Osteology with Dr. Daniel Wescott
Ologies Podcast
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Oh heeey, it's your ol' Pop here, helping you make a robot costume out of boxes and aluminum foil, Alie Ward, back with another episode of *Ologies* and the first in our month of Spooktober. Five Tuesdays of creepy, and cozy, and scary, and chilly topics, and we're starting with one that's in the room right now. Your skeleton. Skeletons! Look around. There's a skeleton sitting next to you on the subway. They're surrounding you, surrounding you in the office. A skeleton made that warm dirty chai latte that you're cradling. But, before we dig into bones and body farms, let's do some business up top.

First off, thank you to everyone on Patreon for supporting *Ologies* and submitting your wonderful questions. Thanks to everyone wearing *Ologies* merch from OlogiesMerch.com. Thank you to everyone who rates and hits subscribe, and of course to the folks who leave a review, which you know I creepily read. For example, JN [phonetic] who said:

> *I recently got sober and with that has come a renewed passion for learning. Filling the time I would have been drinking with learning about any ology you could possibly imagine has been invaluable to me. I love hearing the incredible passion of the guests when they talk about the subjects they clearly love so much. It's infectious.*

Thank you! Thank you, and congrats. It's an honor to be in your ears, as always. Now let's get into another infectious episode.

Osteology. This comes from the Greek for 'bone' which is osteon, and this guest is an Ologist many times over. He is a Professor of Anthropology and Director of the Forensic Anthropology Center at Texas State University, and he got his bachelor's from Wichita State University studying Anthropology, got his master's from Wichita State studying skull bones, and his Ph.D. at University of Tennessee at Knoxville in Biological Anthropology. Guy knows his skellies! Huge thanks, by the way, to Dr. Joe Hanson, who makes excellent, top-notch science content. He created It's Okay to be Smart and Hot Mess on PBS, so follow him @DrJoeHanson on all the social media. Thank you for hooking me up with this Ologist, Joe.

Okay, so this Ologist, he also runs a forensic anthropology research facility. This is located on a 3,500-acre ranch site, Freeman Ranch, outside of San Marcos, Texas. It is one of only seven of its kind in the country and it studies human decomposition rates. So, with roughly 50 or so human bodies in various states of decay, forensic anthropologists can gather all this data, and it helps law enforcement agencies solve crimes, identify remains of folks that have died, missing persons. It's very important work. It features wooded areas with shallow graves and an open pasture with vulture-picked bones. There's lush grasses sprouting between ribs of body donors, and as a person who once had a panic attack as a child just seeing a cemetery, this body farm would have just been my nightmare.

Now, I didn't visit it, not because I didn't want to, the Ologist was just busy, but I did meet with him in his office, which is a few winding miles down an oak tree-line road passed the Texas State University's main campus, and his office is sandwiched between a barbeque restaurant and a funeral home, so… sure. Went through some double glass doors into a lobby with just a full wall cabinet of skulls, and femurs, and human vertebrae, into this large, gleamingly clean lab. There are towering shelves above us that had rows and rows and rows of cardboard boxes, in size somewhere

between a shoebox and a coffin. Maybe like what a thigh-high boot salesman would bring out from the back to try on for size. In each, a human skeleton. Now, did this Ologist seem like a person who spends the majority of his waking hours on Earth helping college students bury bodies in a thicket? Will I get freaked out? You're gonna have to listen.

So, take a load off your very weary bones and settle in for a discussion about how skeletons grow, and how hard they work to support you, and what life stories you can glean from the remnants of a death, and cleaning femurs, and animal versus human bones, and crime drama slip-ups, and why, despite this being Spooktober, maybe you shouldn't be so scared of the things that lurk below your surface, with Forensic Anthropologist and human Human Osteologist, Dr. Daniel Wescott.

Alie Ward: Dr. Daniel Wescott?

Dr. Daniel Wescott: Dr. Daniel Wescott.

Alie: Do you make people address you as Dr. Wescott?

Danny: No.

Alie: No?

Danny: Never.

Alie: Do you have to wear a lab coat?

Danny: Uhh, I *have* a lab coat. [*laughs*]

Alie: Yeah, you do!

Danny: But I don't always wear it.

Alie: Now are you a forensic osteologist, a forensic anthropologist, an osteologist? How do you describe what you do in terms of an ology?

Danny: Well, I'm an osteologist, so I study bones. Within that, there's a lot of different ways that you can look at it. There's a lot of areas of study that are associated with osteology, like paleopathology, which is looking at bone diseases, mainly. Paleoanthropology that's looking at fossil ancestors and stuff like that. Bioarcheology, that's looking at human populations, typically archeological. And then forensic anthropology, which is typically focused on the individual.

As the director of the Forensic Anthropology Center, I do a lot of stuff where I'm looking at how do you identify a specific individual, so in that sense I would consider myself a forensic anthropologist. But I also do bioarcheology work, and I also do paleoanthropology. I've done some research looking at *Homo erectus* specimens. So, it's applying that osteology knowledge. Forensic anthropology is really the application of osteology.

Alie: So many ologies.

Danny: There's so many ologies in one lab!

Alie: And what is Osteology? How do you define it?

Danny: It's simply the study of bone. Obviously, I focus on human osteology, but you can be a mammalian osteologist, a dinosaur osteologist, whatever.

Aside: Somewhere in the world, there's someone studying the bones of wildcats and they are an Ocelot Osteologist. [*squeak*]

Danny: Even within forensic anthropology, a lot of what I do is tell people, **"**This is not human." [*"You're an animal!"*]

Alie: [*laughs*] Does that happen a lot? I noticed you're right across from a ribs place, so does that happen a lot with cattle bones? You're like, "That's just someone's lunch."

Danny: Oh, yes. One of the things we frequently get that's kind of interesting is we get the knee joint of pigs and deer. And that's because it's basically a ham hock, where they're cutting it.

Alie: You're like, "This is a pig patella."

Danny: They wind up all over the place, because people throw them out, they wind up in people's yards, dogs drag them around, things like that. So, we get a lot of that. Whenever they're doing a search for a missing person, they find lots of animal bones, obviously. So we get pictures associated with that, that they send or bring in bones for us to identify. You can always tell whether it's human or not human, and then the question is how much detail do they want? And if that's the case, then I can usually go in and get a pretty good idea of what animal it was. Even if it's not quite down to species level, it's at least broad terms, like in the deer family or a carnivore, things like that.

Alie: Are people usually relieved or bummed out when they find out it's just a pig knee?

Danny: Well, for the police, they're really excited, because it just saved them hours and hours of work. So, it used to be when I first started, they would spend all this time out on a case, they'd bring it in, it would go to the medical examiner's office, I would get called to the medical examiner's office, I would walk in and go, "It's not human." [*"Work here is done!"*] So now, with cellphones and everything, most of the time they're out on the scene, and they get called, and they just send me a picture, and I just immediately send them back, "It's not human," and they say, "Okay, thanks!" So they can just walk away.

