum's display came from Anderson Mills. At this time, only the right tibia and left first rib can be confidently attributed to the Boaz trove.

Radiocarbon dating resolved another question. The bones from Anderson Mills were more ancient - 12,900 years old compared with 12,100 for the Boaz bones.

Not all of Eaton's questions could be answered. As she examined the evidence, she could not help thinking of Ernest Buckley, the young geologist who had been to Boaz and Anderson Mills to buy the bones. In Boaz, he had written mastodon, then crossed it out.

"I spent a lot of time wondering and thinking about why Buckley would have put mammoth," she said.

Perhaps it had to do with his background. Buckley was a bedrock geologist, more familiar with types of rocks than with species of animals. Whatever the reason for the mistake, mammoth never slipped into the official story. When Eaton checked the museum's acquisition records she found the purchase of the Boaz bones in a ledger in January 1898, described simply as mastodon.

In the 1930s, the museum's curator created a card catalog system for all acquisitions. He, too, labeled the skeleton a mastodon.

In May, the North-Central Section of the Geological Society of America held its 49th annual meeting in Madison, and after two years of keeping her research quiet, Eaton announced her findings.

"I will be talking today about a new, old mastodon," she began.

Step by step she took a small, but rapt audience of 50 people through her investigation.

"We're changing the narrative," she said at the end of her 20 minutes.
"We're preparing a new exhibit to share with the public."

The new narrative will include both Boaz and Anderson Mills.

The four Dosch boys are long dead, but over the years some of their descendants have driven to Madison to see the skeleton that made the family famous. Today, it's the grandchildren, some of whom still live near Boaz, who carry that legacy.

"I went out to see it once," said Gail Dosch, the 79-year-old grandson of Harry Dosch. "You go down and stand by it and see the size of the bones. It was quite a thing to be able to see it and to know that your grandfather was one of them that found it."

He said that whenever he drives by the historical marker, he thinks about his family's role in this small chapter of history.

"I suppose it meant quite a bit," said Dennis Dosch, 65, describing the bones his grandfather, Verne Dosch, helped find.

He admitted that while his father used to go see the skeleton, "I never have."

Eaton said she has searched hard, but has not turned up any living relatives of Harry Anderson, though there may be some. The task is a challenge given that Anderson Mills is gone and has largely passed from memory.

Bernadine Freymiller is one of the few who recall the little community,

which sat on a narrow-gauge line of the Chicago and North Western railway. Raised on her family's farm in Woodman, Freymiller attended the small country school a mile or two away in Anderson Mills. The school went up to eighth grade and seldom had more than 20 children in the whole building.

Freymiller, 91 now, has no memory of folks ever talking about the mastodon bones found in 1898. But the area did get a lot of rain in the spring, which made it a good place to find fossils.

"After a flood my dad found a mastodon tooth," Freymiller said. "I just remember the big tooth and how I would go get it and show it to people."

She was glad to hear about Eaton's research. The new exhibit may resurrect Anderson Mills, at least in memory.

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