

Host: Robert Frederick

At the rate paleontologists are digging out fossils at the Gray Fossil Site, they'll be at it for another 16,000 years. Still, it's likely to be worth it:

**Interviewee: Shawn Haugrud**

It will just be years and years. I mean, we'll stop working before then because we'll stop finding new things. But that is basically where we're set forever—pretty much out here.

Interviewer: Robert Frederick

Wow.

Host: Robert Frederick

On this episode of The Conjectural, a story about the oldest form of science: looking closely at and describing the world.

On the western piedmont of the Appalachian mountains, there's a hill that's also a hole. That is, a long time ago, it used to be a sinkhole. Now it's a hill, but the scientists still call it a sinkhole.

Interviewee: Shawn Haugrud

So we have a rough idea of the size and shape of the sinkhole deposit and also we've been refining that over the years with various other methods, so we got a pretty good handle on where to dig.

Host: Robert Frederick

That's Shawn Haugrud, the lab and field manager for the Gray Fossil Site.

Interviewer: Robert Frederick

And what's your background?

Interviewee: Shawn Haugrud

I've always enjoyed paleo. That was always my career goal, and so I started volunteering at a different museum where I lived in Virginia when I was sixteen and just worked my way up the ranks there. Did a lot of field experience in Montana on dinosaurs. Got a job here in January of 2005, so I've been here eleven years now — eleven and a half. But just working up through here as well. And then recently became the lab and field manager. I've mostly been working in the lab, but recently started supervising out here as well.

Host: Robert Frederick

People have been purposefully digging here for the past 16 years. But the first diggers weren't scientists. They were construction workers building a road.

It was a spring day in May, 2000, when the Tennessee Department of Transportation started working to widen State Route 75. A little hill — only 20 to 30 meters high — was blocking the line of sight, so the construction crew set about to level part of it. The heavy equipment was brought in, and the crew removed a few meters of orangish dirt and rock. The next scoop down, though, the dirt turned black.

Interviewee: Shawn Haugrud

Orange stuff does not produce fossils, so we have to get down to the proper layer.

Host: Robert Frederick

Shawn looks a little tired when he says it because it takes a lot of work to dig it all by hand, which is what they do nowadays.

**Interviewee: Shawn Haugrud**

So the further into the hill we go, the more we're going to have to remove of that.

Host: Robert Frederick

That's because the construction workers didn't start at the very top of the hill. To widen the road, they only needed to remove the side of the hill. So, the black dirt and rock where the fossils are is in a layer under all the orange stuff. And as you look up toward the very top of the hill, you can see both the layer of black earth where the scientists are working and, as you look a little higher up, it quickly turns to orange. On top of all that orange stuff is the trees and shrubs that the scientists will have to remove, too. Though Shawn is remarkably upbeat.

Interviewee: Shawn Haugrud

But we're doing pretty well now. We've picked up speed and everything is going well. So we'll find a bunch of stuff over the course of the day and then about every other morning we'll survey some things out and day before yesterday we surveyed out 55 items, so it's a really prolific site. It produces a lot of material.

Host: Robert Frederick

It was much easier, of course, with the excavating equipment, but back in 2000 when the construction workers hit black earth, they stopped. They hadn't seen this kind of earth before, but suspected that it was not the kind of material you build a road on. So, they took samples to geologists, who came out and dug around, as geologists like to do. Drilling showed that the black stuff was at least 30 meters deep and that likely there had been some kind of limestone, dolomite, or other carbonate bedrock down there that had been dissolved by the groundwater and produced a sinkhole. The sinkhole later got filled up with all kinds of things — turning into the black material — and over the years, the area around the filled in sinkhole eroded away, making it into a kind of hill. But whether you call it a sinkhole or a hill that used to be a sinkhole, no one wants a road built over a sinkhole, even if it is an old sinkhole filled in. So, construction was at a standstill until they could figure out another plan for the road.

Interviewer: Robert Frederick

This is the hill that we're standing on right now, is there a thought that there might be stuff below this hill, too, and someday this will be excavated?

Interviewee: Shawn Haugrud

Absolutely. Anywhere within the five acres we're going to have fossil deposit. It goes down 140 feet. And we already know the extent of it because we've done core sampling on a grid: so you drill down and see when you hit bedrock; take up cores; see how much of it is black versus orange.

Host: Robert Frederick

For the construction workers and geologists, the black earth signaled the problem. And like anyone with a problem staring them in the face, they stared back at the black earth.

Interviewer: Robert Frederick

Do you think future paleontologists will be upset by the fact that there are these core holes that go all the way down and might have gone right through a fossil, right?