So, it saves them hours of time in that sense. Private citizens that send us stuff are usually bummed out because they're hoping that they found a human bone. We actually just had, for example, a middle school teacher send me a picture of a bone that one of her students found, and very close to where that was found, about in August, they found an 800-year-old femur of a human. So, this kid was obviously excited that he'd found part of the same person or something like that. And it was just a cow bone.

Alie: [*sad whisper*] Oh man.

Aside: By the by, this first human femur was the discovery of a Parker County, Texas man, who was out fishing a few months ago and spotted it floating near the banks of a river. He took it home and his mother-in-law apparently suggested, "Hey, that's human-sized as far as bones go," and lo and behold, he had experts look at it, and it dated from around the year 1200. So, it's thought to be the remains of a member of the Caddo Nation, and will now be returned to its descendants. Now as for the middle school student who found a cow bone, well, maybe he'll grow up to be a Danny Wescott.

Danny: But a lot of the times people are excited even with that, just to know a little bit about what's going on, even if it's an animal, like what kind of animal it is.

Alie: And this goes back to your own childhood, correct? You used to wander the woods and look for bones. When did this start for you?

Danny: Oh, yeah. When I was a little kid I used to... Right up the street from us was completely undeveloped, so I would go out there and search for bones, and find skeletons, and try to

figure out what kind of skeleton it was, because I didn't know anything about bones at all, but I would try to figure out what kind of animal it was and stuff like that. I've always had a fascination with bones. The other thing about your bones is that it's kind of a written history of your life in those bones. So, you could reconstruct whether it's a human or another animal. You could reconstruct a lot of things about it, not only their diet and stuff like that as a species, but also what that individual was doing.

Aside: Interested in osteology? You can always start small. Like teeny-tiny balls of hairy bird vomit.

Alie: Did you ever put together owl pellets?

Danny: I've done a few things with owl pellets. Actually, my daughter just did a thing where she dissected an owl pellet and looked at all the little mouse bones and stuff in it.

Alie: Was it hard for you to not be like, "Aw, I wanna help you, but I know this is your project"? [*laughs*]

Danny: Oh, of course.

Alie: You're like, "I'm so good at this!" At what point did you decide to pursue osteology as a career? At what point did you figure out, "Oh, me collecting shoeboxes full of bones is actually a job"?

Danny: Yeah, so I was in the army for a while, and then I got out of the army and decided to go to college. I had no idea what I wanted to do, but what I decided I would do was go into engineering. What I wanted to do was kind of design workshops and stuff like that. And so, I started taking courses, your prerequisite courses and stuff like that. I was always interested in archeology and stuff like that, so I took a general anthropology course. And when I was in that class, right next to the class was actually a library associated with the anthropology department and I would go in there before class and study.

One day I was studying in there and one of the biological anthropologists who was actually a forensic anthropologist as well, came in and she said, "Somebody brought in some bones they found in a field, is anybody interested in looking at them?" So, I went in and started working with her on this, and it was three individuals, and they were kind of interesting, they were prehistoric skeletal remains. One of them had a pipe stem notch, so you could clearly tell they were smoking a pipe. But basically, from then, I just switched.

Alie: You're like, "Oh, this is where it's at."

Danny: Definitely, yeah. Because I didn't realize I could actually study bones and make a living at.

Aside: I asked, and much like the Paleontology episode's Dr. Michael Habib, Dr. Wescott isn't into puzzles. So, what drives him?

Danny: I really like research, and I really like it because I like trying to answer questions that either nobody's ever asked before or nobody's solved before. And with osteology, it's kind of the same way. Can I figure out what's going on, either with this population if I'm doing bioarcheology, or this individual when I'm doing forensic casework?

Alie: And let's get to the basics of, what is a bone? What kind of layers are happening in a bone? I know that's so basic but there's marrow, and I'm sure there's some kind of outer cuticle, but I'm not positive.

Danny: So, bone… this is the other thing too. We often think of bone as being this static thing. It's a living organ, so it can change and reshape itself and everything else while you're alive, but

it's a lot different than other organs in the fact that it's got an organic component. This is made up of what is called the osteoid, and this is what gives it it's elasticity to it. So, it kind of gives it some flexibility.

As a matter of fact, a favorite thing for kids to do is, if you put a bone in vinegar and let it set for a couple of months, all the inorganic components of it will dissolve away and then you can pull it out and you can twist it into a knot or whatever you want to.

Alie: [*horrified gasp*] Whaaat? I didn't know that!

Aside: P.S., I just went down a *YouTube* rabbit hole watching people bend chicken bones that have soaked a week in white vinegar and yes, they are rubbery and twisty, and for some reason, it made me want to barf and take a long shower in the fetal position.

Bones. Shouldn't. Do. That!

Also, only have a day or two and need to make a bone revoltingly pliable? The cleaner, CLR, dissolves calcium, so it gets the job done. But, unlike the video tutorial I watched, can you please wear gloves before you dip your soft, alive, human hands into a cup of high-strength janitorial solvent? Appreciated. But yes, the acids dissolve the calcium and my peace of mind, apparently.

Danny: So, it's got the organic component that's got the pliability to it, and then it's got the inorganic component to it which is calcium phosphate mainly, and that's what gives it its stiffness, its ability to resist bending and stuff like that. The other way to look at it, if you wanted to do a little study on that, is you just take it and put it in an oven and cook it for long enough until it starts to turn white, you can drop it and it'll just shatter because you've removed all the organic components of it. You kind of baked that away.

Alie: Oh my gosh, I didn't know that at all!

Aside: Okay, I looked it up, and what you're breaking down by baking is the collagen in the bone, which is what makes it flexible. So, brittle bone disease can result in easy fracturing and it stems from an issue with collagen production. So, bones need to be both strong – calcium phosphate – and flexible – collagen, and other stretchy components – in order to work in your favor. So, strength and flexibility is good for bones, good for negotiations, and just general character traits, I think. Strong and flexible.

Danny: So, it's got these interesting characteristics to it. And then, if you look at a typical long bone, which is just a bone that is longer than it is wide, then you have the shaft, [*Shaft theme song: "Shaft!"*] then you have the ends that are referred to as the 'epiphysis', and that's where the joints are. And so, what you tend to see is that in the shaft, you have this really thick, dense, outer bone called cortical bone, and inside you'd have yellow bone marrow. So that's where you store fats and stuff like that.

And then on the ends you have this thin outer bone, and inside it you have what's called 'trabecular' bone, or spongy bone. And the reason you find that at the joints is that it's really good at absorbing energy. So, think about if you go jogging, every time your foot hits the ground, you basically have an equal reaction going back up through your bone, so you've got to be able to absorb that energy, so that's

So, these little trabeculae bend so they can absorb a lot of energy, and then they also concentrate that energy down into the cortical bone that's really stiff. So, it keeps you from breaking your bones when you're out doing something.

