

# Smologies #2: DINOSAURS with Paleontologist Michael Habib

## Ologies Podcast

### July 19, 2021

Oh hi, it's your internet uncle, Alie Ward, back with facts, and science, and stories, and the second ever episode of *Smologies*, which is a new spin-off of quick, distilled *Ologies* episodes that we've shrunk down and de-filthed, so you can listen in a classroom or on a road trip with your in-laws. I don't know what your in-laws' vibes are, but maybe you need a clean version. Also, if you want the full version of this episode, it's linked in the show notes. There are also bleeped full versions available, but *Smologies* are small and they'll show up right in this feed every other Thursday.

As usual, regular brand-new, full-length episodes of *Ologies* come out on Tuesdays. We're just launching this double on a Tuesday because I got married to your PodMom, Jarrett, last Saturday and I'm taking this week off to go see family in Montana; my first vacation in nine years. I'm very excited.

Okay, this intro's already too long! Let's get to fossils, dino digs, brontosaurus, titanisouri, flimflam, *Jurassic Park*. What does a dinosaur taste like? Museum secrets and more, in this, Episode 2 of *Smologies* with Paleontologist Michael Habib.

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**Alie:** Now, you study movement of animals and that's kind of how you got into paleontology? Is paleontology only about fossils? Or is it just about living things of that era?

**Michael:** So, paleontology doesn't necessarily have to be about fossils, but historically it kind of was. It was considered to be the study of fossils, essentially. Although more literally it is just the study of life in the past. And you mostly do that through fossils. I am one of those paleontologists who does play with fossils.

**Aside:** Before we go much further, let's define super quick, what a fossil actually is. I didn't know this until just now. Fossils are any trace or remains – like a cast, an impression, or a substitution with rock or even the thing itself – of something that was once alive. They have to be at least 10,000 years old to be considered a fossil. I don't know what they're called if they're younger than that, to be honest. And the word fossil comes from the Latin for, 'obtained by digging', which is kind of adorable. I just picture people digging around and being like, "I obtained this by digging! It's a fossil!"

**Alie:** What amount of time do you spend in the field as a paleontologist and how much of that back in the lab, or looking at spreadsheets, or measuring fossil density and stuff?

**Michael:** In terms of how much of the year I'm in the field, it's a good chunk of the summer. That's usually when I do all my fieldwork. So, basically July and August, a good bit of it, I'll be in the field, mostly in New Mexico.

**Alie:** Was that a titanosaur?

**Michael:** That's the titanosaur project, yeah.

**Alie:** Can you reveal what you're working on with that?

**Michael:** Sure! Obviously, you excavate whatever you find. It's not like you went out there saying, "We're gonna find a titanosaur." Actually, we kind of went out there going, "I really, kind of hope we *don't* find a titanosaur."

**Alie:** Really?

**Michael:** I mean, we were being glib about it, which is what makes it funny. But there was a part of us that was like, "I really hope we don't find anything super huge because we're going to feel compelled to excavate it and it's going to take forever." [*Alie laughs*] And of course, what we found was *two* individuals of the group that includes the largest land animals of all time. In fact, one of our specimens may be the largest dinosaur from North America. Maybe.

**Alie:** That's huge! Literally!

**Michael:** Yeah. These are animals that... At *mid-size*, titanosaurs are 30 tons plus. And the big ones are like 60 tons plus.

**Alie:** How many feet?

**Michael:** The big guys, you're looking at a 100 feet-ish.

**Alie:** Woah! How many times bigger than an elephant are these guys?

**Michael:** A big, bull African elephant, which would be the largest living land animal, I think the record is 6.2 tons or something like that. The average is more like five and change. So, if a big titanosaur is regularly hitting 60, that's 12 times.

**Aside:** So, these titanosaurs are like if 12 elephants were stacked under one giant overcoat and pretended to be a person. So, his work is kind of a big deal in every way possible.

**Alie:** Who gets to name it?

**Michael:** Well, that depends. We don't know whether or not we *will* be naming it because we don't know if it's a new species yet or not. There is a type of titanosaur from North America that is named. Just one. Which is interesting, because in the rest of the world, there's a ton of these things. They're like one of the hot groups of dinosaurs to work on these days. We went from not knowing much about them 20 years ago, and suddenly there has been this explosion.