**Interviewee: Shawn Haugrud**

I don't think so. The cores when they came up, they didn't have — cause that is always, you're always worried that you'll get unlucky and that'll be the one place that it happens, but with the, again, with the amount of material that's out here — the five acres — there's lots and lots of fossils still to be found.

Host: Robert Frederick

Back in the year 2000, spring was turning into summer. And still there was no new plan for the road. More geological studies revealed just how extensive the layer of black earth was. Five acres is a pretty big area, but the only patch of black earth to stare at was the tiny bit they had already dug up. Well, as geologists like to dig around, they finally decided to dig a bit more. Within minutes, they saw something new: fossilized bones, including the upper jaw of a tapir.

Interviewee: Shawn Haugrud

Basically anywhere we dig here, there will be a lot of fossils. This is a very prolific site compared to other fossil sites.

Host: Robert Frederick

If you're unfamiliar with a tapir, that's completely understandable. First off, they're four-legged hooved mammals, but they tend to go out only at night. Nowadays, they tend to live in tropical forests. So finding a tapir jaw in eastern Tennessee does suggest either a very lost tapir, or a warmer climate. But after a little more digging around, as geologists like to do, there were even more fossils, including what looked like the skull of an alligator. Well, that suggested a much warmer, much wetter time period from Earth's past. So, the geologists called in the paleontologists, who dated the site back to the Miocene — around five million years ago — that's around the last time the Earth was much hotter than it is today, so very important if you're trying to understand what might happen with climate change.

It's a unique scientific treasure for the area, and so prompted the governor to divert the road. The construction workers got to go back to work, and the Gray Fossil Site — named after the nearby town of "Gray" — was born, along with the museum, and the paleontology program at East Tennessee State University, or ETSU.

Interviewee: Shawn Haugrud

The geologists over at ETSU had his students measure the volume of our pits — so get a depth of the pit, length and width, and see how much we've removed versus how much we've been digging. At the rate we're digging versus a minimum model for the sinkhole deposit, we could be digging for the next 16,000 years. So there's no human...

Interviewer: Robert Frederick

16,000 years?

Interviewee: Shawn Haugrud

Yes, there's no human way, at the rate you dig, cause you don't want to just bulldoze it up, you have to dig slow with a small trowel, an inch-and-a-half across, and you're taking little slices at a

time, about a quarter-inch, max. You really want to do about half that, and carefully go down through it, and so it would just be years and years, I mean, we'll stop working before then because we'll stop finding new things. But that is basically where we're set, forever, pretty much out here.

**Interviewer: Robert Frederick**

Wow.

Host: Robert Frederick

In the past 16 years, the scientists have recovered and cataloged over 20,000 specimens, including elephant-type creatures, rhinoceros-type creatures, red panda-type creatures, turtle-type creatures, saber-toothed cats, and all sorts of other things, including several new species. And right now, they think they're just about to discover another one: it appears to be a new species of mastodon.

Interviewee: Shawn Haugrud

The body is over there. It's starting to pop up, so we do have a little bit of rib sticking out and some vert (vertebrae) and stuff going on. The head we removed last season.

Host: Robert Frederick

And the head is sitting in a jacket made from plaster inside the lab, just a hundred or so meters away from where the rest of the body is. Digging out the rest of the elephant-like creature and putting it back together will take years. And who knows what else is down there. Of course, as you now know, it will take a long, long, long time to find out. To speed it up, though, and maybe to find something yourself, you could always volunteer. That's what Jarod Duckworth did. I met him wet screening, or dipping a box with a screen bottom over and over again into water. The box is filled with sediment from the dig site, and the action of the water gently breaks them up to reveal any fossils held inside.

Interviewer: Robert Frederick

And how old are you?

Interviewee: Jarod Duckworth

Seventeen.

Interviewer: Robert Frederick

Seventeen. You just decided to do this this summer right before going to... or you still have one more year of high school left?

Interviewee: Jarod Duckworth

I'm really (*inaudible*) this.

Interviewee: Jarod Duckworth

I have one more year of high school left — just doing this to get some experience.

Interviewer: Robert Frederick

Okay. And how did you meet up and decide to do this?

Interviewee: Jarod Duckworth

I came to the museum not knowing I could do this and learned from one of the tour guides.

Interviewer: Robert Frederick

Okay. Thank you.

Interviewee: Jarod Duckworth

Thank you.

**Interviewer: Robert Frederick**

It's pretty much a bonanza from what I understand: that every single time you go out to dig you find something.

Interviewee: Shawn Haugrud

Yes. Every year we're pulling out a lot more.

Interviewer: Robert Frederick

Alright. Thank you very much.

Interviewee: Shawn Haugrud

Thank you.

Host: Robert Frederick

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