Aside: To recap: your cylindrical bones are made of bundles of other cylinders called osteons, and the cortical bone, aka the compact bone, is more dense and it provides a lot of the structure. This accounts for 80% of the mass of a human skeleton. But the spongy bone, aka the cancellous bone, aka trabecular bone, is less dense, and it only accounts for 20% of the mass of your skeleton, but it has 10 times the surface area. So go look in the mirror and just be like, "Hey, look at you, smokin' hot babe, look at your bone structure. Amazing down to the cellular level."

Danny: And then within that is what we call the red bone marrow, and this is where your blood cells are produced.

Alie: And blood cells are produced *in* your bone marrow, which is so bananas to think about. To think you just have these long blood factories running inside your structures. Do you ever think about that? Does that freak you out?

Danny: Sure, it's interesting. That's the thing, like anything else - why it got put in the bone, I don't know. But your kidneys are the ones that are monitoring your blood cells, and when you are low, they release a hormone that targets the bone to start producing more red blood cells, or white blood cells, or whatever you need. But the kind of things you see that are interesting associated with that are, if you look at archeological stuff, when you start having heavy bacterial infections or diets that are low in iron, you'll start getting kids that are over-producing red blood cells, and they form what's called 'criba orbitalia' and porotic hyperostosis because they're basically just cranking out these blood cells.

Alie: And then when it comes to healing a bone, if you've got a fracture, how does that healing happen?

Danny: It's obviously a complex process, your bone is surround by periosteum, a tough connecting membrane surrounds it, and that's where a lot of major blood vessels that go into your bone are. So, if that gets torn – and a matter of fact when you feel pain association with broken bones, that's what it is, you've torn your periosteum.

Aside: So, side note: periosteum, meaning 'right next to the bone' is a fibery, vascular connective tissue, kind of like if you shrink-wrapped a carrot, tearing it. Yowzers! Boy howdy, no thank ya! Ugh!

Danny: But that blood then starts to form a clot, right? And then the other thing, if you have a bone that breaks, there's going to be these jagged edges and stuff like that. And you don't want every time you move for those to keep tearing things. So, you actually have bone cells called, osteoclasts, that remove bone. They go in and remove the dead bone and round off the sharp edges. At the same time, you have bones producing cells called osteoblasts, and they start to lay down what's called woven bone. Woven bone is laid down really fast, it's very random in nature, but its relatively strong. But it can be laid down rapidly.

Aside: And of course, yes, your body would be hard at work literally taking the edge off so that your bone doesn't act like jagged shivs, shredding you from the inside and hurting like a bitch.

Danny: And then over time the bone cells then just replace that, so the osteoclasts remove it and new osteoblasts lay down new bone until they form the adult lamella over that.

Alie: Have you ever broken a bone?

Danny: I've broken my wrist, yeah.

Alie: Ugh! Did you have to wear a cast?

Danny: I did, for a long time, yeah.

Alie: Did you think about what was going on inside there or were you not an osteologist?

Danny: I was not an osteologist at that time. I didn't think anything of it too much at the time. I think about it all the time now because I still have problems with that wrist, so I frequently look at it. It's kind of interesting, I'll be looking through the skeleton of one of our donors and I'll see something and think, "Oh, I bet mine looks something like that."

Alie: [*laughs*] Were you rollerblading?

Danny: No, I was riding a motorcycle.

Alie: Ugh, it's always doing something fun that gets not fun at some point. I feel like the wrist fracture is like, "Well, you were having fun at the time at the least." Does it ever bum you out that you're not going to be able to see your own skeleton?

Danny: Yeah. As a matter of fact, I've actually contemplated getting a CT scan and then printing my skeleton. [*laughs*]

Alie: How can we have this happen??

Danny: Money. [*laughs*]

Alie: I think you should apply for an art grant!

Danny: I always thought it would be kind of interesting then, to give that skeleton to my students to figure out who it is!

Alie: Oh, my gosh. Now how much of the work you do in osteology involves recent human remains versus hundreds of years old?

Danny: It just depends on the studies that I'm doing. Recently I do a lot of stuff with recent individuals. For example, one of the areas I'm doing a lot of research in is looking at the effects of obesity on the skeleton. I'm not necessarily doing it for health studies. What I'm doing is, we know through lots of clinical studies that obese individuals have a slightly different gait pattern than non-obese individuals. And therefore that should directly affect the underlying trabecular bone, that spongy bone because that constantly changes through your life depending on the forces that are placed on it. And so, we have an idea of how that should work, but we don't always know.

For example, if you put greater force, do those trabecular thicken, or do you get more of them? So, you can use obesity as a natural experiment on that. So, there I'm looking at people who have really good documented records on. For my dissertation, what I did was looked at prehistoric and proto-historic people of the United States and looked at how mobile they were by looking at their bone structure.

Alie: Wow. And how do you have to handle remains that have been found versus donor remains? Like when you're looking at prehistoric, say, Indigenous populations, which I imagine must come up with building sites and things, what kind of protocol do you have to use to make sure they're treated with respect?

Danny: Especially now, they fall under NAGPRA.

Aside: NAGPRA, side note, stands for Native American Graves Protection and Repatriation Act. It was passed in 1990 and it protects sacred or funerary objects and

human remains, and it gives a protocol, essentially, for museums and federal agents used to return these items to their descendants, to tribes, and to Native peoples. If you want to know more about what's happening right now in this whole vein, there's actually a NAGPRA review committee meeting via teleconference on October 30th. It's open to the public to just dial up and listen in. You can find the google form to join, it'll be up on my website AlieWard.com/Ologies/Osteology or at NPS.gov/NAGPRA. So, get the info, hop on the horn, learn more, and we can all be better advocates and allies.

Danny: So, you immediately – matter of fact, before they're even removed from the ground – tribes are consulted as far as, are we going to remove them or not. If they are removed, then there again, with consultation with the tribes as far what kind of analyses are done, especially if they are any destructive analyses or anything of that nature. When I did my dissertation, it was using collections that were Smithsonian that were collected back in the '50s and '60s so they were very different collections, although most of those have been repatriated now.

If it's a forensics case, then it becomes evidence. So, you have to follow chain of custody, it always remains in a locked room. Matter of fact, for us, when we do casework, we have a single room where the only people in that room are the people that are working on the case, and then when you leave, it locks behind you so there's no access to it otherwise.

Aside: So that involves found remains. But remember, Danny also runs a body farm.

Danny: And then for the donated collection, on the other hand, that's the whole point of it. These people are donating their bodies to be used for research. We have people from all over the world who come to study these skeletons because we have so much information about the individuals, and about their life, and stuff like that, that can be valuable if you're trying to tease out small differences.

Alie: Oh, so since you have a background on them, you can maybe correlate perhaps what you see in the bones to kind of verify, "Okay, they were a runner," or "They tended to have this kind of lifestyle and this is what happens to their bones."

Danny: Exactly.

Alie: What types of stories and what types of conclusions can you come to by looking at bones? What can you tell about a person based on their skeleton? I know for you, you can almost immediately tell if its male or female remains. I've read that about you, that you're like, "Boom!" Ask Wescott!