**Aside:** So, sauropods are those really long-necked, round-bellied, plant-munching cuties.

**Alie:** Even if you don't get to name the species, you get to actually be like, "This one's Gary" or whatever, right?

**Michael:** Oh sure, yeah. They do get nicknames. So, if this ends up being a new species, we will give it a new technical name in a publication and it'll be myself and my colleagues that will name it. But, in terms of nicknames, those kind of just happen organically and our two titanosaurs actually have nicknames.

**Alie:** Oh, what are they?

**Michael:** They are Daisy and Duke.

**Alie:** Aww, look at that!

**Michael:** And it's usually the students that are naming these things.

**Alie:** Where do they come up with Daisy and Duke? It has nothing to do with jean shorts, does it? Like, Daisy Dukes?

**Aside:** Daisy Dukes, for those unfamiliar, are a type of micro-pant fashioned from truncated denim trousers. They are beneficial in warm climates. So, when might Daisy and Duke make their museum debut? Please put shorts on them.

Here's the deal with museums. It's actually like the shoe department at JCPenney. What you see on the floor is a representative fraction of what they got in the back. So, you may see a cool dinosaur, or a weird old knife, or a clay jug. But the museum has literally millions of specimens on site, archived for research. The LA County Natural History Museum, for example, has *35 million* artifacts in storage.

**Alie:** How much money does it cost to dig up a dinosaur?

**Aside:** This is the most fun game I've ever played.

**Michael:** Let's have fun with this. How much do you think a field season for us costs?

**Alie:** Oh gosh. Well, it depends on if you have interns.

**Michael:** We have a combination of paid employees for the museum, as well as volunteers. But let's look at just the field season and let's assume that salaries for the museum employees, this is part of their yearly work and everything. So just the additional money for the supplies, the trucks, to get people out there, to feed them, keep them safe, make the jackets, transport the specimens.

**Alie:** I would say \$800,000. No, four million dollars. A billion dollars. *[laughs]* I don't know.

**Michael:** Less than \$10,000 per year.

**Alie:** You're kidding me!!

**Michael:** No.

**Alie:** Are you kidding me??!! You could buy a used Toyota Camry or a dinosaur expedition?

**Michael:** That's right.

**Alie:** What kind of a world is this??

**Michael:** *[laughs]*

**Alie:** Why haven't we all done this?

**Aside:** Side note. I got married last weekend and I can tell you, shoulda folded it in with a dig. But yes, that's one of my favorite *Ologies* facts maybe ever. Speaking of favs:

**Alie:** So, do you have a favorite dinosaur?

**Michael:** Do I have a favorite dinosaur? Yes, I have a couple of favorite dinosaurs, depending on what kind of favoritism one has in mind.

**Alie:** The one that really has a place in your heart. Like, you *know* which one it is. There's one that you really like the most.

**Michael:** Sure. So, growing up, the one that makes me think, "Ah, childhood," is this thing *Deinonychus*, which is very similar to *Velociraptor* of *Jurassic Park* fame. Incidentally, the real *Velociraptor* was about coyote-sized and feathered...

**Alie:** *[gasp!]*

**Michael:** ... not giant and scaly.

**Aside:** Dino enthusiasts love to note that the Velociraptors in *Jurassic Park* were not historically accurate. Deinonychus, which means, 'terrible claw', was much closer to what was portrayed as a Velociraptor. And I thought this was just someone sleeping on the job, but the confusion is said to have originated from Deinonychus originally being labeled as a subspecies of Velociraptors. Either way, these things should have had feathers. So, imagine a giant, clawed bird wanting to murder you. It's upsetting, but not as upsetting for some people as a movie getting facts wrong.

**Michael:** Some of them are. I've seen some people get really upset about it. I don't get that upset about it. But yeah, I mean they're essentially fantasy creatures. But Deinonychus was particularly important historically because it was one of the first dinosaurs that was specifically used in some of the original hypotheses about the origins of birds. And specifically about them being dinosaurs.

**Aside:** By the way, all birds are technically dinosaurs. And that may be a thing you've accepted and you've processed in your heart or mind, but it still weirds me out.

**Michael:** Now these days, I might very well say and have said that my favorite might be a Changyuraptor.

**Aside:** Changyuraptor. Now, what a weird thing. Find it, google it; it took me a while. So, this was a non-bird, flying dinosaur. It has four wings. Four wings! And a tail that was, like, a foot long, big claws and teeth.

**Michael:** Which is not something you hear a lot about.

**Aside:** Now, Michael was on the team that first analyzed and published the paper naming this a new species. So, you know...

