

Life underground suited newly discovered dinosaur, study finds

July 9 2024, by Tracey Peake



3D printed skull of *Fona herzogae*. Credit: Lindsay Zanno

The age of dinosaurs wasn't conducted solely above ground. A newly discovered ancestor of *Thescelosaurus* shows evidence that these animals spent at least part of their time in underground burrows. The new species

contributes to a fuller understanding of life during the mid-Cretaceous—both above and below ground.

The new dinosaur, *Fona* [/Foat'NAH/] *herzogae* lived 99 million years ago in what is now Utah. At that time, the area was a large floodplain ecosystem sandwiched between the shores of a massive inland ocean to the east and active volcanoes and mountains to the west. It was a warm, wet, muddy environment with numerous rivers running through it.

Paleontologists from North Carolina State University and the North Carolina Museum of Natural Sciences unearthed the fossil—and other specimens from the same species—in the Mussentuchit Member of the Cedar Mountain Formation, beginning in 2013. The preservation of these fossils, along with some distinguishing features, alerted them to the possibility of burrowing.

Fona was a small-bodied, plant-eating dinosaur about the size of a large dog with a simple body plan. It lacks the bells and whistles that characterize its highly ornamented relatives such as horned dinosaurs, armored dinosaurs, and crested dinosaurs. But that doesn't mean *Fona* was boring.

Fona shares several anatomical features with animals known for digging or burrowing, such as large bicep muscles, strong muscle attachment points on the hips and legs, fused bones along the pelvis—likely to help with stability while digging—and hindlimbs that are proportionally larger than the forelimbs. But that isn't the only evidence that this animal spent time underground.

"The bias in the fossil record is toward bigger animals, primarily because in floodplain environments like the Mussentuchit, small bones on the surface will often scatter, rot away, or become scavenged before burial and fossilization," says Haviv Avrahami, Ph.D. student at NC State and

digital technician for the new Dueling Dinosaurs program at the North Carolina Museum of Natural Sciences.

Avrahami is first author of the paper describing the work now [published](#) in *The Anatomical Record*.

"But Fona is often found complete, with many of its bones preserved in the original death pose, chest down with splayed forelimbs, and in exceptionally good condition," Avrahami says. "If it had already been underground in a burrow before death, it would have made this type of preservation more likely."

Lindsay Zanno, associate research professor at NC State, head of paleontology at the North Carolina Museum of Natural Sciences and corresponding author of the work, agrees.

"Fona skeletons are way more common in this area than we would predict for a [small animal](#) with fragile bones," Zanno says. "The best explanation for why we find so many of them, and recover them in small bundles of multiple individuals, is that they were living at least part of the time underground. Essentially, Fona did the hard work for us, by burying itself all over this area."

Although the researchers have yet to identify the subterranean burrows of Fona, the tunnels and chamber of its closest relative, *Oryctodromeus*, have been found in Idaho and Montana. These finds support the idea that Fona also used burrows.

The genus name Fona comes from the ancestral creation story of the Chamorro people, who are the indigenous populations of Guam and the Pacific Mariana Islands. Fo'na and Pontan were brother and sister explorers who discovered the island and became the land and sky.



Lisa Herzog examines Fona bones. Credit: NC State University

The species name honors Lisa Herzog, the paleontology operations manager at the North Carolina Museum of Natural Sciences, for her invaluable contributions and dedication to the field of paleontology.

"I wanted to honor the indigenous mythology of Guam, which is where my Chamorro ancestors are from," Avrahami says. "In the myth, Fo'na became part of the land when she died, and from her body sprung forth new life, which to me, ties into fossilization, beauty, and creation. Fona was most likely covered in a downy coat of colorful feathers.

"The species name is for Lisa Herzog, who has been integral to all this work and discovered one of the most exceptional Fona specimens of several individuals preserved together in what was likely a burrow."

Fona is also a distant relative of another famous North Carolina fossil: Willo, a *Thescelosaurus neglectus* specimen currently housed at the museum and also thought to have adaptations for a semifossorial—or partially underground—lifestyle, research that was published late in 2023 by Zanno and former NC State postdoctoral researcher David Button.

"*T. neglectus* was at the tail end of this lineage—Fona is its ancestor from about 35 million years prior," Avrahami says.

The researchers believe Fona is key to expanding our understanding of Cretaceous ecosystems.

"Fona gives us insight into the third dimension an animal can occupy by moving underground," says Avrahami. "It adds to the richness of the [fossil record](#) and expands the known diversity of small-bodied herbivores, which remain poorly understood despite being incredibly integral components of Cretaceous ecosystems."

"People tend to have a myopic view of dinosaurs that hasn't kept up with the science," Zanno says. "We now know that dinosaur diversity ran the gamut from tiny arboreal gliders and nocturnal hunters, to sloth-like grazers, and yes, even subterranean shelterers."

More information: Haviv M. Avrahami et al, A new semi-fossorial thescelosaurine dinosaur from the Cenomanian-age Mussentuchit Member of the Cedar Mountain Formation, Utah, *The Anatomical Record* (2024). [DOI: 10.1002/ar.25505](https://doi.org/10.1002/ar.25505)

Provided by North Carolina State University

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