Danny: Yeah, male and female usually, that's like an across-the-room thing. But, obviously, you can tell their age. The younger they are, the more accurate and precise that age estimation is. If you're looking at fetal remains, you can get within a week of how old they are. If you're looking at a 90-year-old, you're talking about within decades of how old they are. But you can get an age, you can get some information on their ancestral background, you can get information on their health status. Even things like how tall they were compared to how tall they had the potential to be and all that kind of stuff gives you an idea about their health. Looking at their teeth, did they have pitting and stuff in their teeth that's associated with a disease?

Aside: What causing pitting in the teeth you ask me to ask Google? Will do. Okay so: Tuberous Sclerosis, Celiac disease, those are a few conditions. Honestly, I could really just sink my teeth into an Odontology episode because teeth are so weird, so gross, so helpful when it comes to not swallowing a calzone whole like a python. Anyway, what other bony clues speak for us after death?

Danny: And then you can tell general activity patterns. Were they using their upper limbs more than their lower limbs, were they running? You can probably tell the difference between a soccer player and a long-distance runner because they're putting slightly different forces on their bones and so their bones are going to wind up being a different shape. That can a lot of times relate to things like occupations, at least a manual laborer or a non-manual laborer. A lot of that stuff still stands today.

I just had a student who did her master's thesis where she looked at, in our collection, manual versus non-manual laborers, because a hundred years ago, a manual laborer was someone who was lifting crates, physically lifting the crates, where now, someone who had that same job would be using a forklift. But it turns out they actually still are more physically active, and you can detect that.

Alie: Will you be able to tell who did CrossFit in the future? Like, "This guy was out there turning tires in a gym." [*"I'm okay. I'm fine, I'm fine now."*]

Danny: I think you probably could. I mean, maybe not specifically what they're doing, but yes, in general, that they were doing something of that nature. You can tell a lot of that.

Aside: So, side note: another really amazing program in the Texas State Forensic Anthropology Department works to identify and return, if possible, human remains that have been found along the south Texas border and it's called Operation Identification, or OpID, and it's led by Dr. Kate Spradley, and I was looking on their website and it was just heartbreaking, so I'll read it verbatim, but it says:

> *Most counties were overwhelmed and began to bury the undocumented migrants, most without proper analyses or collection of DNA samples, without documenting the location of burial, leaving little chance that these individuals will ever be returned to their families. And in turn, families are left without knowing what happened to their son, their daughter, mother, father, brother, or sister.*

So, the work Dr. Spradley directs there helps to find the origin of those folks who have lost their lives on that journey. How do they even go about that?

Danny: The isotopes in the bones can tell you that because, basically, your bone is recording history of the water you drink and stuff like that.

Alie: Wow. Is there something about the narrative that interests you in the job? Is there something about people's history that keeps you engaged as well?

Danny: Oh yes, that's the whole point of it, to understand. I really got started in a lot of this looking at – especially with prehistoric skeletal remains – what can we actually tell about the lifestyles of people? The differences between what males and females were doing to give you an idea of the structure of society. When did kids start participating in adult activities? A lot of that, you can tell from the skeletal remains. All kinds of stuff like that. The whole idea is that population history.

But then, if you're doing an individual one, for example, we did a case one time where they were digging in a cemetery and found a coffin. And you think, "Well, that's not a big deal," but no one was supposed to be in that grave. And it turned out to be a cast iron coffin, which is kind of unique in itself. And so, we tried to figure out who this person was, and then follow the history. By doing that, we had to go back and look at census records and all kinds of stuff to figure out who it was. And then following the history of this person once we figured out pretty much who it was.

Alie: Who was it? Can you say?

Danny: Well, I actually don't remember her name right now. I can look it up. But she died in 1854, she was 26 years old, she died of tuberculosis.

Aside: So, a little background. This was in 2006 in Lexington, Missouri, and it turned out to be Elizabeth Triplett Stewart, who died in 1854 around the age of 20 to 30. And I found a paper that Dr. Wescott had published, and I'll also link to it on my site, but they could tell from her flattened ribs and her burial garments that she had worn restrictive clothing for most of her life. So, I'm guessing she wore some kind of boned corset just right into the afterlife. I hope that wherever her soul is, she just got to rip that fucker off, just kick back, all loosey goosey. She's done with it.

Danny: She'd had a son, and he died as well, and I want to say he probably died before she did. But then her husband remarried and the family that was using that cemetery plot was the descendants of that husband. And they did not really know about her until we started investigating this.

Alie: Oh, wow.

Danny: And so, I actually worked with the family on this. We actually wrote a paper and one of the family members is an author on the paper.

Alie: Oh my gosh, that's amazing!

Danny: Yeah! So, it was pretty cool to follow this. And then also to follow the history of these cast iron coffins, which is something that's kind of a rabbit hole you didn't expect to go down.

Alie: Yeah, they seem expensive and very heavy.

Danny: Yeah, they're both. So, prior to being able to embalm people, the idea was that they would preserve bodies for travel across the country, and they did a really good job. And if you look at the advertisements of stuff like that, they talk about the Madisons being buried in them. Typically, they were thought to be of the wealthy, but it turns out that the other use of them was for contagious people. So, some of the other ones that have been found, like ours, had tuberculosis. There's one I know of in New York where the individual had smallpox. They're either really wealthy or really sick.

Aside: Okay so PS; these cast iron coffins were shaped like a human body, kind of like a giant, ghoulish La Creuset casserole dish, but once again, shaped like a dead human, with a glass viewing window for the face. They were the invention of one Almond Fisk, who got a patent in 1848. An *Atlas Obscura* article about it dug up his patent application, which reads:

[*as if over an old radio*] *The air may be exhausted so as to prevent the decay of the contained body, or, if preferred, the coffin may be filled with any gas or fluid having the property of preventing putrefaction.*

So, just toss me in a Dutch oven and top it off with wine spritzer. Let me ride that bubbly river into Forever Town. Anyway, what else did they learn about Elizabeth Triplett Stewart?

Alie: Could you tell from the skeleton that she had TB?

Danny: Yes.

Alie: Oh wow, is that in the isotopes, is that in certain pitting?

Danny: Not in everyone does tuberculosis manifest in the skeleton, but in her it did. And what it is, is a buildup of inflammation going on in the lungs, and that affects that periosteum on the ribs, which causes inflammation of the periosteum so you get this bone plaque buildup associated with that. Now, in really advanced stages of this, you'll see in some prehistoric populations, is that it'll actually get into the vertebra as well, and you'll get collapsing of the vertebra, and so you'll get this kind of hunchback.

Alie: Are you able to look at a skull and almost see what the person's face might look like? Do you notice those details?