**Michael:** So, that one has a special place in my heart for that reason.

**Aside:** Now, a little background on this: last year, a paleontologist was trolling some amber markets in Myanmar and saw this apricot-sized piece of plant resin for sale as a jewelry piece. Whatever. The seller said there was, maybe, a plant stuck in it? Yeah, no! It was actually a whole baby dinosaur tail, feathered. Like the best episode of *Antiques Roadshow* EVER. They named it Eva. Eva is 99 million years old and probably got her tail stuck in tree sap and died there, which is currently making me want to cry. So, RIP little feathered buddy, and thank you for not ending up as a random chunky pendant.

**Michael:** That's a really neat find. You'll be seeing more things like that in the future.

**Alie:** Are we going to be cloning anything?

**Michael:** No, you're not going to be cloning anything from this because, while it more or less *looks* exactly like it was just preserved yesterday because the soft tissue is there, that doesn't mean that the molecular structure is completely unaltered. DNA has a reasonably short half-life, so you would just get gobbledygook out. You'd probably get DNA, but it wouldn't mean anything. DNA doesn't have to break down much, and it would be very broken down in this stuff. You might not even get any. You might be able to get a small amount, but it wouldn't matter.

DNA becomes incomprehensible very quickly because it only has a four-letter alphabet. If you only have four letters in your alphabet in your 'words', if you will, have to be very lengthy. If you break them even a few times, it means nothing.

**Aside:** So we can't "bloop-bloop-bloop" resurrect the brontosaurus with fragments of a broken code. But wait, what *is* going on with brontosaurus?

**Alie:** What's the hot goss on brontosaurus?

**Michael:** So, the short answer is brontosaurus is a valid name again. The original material that was named brontosaurus was then later found to have been comprised of multiple animals of different species.

**Alie:** Whoops!

**Michael:** So, it was decided that brontosaurus was not a valid name because it was all known stuff. You can't combine them and say it's a new animal. Researchers recently went through that material again with better knowledge and more data that we now have, because over time you get better and better knowledge of what's out there. They cross-compared a bunch of stuff and what they found was that, yes, a lot of that material was already known species. But *some* of it didn't match anything and therefore it was in fact new.

**Alie:** Doh!

**Michael:** And that means the original name holds.

**Alie:** That's some good breaking news on the brontosaurus fronts.

**Michael:** Yes.

**Aside:** This is why it's always a good idea to ask smart people seemingly silly questions. Right now, the more the merrier. Also, before we get to your questions, we will be donating to a related charity. This week, it's going to the Natural History Museum of LA County, one of my favorite places in the world. Definitely stop in and wander next time you're near downtown. A donation was made possible by some sponsors of the show.

[Ad Break]

Okay, your listener questions.

**Alie:** I have some rapid-fire questions for you from listeners. David wants to know: Any new thoughts on what color dinosaurs were?

**Michael:** It depends on how new you're looking at. But within the last handful of years, yes, there was a significant breakthrough – it's still a little bit controversial, but seems to be accurate – in looking at the impressions of feathers in particular, because feathers store some of their pigments in these little capsules, basically, that do preserve in some of these really well-preserved fossils. You need a microscope to see them, but they are there.

They're called melanosomes and they store melanins, which is a family of different pigments. And of course, the original pigment is in them anymore but the shape and size of the melanosome tells you what kind of melanin it had in it. So they can use advanced microscopy and imaging techniques on those feathers to determine where certain melanins were located.

**Aside:** Oooh, what is microscopy? It's just looking at things with a microscope. Okay.

**Michael:** It means they can get some blacks, grays, dark browns, and reddish browns, but they can't get other colors. So, we have some idea that some of these things had bold patterns but we don't know how bold the colors were.

**Alie:** Interesting. Tony wants to know: If dinosaurs are the ancestors of modern birds, does that mean dinosaurs tasted like chicken?

**Michael:** They probably did taste like chicken, yes. A way of putting it is, birds are just weird dinosaurs and they probably did. Keep in mind, the closest living relatives of birds are crocodilians. And if you've ever had alligator, it tastes a little bit like chicken, too.

**Alie:** So there you go.

**Michael:** There's what we call a phylogenetic bracket of tastiness there, to be technical about it. So, I imagine it would taste pretty much like chicken. Your typical dinosaur would probably be mostly more dark meat than white meat.

**Alie:** Because they have more hemoglobin for moving?

**Michael:** Sort of. That's very close. What turns the dark meat dark is something called myoglobin, which is used for restoring oxygen in muscle. And that's used particularly in aerobic muscles, a muscle that uses a lot of oxygen. It's a high endurance muscle.