Danny: Sometimes, yes. It's kind of interesting, especially when we're doing a forensic case. If we have an unidentified person, we'll go through and do the analysis and then we put it into a program called NamUs. This is a National Missing Persons database. There are two sides to NamUs. We put in unidentified people, and then other people can put in missing people. And so, when you put in an unidentified person, you get back, "Of the information we have, these are some matches." And there are sometimes when I start going through the pictures and I'll go, "Nah, that's definitely not them, because that's not what they look like."

Now, I never rely on that, obviously, but then there's other ones when it'll hit and I'll be like, "That could be it. That's what this person looks like!" So, I don't know that I always have this vision, but if I see a picture I can usually say yes or no. But obviously I wouldn't rely on that. We just had one that looked very much so like the person and when they did the DNA, it's not the person.

Alie: Is there DNA in bones that you can use?

Danny: Oh sure.

Alie: Now where in the bone is that?

Danny: Every part of bone. So, in your bone you have bone cells, osteocytes that kind of maintain the osteoblasts and osteoclasts, and those have cells, like any other.

Aside: So, in case you were distracted by like a weird smell or a bird, here's a quick recap: Osteoblasts are like, "Pow, blast, boom!" Building, making new bone cells, those are osteoblasts. Osteocytes are mature bone cells. And osteoclasts are the ones that decide it is time to remodel your bones and reabsorb the osteocytes. Now, speaking of demolitions, what remains in the bones after you die? Is it all just a bunch of chalky minerals?

Alie: I always thought that, for some reason, and maybe it was because of cremated remains, cremated remains don't have DNA in it?

Danny: Right, because you basically removed all of the organic matter by cremating it, so you're just down to the inorganic portion of the bone.

Alie: Oh, that was such a dumb question but I didn't know! [*laughs*] I had no idea! And now you run one of the nation's few body farms, which is kind of an outdoor laboratory that studies the decomposition rates and things like that. How long have you run that and why do you think there's so few of them?

Danny: Well, so I've been here since 2011. This was actually established in 2008 and I came in as the director in 2011. There's a lot of reasons, I think. One is that people have their own perception of dead bodies. Just to give you an example, as you noticed when you walked in, there's some skeletons on display here, and we had a delivery driver a few days ago who

came in, and when I went out to help him unload some stuff he said, [*serious tone*] "You need to put a sign on the door that says there's skeletons in there." [*laughs*]

Alie: [*gasps*] Oh, wow, he was pretty heebie-jeebed, huh? [*"Spooky stuff!"*]

Danny: So as a result, and the fact that you are dealing with dead bodies, you have to have a university that is going to support that. And if they are not 100% on board, it's going to fail. And so, luckily here at Texas State, our administration is fantastic as far as that goes. The other thing is that it's not cheap.

Obviously, we don't – I mean I guess we could, theoretically – we don't want to charge our donors or anything like that. But we go pick them up, and that costs money, and we have to put them in body bags, and we have to have the facility to do it, and all that kind of stuff. So, it's not an inexpensive process either, so a lot of places are not willing to do that. And then it's just a lot of work. We collect data on them daily, and in our case luckily our students do most of that work, but if not, you would have to have a lot of employees doing that as well.

Alie: And that data is valuable because it can tell forensics teams how long it's been since someone died, what conditions they've been in, and essentially the rates of decomposition, insects, wildlife, things like that. If you were to, say, die in a setting or be left in a setting that is not a funeral home with embalming or cremation. Is that kind of work ever difficult emotionally or is it something that you're able to kind of look at the science of it and just see it from that perspective?

Danny: Well, for me, and I think this is probably true for a lot of people, the hardest part about the donation program is actually when you pick up somebody. For us, actually, too, is that since we don't get them from some type of anatomical pool, all our donors donate specifically to us. So in a lot of cases they've actually come into this office, we've talked to them, and helped them fill out the paperwork, and stuff like that. So, in a lot of cases you actually know them, or you've met them. And especially if they're young individuals. For example, we had an individual who actually took a workshop with us and then died, and she was in her 20s.

For me, the hardest part is that initial seeing them when you're picking them up. Once the process starts and you're doing the research, then you're less attached to them, I guess. I mean, that's the thing, you're always cautious and aware of the fact that this is an individual, and a lot of times it was an individual you'd actually met, so you have that respect that they donated. So yeah, it becomes more doing the science and less the emotional part of it.

Aside: I really wanted to ask if he was going to donate his body but I was like, I dunno. I just wanted to wait for the right time. It's not like a thing you want to bring up with someone you just met. Huh?

Danny: So, this is one of the things I always get asked about, "Am I going to donate my body?" And of course, I will. Matter of fact, I'm thrilled about the fact that a hundred year from now, some kids will look at my skeleton and be thrilled by it. [*"This is the best!"*] I did my dissertation at the University of Tennessee, so right now I'm donating to the University of Tennessee, and one of the main reasons for that is that if I were to die today, it would be my students that would have to place my body and have to monitor my decomposition.

Aside: So quick aside: by "place my body" and "monitor decomposition," this might be: to leave it buried under different materials like tires or wood, or leave it exposed and track how long it takes for scavengers to find it. Now that answer is about 15 minutes for

vultures, and they can render a fresh corpse into a skeleton in a matter of hours. This was research done in this facility and it helps medical examiners and law enforcement estimate a time of death, that way they can correlate it to potential matches for a missing person. So, the science is really important and donating his own body doesn't disturb him a bit. But his students?

Danny: And while it doesn't bother me, it's not really fair to them.

Alie: You're like, "You guys can't be crying over my corpse! You gotta get the right data!" [*both laugh*] It's a way to kind of return to the Earth and also let your cells become dragonflies, and vultures, and frogs, and flowers…

Danny: Yeah, right. Well, living close to Austin, the reason that a lot of people donate, too, is that they want a green burial and we provide about as green a burial as you can get.

Alie: Yeah, seriously! Literally sprouting grass underneath, you.

Danny: The other thing that's interesting about this decomposition facility, especially because this is a podcast on ologies, is that – and this is a very interesting part of my job that I didn't have before – is that it's not just anthropologists that are out there. Typically, on any body, we may have soil scientists, microbiologists, entomologists, botanists, you name it. They're coming out there and doing some research on those bodies because it's a little ecosystem. It's short-lived, but you got all kinds of things that are trying to get nutrients from that before it's gone.

Alie: How long does it take between getting placed to being pretty much skeletonized?

Danny: It depends on the conditions, obviously, but typically here in Texas, to be completely skeletonized takes about a year. Only because of the fact that it takes a long time for the skin to decompose. So, you have a skeleton with this mummified skin on it, but all the muscles, and organs, and stuff like that, are long gone. So that usually only takes a few months at the most.

Aside: Danny says that in the winter, decomposition might take a little longer. But hey, listen to last week's Phenology and just think of the crisp, fall spell that the microorganisms make when they eat all the dead stuff! That's you!

Alie: Does global warming effect decomposition rates?

Danny: I don't know! My guess is yeah. Typically, the way we think about decomposition is it's associated with what we call accumulated degree-days, which is basically the thermal energy that is available for the decomposition processes to happen. Decomposition is both chemical reactions and biological, so you have maggots that have to develop and stuff like that. And both of those are dependent on temperature. Just like if you take a steak and buy it and put it in the refrigerator, it's going to stay a lot longer because you've slowed down the chemical reactions and you've also slowed down the bacteria. But if you put it –

Alie: On your dashboard?

Danny: [*laughs*] on your dashboard, yeah, it's going to go very fast! But then there's also – and this is the one thing most people don't think about –there's actually an upper threshold to that, too. Sometimes this happens in Texas where it gets so hot it actually slows everything down too. But that makes perfect sense. You think about the same kind of analogy with the steak, that if you cook it, you're basically killing off all the bacteria.

Aside: You are a scaffold of minerals, covered in steaks, wrapped in supple leather, serving as a spaceship for trillions of tiny little souls. And you'll be recycled into millions of other living beings! I mean, life, man! Nature. It's a wild ride! So, go cut some bangs! Text your crush. Do it before you become a mushroom.

Danny: So, there's this upper/lower threshold of these optimal areas. Things have decomposed since the beginning of time, obviously, so you'd think we know a lot about it, but it's amazing to me how little we know about how decomposition works. Even things like, why do flies come? How do they know there's a body there? Things like that.

Alie: And I guess that would be like, a forensic dipterologist, I think?? [*laughs*]

Danny: Yeah, that's what I mean! The best thing about this, is that there's all kinds of people who are interested in doing this research, and they have different perspectives on things than what I would have ever thought about. It's really fascinating to work on these multidisciplinary projects where I may be the only anthropologist in a big group.

Alie: Now what about movies and TV shows about what you do? Do you ever watch *CSI* and you're like, "That's not how it works!" Or are there any that actually get it right?

Danny: For anthropology that is like *Bones*, typically they over-interpret what can actually be told, or at least their confidence in that is overblown. [*Alie laughs*] Like I was telling you before, I might be able to get an idea of what somebody did for an occupation, but at this point in time, I couldn't tell you, you know, within a 95% confidence interval, how good that estimation is, while they seem to be just like, "Pow."

[*clip from CSI: Miami: Travers, "I found some trace on the weapon, it's chemical makeup suggesting a type of salve, but it's a synthetic tripeptide." Natalia, "Synthesized from what?" Travers, "Snake venom."*]

There's a few things that they obviously can't do or wouldn't likely do, but most of the time… what I tell my students is, a lot of things that get done in *CSI*, where there's multiple – not just skeletal remains, but there's multiple things going on – is that in the show they have one person doing all this stuff, but in reality, every time they turn their chair to a different table, it's a different person, probably in a different lab, and could even be in a different state.

Aside: So yes, sexy shows like *Bones,* make osteology glam and cinematically efficient, but in real life, no one is swiveling their lab chair around from one microscope to another doing DNA sequencing, and then histology, and looking at audio files and spectroscopy, while also putting the 'bones' in *Bones* and making out in a morgue. In real life, they're real lives and not wrapped up in 59 minutes.

Alie: If it's something forensic, do you ever follow the case at all? Or is it once it's out of your lab, you're onto the next?

Danny: Uh, it depends. Some cases I have no idea what happens to them once they leave the lab. But there are other ones where, especially if they're something that winds up being in the news a lot, even if I didn't want to, I wind up kind of following along with it. And of course, in some cases you might actually be called to testify in the court cases, so you kind of have to follow up on it. But overall, I would probably say, for me, I don't really follow up on them that much. If I happen to see something on it, great, but I don't spend a lot of time.

Alie: That's not what attracts you to the field.

Danny: Right.

Alie: Can I ask you some questions from listeners?

Danny: Yes.

Alie: Ohhh, amazing.

Aside: Okay so before we get into your questions, we may have some words about sponsors who make it possible to donate to a cause of the Ologist's choosing every week. This one was very easy. Dr. Wescott said that to continue to do the work they do at no burial cost to the donors or their families and to literally pay for things like body bags and transportation, they're funded in part by donations of the monetary kind. So a donation will be going to the Freeman Center.

You can find a link to that and also info on body donation if you're inclined to have a free, very green and scientific, and dare I say, pretty heavy metal burial at AlieWard.com/Ologies/Osteology that will also be in the show notes. There will also be links to the sponsors who made that possible, which you may hear about now.

[*Ad Break*]

Okay, back to your questions. This one was asked by Hayden Sloan, Andrew Bain, Erica Smith, Elizabeth [ph.], and Kiersten Wallace, who also asked: Hey, have you seen that "When you're dead inside but still want to brighten other people's lives" meme? Aka this year's Halloween costume? So, I went and looked it up, and it's a skeleton with shimmery fairy wings holding a sparkly wand, and I don't think Danny had seen the meme, but I will be giving double high fives to anyone dressed as that this year. And to you, Kiersten Wallace. Anyway, that questions was:

Alie: A few people asked: What is the most useless bone in the human body? What's one that we can evolve right outta there?

Danny: [*laughs*] Most useless? [*"Why are you here?"*] I don't know that there is a useless bone in the body. The one that most anthropologists would tell you is the fibula.

Alie: The fibula? Really? Why??

Danny: Because it's not weight-bearing, it's just a muscle attachment site, basically. And as a result, its shape varies a lot, from person to person, the shaft of it. So, a lot of times it's hard to size and things like that. But every bone at least serves as a muscle attachment site or something like that so I don't think you could get rid of any of them.

Alie: Are you ever just exasperated in the dirt looking for those last ear bones?

Danny: Not ear bones, but wrist bones and stuff like that, yes. And then there are two little bones associated with your big toe, these are sesamoid bones, so they're bones within a tendon. The only one that we name is the patella, which is in your kneecap. These aren't named but they're associated with a muscle called the flexor hallucis brevis, and I've spent a lot of time actually looking for those because I just want to find them. They're just these little pea-sized bones.

Aside: Okay, so this tiny knee bone is sometimes called the fabella, and we might also have some of these sesamoid bones in our feet, or by our thumb. And sesamoid comes from the word for 'seed,' like sesame, because they're so teeny tiny. And folks who have knee pain are more likely to have an extra teensy bone in their knee tendons. So, no, you don't

really have 206 bones, because you have some li'l floaters! The three in each ear, by the way, are called 'ossicles.' It means 'little bones'!

Danny: The ear bones, because they very well could be inside the temporal bone, you never know until you get back and look.

Aside: This next question was also asked by Ella Thompson, Juan Isaac Moreira-Hernandez, and Maria Hancox.

Alie: Rebekah Fitchett wants to know: What's your favorite bone?

Danny: The femur.

Alie: Femur? Because there's a lot of information in it?

Danny: There's a lot of information in the femur. I can tell you the sex, how tall the person was, what kind of activities they did. I can even tell for example, when I go through the femora here from our donations, I can go through and tell you the obese people from the non-obese people.

Alie: Wow! Just based on that spongy bone tissue at the joints?

Danny: And the shape of the bone.