**Aside:** So it's this oxygen storing protein, myoglobin, that makes dark meat dark. Which is why legs, which move around more, are dark meat. And chicken breast, which just sits there, not flapping much, is white. So good luck ever looking at a roasted dinosaur the same.

**Alie:** Adam has a question: How do you know when to switch brushes when you're digging out a fossil?

**Michael:** How do you know when to switch brushes? When the one you currently have is unusable.

**Alie:** And then do you have to get the finer and finer brushes when you're getting tiny grains of sand off?

**Michael:** You don't usually have to reduce the brush size much, maybe a little bit. It's more things like chisels. Anything sharp. Chisel size, things like that. If you're doing some more detailed work, you have to go to the smaller tool. Brushes, any kind of broad soft paint brush will kind of do. Certain bristle types are better than others. It's not like painting where you're going after detail work. You're not taking off each individual grain of sand. You just have some loose stuff and you brush it out of the way. Then you have more loose stuff and you brush it out of the way. The key thing is to not damage the fossil.

**Alie:** I always picture you guys going down to, like, a watercolor brush with only two hairs, just delicately... It's good to know that you guys are just like, "No, just get the dust off."

**Michael:** I've used dental tools to etch stuff around a fossil before.

**Alie:** That seems fun!

**Michael:** It is for a while. Then it starts to become tedious. But it's mostly fun. I honestly love it. But yeah, we don't go to tiny brushes.

**Alie:** T.J. wants to know: How many of the fossils on display at museums are actually replicas or casts?

**Michael:** So, it depends on what museum you're at. And it depends, in large part, on what age the museum is, the exhibit in particular, when it was built. If it's a really old exhibit, say it hasn't been changed since the 1920s, it's likely mostly original material. Because during that time, they didn't do as much casting. They didn't mind drilling through some of

these things to put them on exhibit. Then as you got to the mid-to-late 20th century, that fell out of favor because they didn't want to put holes in the research specimen. But now, if it's a really recent exhibit, ironically enough, you're going to see more original stuff on display again because we have better armatures now, what we call cradle armatures.

**Aside:** Armatures are the metal cradles that hold the bones in place externally. And that lets you remove pieces for research and put them back. Do whatever.

**Michael:** Now, what percentage of each of the specimens being original is a whole other ballgame. You very rarely find a complete skeleton. So, there's a few different ways of ending up with a complete skeleton for exhibit. One is you create a composite from multiple originals of the same species that are all similar enough in age and size that it will more or less work as an average individual. So what you're displaying isn't a single individual that ever lived, but it's sort of an average of four or five individuals that were very similar.

**Alie:** So it's like a Frankensaur?

**Michael:** It's like a Frankensaur, yes. Then if the thing's really incomplete, and this happens quite often – you found it, you do have enough to know what it is, you have enough to know it's a new animal or what have you, but you only have, say, 15% of the skeleton – you will then fill in the rest with casts.

**Alie:** But the museums are trying their best.

**Michael:** Yeah.

**Aside:** So, sometimes you don't have all the parts and pieces to a dead dino that you need, but that's why scientists and artists build it out for us, and that's why we love them.

**Alie:** What's your favorite thing about the job?

**Michael:** That one's hard just because the job actually is super fun. I love fieldwork, I love opening drawers in new museums in the collections when I travel to do research. I really do enjoy teaching. A friend's dad at a social gathering came over to me, he decided he'd give me a little bit of a hard time. He goes, "So, you're an academic, right?" I'm like, "Yeah. Right." He says, "What do you actually make?" As in, like, "What do you produce?"

**Alie:** What do you *make*?

**Michael:** Like "What do you make." And I took a quick second and I said, "I make doctors."

**Alie:** Face!!

**Michael:** [*laughs*]

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And thank you, Dr. Habib for teaching us so much about dinosaurs, and paint brushes, and mosquito bites, and following your passions into a pit of dusty bones. And thank you to everyone who helped make this episode. Full credits are in the show notes along with Dr. Habib's handles to follow. We are @Ologies and I'm @AlieWard. More info is at [AlieWard.com/Smologies](http://AlieWard.com/Smologies).

One last thing before I go: some advice from Old DadWard. You know, sometimes it can be scary to start a project, but starting is always the very hardest part. It's all easier once you start. So be strong, start the thing. You're going to do great.

Okay, berbye all you smart smologites.

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