Alie: Oh my gosh! Now I wonder what my bones look like, because I used to be a runner but now I'm not, so I wonder if my bones are like, "Hey, come on! We're built for this!"

Leanna Shuster wants to know: A question from my 9-year-old son. How does a skeleton stay upright?

Danny: Muscles.

Alie: There you go! [*laughs*]

Danny: So, your skeleton works with your muscle to form lever systems, and those lever systems are what keep you upright.

Alie: There you go. ["*I've got a lever; I just need to pull it!"*]

Aside: Levers, muscles. Scapegoatee, Makenna Hopwood, Natalie crinklaw, Brynn Bell, Donald MacGregor, Kimberly Fajardo, Amy Salley, Jessica Friz, Danielle Dorman, all asked about Big Milk.

Alie: A lot of folks wanted to know: Does milk build strong bones or is that just really good advertising?

Danny: [*laughs*] Well, so it is calcium phosphate, so you need that calcium in your diet. As long as you're getting calcium in your diet. The main thing is that by the time you hit your early to mid-twenties, you have the best skeleton you're ever going to have in your life. From there on, you actually kind of lose skeleton over your life. As a matter of fact, when we look at age estimation, before 25, we basically look at growth and development. After 25, what we're looking at is breakdown of the skeleton.

Alie: After 25?? [*Danny laughs*] That's so depressing!!

Danny: But what really builds skeleton is activity. Obviously, you have to have an adequate diet as well, because you have to have all those components in it, but it's activity.

Alie: And is that because you're doing little microfractures, or what's making that bone stronger? How is the impact making it stronger?

Danny: Yeah! So, you're putting bending forces on it and your bone basically adapts to resist fracturing. So, it adds bone in places where you have a lot of stress, and if you don't have any stress at all, it will either not build it or remove bone from that place.

Alie: So, do you think that weightlifting is good for bones?

Danny: Sure. But any activity is good for bones, it's just that a weightlifter's bones are going to be under different stresses, or different strains I should say. So it's going to be a different shape than – you were talking about being a runner – so you're putting more forward and backward force on the bones than versus a soccer player that's actually changing directions a lot, so they're putting a lot of twisting forces. Both of them are going to build bone, they're just going to build a slightly different shaped skeleton.

Alie: But keep it active! This is so good to know.

Danny: And then the same thing even with later in life, the way you keep from losing bone and becoming osteoporotic, a lot of that has to do with how active you stay.

Aside: Okay so side note: Joyce Dvorak, Kelli Evans, and Breann Wharton - my sister in garbage ovaries, aka POI, heeeyyy lady what's up, I have that too - all mentioned osteoporosis in their questions. Just a little info on that according to the National Osteoporosis Foundation. Two million bones fracture every year in the U.S. because of osteoporosis. That's so many bones.

And 'osteoporosis' just means 'porous bones.' So, the structure of the bone becomes weaker because it's less dense and more porous. Think of like a pumice stone versus granite. So many hormonal factors, and inactivity, and medications can cause it, but what about slurpy-sippy-yum-yums, which was asked by Emily Burns.

Alie: What about if you're drinking soda?

Danny: Soda can be terrible for your skeleton. It can cause osteoporosis.

Alie: Oh no. Can it really? Is it because it's acidic?

Danny: Yeah, it's the acids in it.

Alie: Same with lemon water or no?

Danny: Lemon water is probably worse on your teeth.

Aside: Oh lord, I looked into this and yes, soda may be considered bone-hurting juice. Ow, my bones. And some theories are that this is because the phosphoric acid in colas leeches calcium in order to neutralize it from your bones, while other studies suggest it's the caffeine that's going to fudge your bones up real good. But the main moral of the story is that drinking just plain filtered water is great and that your bones splintering off after 50 is bad. Speaking of:

Alie: Someone asked about flimflam, some myths to bust. Rachel Weiss says: Someone once told me that elderly people's hips will randomly break and *then* they will fall, as opposed to the other way around. Is that a myth? Is that flimflam? Will the bone break and they fall or do they fall and then the bone breaks?

Danny: No, that's true. [*Alie yelps in surprise*] Typically what happens is that… a lot of times people will say, "I was getting out of my chair and I fell down and I broke my hip." In reality, when you are starting to get up, your muscles are putting a lot of force on that bone, and so

what'll happen a lot of times is the femoral neck will break as they're standing up ["*Ouch, ouch, oooouuuch!"*] causing them to fall.

Alie: Oh my god, so that's not flimflam! Any other myths about skeletons that you would want to bust?

Danny: [*laughs*] Uhh… they can't walk around without muscles!

Alie: Good point.

Aside: Also, isn't it weird that when used for anatomy, skeletons used to be the real deal? They had to be! Where else are you gonna get one? So, *Atlas Obscura*, once again just coming in clutch with gross, fascinating research, has an article up all about the trials of being a med student hundreds of years ago, in that you had to somehow acquire a human skeleton to have. Kind of like trying to score a laptop, only your laptop is made of people that you had to dig up, steal, or hope didn't have the plague. So now we have not-real ones available just in the seasonal aisle of Walgreens. [*voice pitched up*] "Put it in the doorway, it's October!"

Alie: Do you ever go to an amusement park or you walk down the Halloween aisle and you're like, "These skeletons are so buster, this is not what they look like."

Danny: Oh yes, of course.

Alie: What do they get wrong a lot?

Danny: Oh, you know, the shape and the joints, the vertebra especially, they tend to just kind of oversimplify them. I don't think there's anything wrong with that.

Alie: How is the jaw staying on also?

Danny: Yeah, right, so like one of the things I thought was kind of interesting, for example, was that show, *Sherlock Holmes*. My wife was fascinated with that show, and I was watching it one time and they had a guy who died and he was at his chair and he was completely skeletonized, but his hand was all attached and his jaw was attached. And all that stuff would just fall apart.

Alie: [*laughs*] We're so used to seeing them all wired together.

Aside: This next question was wondered about by the skull-encased minds of Maddie, Christie Chapman, Hayden Sloan, and…

Alie: Ruby Johnstone wants to know: Is there any scientific basis for the phrase "I can feel it in my bones?" How about weather? Can you feel weather in your bones?

Danny: Uhh, I don't know, to be quite honest. So, I mean I think it's just saying that you feel it deep, but is it really your bones? I don't know! You have this periosteum that's around your bones, and it's got a lot of nerve tissue, so if something irritated that? I mean, that's what shin splints is, you irritated your periosteum, because of all the little microfractures. But I don't honestly know. Now like I said, I broke my wrist when I was 18 years old and I had a pin in it for a long time, and when the weather would change, I could feel that!

Alie: Really?

Danny: Yeah, but that was probably because the pin was changing temperature at a different rate than my body was.

Alie: So, getting cooollddd! [*Danny laughs*]

Aside: And if you don't have any aftermarket parts in your skelly but you can still feel weather in them bones, some researchers report that a sudden drop in barometric pressure can cause squicky bone feelings. In one paper titled, not 'Squicky Bone Feelings', but rather "Self-perceived weather sensitivity and joint pain in older people with osteoarthritis in six European countries," researchers were like, "Hot damn! Yeah, there may be something to this!" Now what if you're on the uphill climb to 25 instead of the downward lope? Danielle Dorman and JSB asked about bone growth, as did MacKenzie Campbell.

Alie: MacKenzie Campbell wants to know: Where do growing pains come from? Is it really from our bones growing?

Danny: My guess is that it's a combination of your bones growing and then stretching the muscles.

Alie: Okay. Oh, yeah, because [*stretching sound*]. Like taffy, right? Ugh, those poor little kiddos. And now they have a growth plate? And so, you could have been, say, 5'10", but maybe certain conditions happened in your life and you only got to 5'7"?

Danny: Sure.

Alie: Yeah? Is that why doorways were so little in older houses?

Danny: Yeah, I mean we have what's called secular trends. These are non-genetic or non-evolutionary changes, and stature is one of those. Clearly, we are taller than we were in the past and there's a couple of things that has to do with. One is diet, a better diet, or at least more constant nutrition. But another thing people don't think about a lot of times is antibiotics.

So, the way that typically you hear people say, "My kids grew overnight!" That's because they literally do. Kids typically, if you watch kids you could see this, and I see this in my daughters all the time, they'll go through this period where they eat everything in sight, and then you can't get them to eat anything. And part of that is they're building up this energy and then they go through this growth spurt. Well, if you're sick during that growth spurt, then it doesn't happen [*Alie gasps: 'Ohhh!'*] And if you have enough of these, then you wind up being shorter than you genetically had the potential of being.

Aside: So, hold onto your actual butts, because some folks, such as curiousDNA, Graham Tattersall, Juliana, Josie Gombas, wanted to know why tailbones exist. And shockingly no one used the word 'coccyx'. But in the same vein, but a different kind of growth spurt, [*splat sound effect*] Zak Smolen, Pandora II, and Ali Bravo were like: What's up? Why don't humans have a baculum? Aka, ye olde dick bone.

Alie: A few people had questions about: Why do we have a tail bone but we don't have a penis bone?

Danny: Well that's a good question. I don't know why we don't have a penis bone, it's just something that in humans got lost, it's been gone for millions of years. I honestly don't know why that is the case. I imagine that… I imagine there's a lot of reasons.

Alie: Right. But why do we have a tailbone??

Danny: A tailbone, our tailbone is really small, but it still serves as a muscle connection for all the muscles of the pelvic floor. So, we wouldn't be able to go to the bathroom, or have kids, or anything like that if we didn't have that muscle attachment site.

Alie: So, thanks, tailbone! [*Danny laughs*] We didn't think we needed you, but it looks like we do!

Aside: PS; real quick because I know you wanna know: humans evolved out of having a dick bone to ensure paternity. So, it behooved the penis-enabled to mate for shorter lengths of time more frequently with the same partner. Now in marmosets – teeny, teeny dick bones, and walruses – nearly two-foot-long members, they need that extra support. Kind of like an inner-dong-corset if you will, because they don't chill with the same chick for as long, so when they encounter a partner, they just need to make the most of it, because it probably won't happen again. So yeah, dick bones are for losers.

Alie: And last questions I always ask: What is the worst thing about your job, or about skeletons, or about your field? What do you hate?

Danny: [*whispering to himself*] What do I hate…

Alie: Is it digging for those little wrist nuggets? [*laughs*] Or something totally different?

Danny: [*long pause*] No, I mean, ya know, like in any other job, the things I hate worst is, like, having meetings about 'how we're gonna do this', or whatever. [*both laugh*] But um… So, I don't know if this is the worst thing, but part of this too is that, especially if you're looking at a forensic case or something like that, a lot of times there's soft tissue left, and so you have to basically cook that down, and scrub it off, and stuff like that. So it's this long, tedious project that usually doesn't smell very good.

Aside: Oh, you had two conference calls *and* the Keurig machine broke? Try picking human flesh off bones on a Wednesday morning. Okay, this next answer was very surprising.

Alie: Is it hard for you to get that smell out of your nose or are you desensitized to it?

Danny: I don't know if I'm desensitized to it but… so this kind of sounds weird, but every smell that you have, whether you like it or dislike it or whatever, is because you've learned something associated with that. And so, over the years I've actually learned to not dislike the smell, if that makes sense? It's not that I don't notice it, but it just doesn't bother me anymore.

Alie: It's the aroma of learning.

Danny: Yes, exactly. Science in process! [*laughs*]

Alie: Yes, that's what that is! [*laughs*] That's a really good way to look at it, that's very positive! Why shouldn't people be afraid of skeletons? What associations do you wish people had if they saw skeletons?

Danny: Well to me, like I said, a skeleton is just a history of that individual. So, it's recording everything that's going on, so there's nothing scary about a skeleton. It's just totally fascinating. And like I said, a skeleton by itself can't do anything. It can't move, it can't do anything. But it is this kind of biological history of that individual. So, it's kind of like the individual's diary.

Alie: Oh, so it's more like finding someone's journal instead of finding someone that wants to recruit you to the other realm.

Danny: Yes. Yes, exactly.

Aside: So just think: your skeleton is the memoir you never actually have to sit down and write.

Alie: That's a beautiful way to look at it. It's someone's diary, it's your ossified diary! And what do you love the most about skeletons or your job?

Danny: Well, I find skeletons just fascinating. The fact that, whether it's an animal skeleton or a human skeleton, all the things you can tell about it. And another part of my job, for me, as a professor, that I love: mentoring the students. I don't really like teaching. [*both laugh*] I don't necessarily like teaching a class, but I like sitting in the lab with the students and teach them, work with them on cases and stuff like that. So, I find that fascinating.

Alie: Is there something about their enthusiasm and their wonder that's kind of infectious that also keeps you engaged in what you do?

Danny Oh for sure, that's what I mean. It's always interesting to be around people that have the same interests and are excited about the same thing. I think back to when I was growing up and when I started doing anthropology and how exciting it was. So, I can feel that with them, that "Wow! This is the first time I've ever seen this!" I'm actually really excited about, at some point – obviously, I don't want to die right now – but at some point, my skeleton being the first thing that gets somebody interested in doing this kind of work.

Alie: Aw! That's a beautiful thought. Instead of just maybe burning it up or leaving it in a box in the ground. Like, put your diary in a library! Ya know? Share your work! You spend all your life forming your skeleton, at least share your work! [*both laugh*]

Aside: And so, before I packed up my gear and walked into the parking lot in the warm September sun, taking in the Texas breeze, I had one more question.

Alie: Is it odd being next to a funeral home, or is that on purpose?

Danny: No, that's totally by accident. [*both laugh*]

Alie: There's literally a ribs place across!

Danny: Yes, a ribs place across the street.

Alie: You're surrounded by bones! Oh my gosh, thank you so, so much for doing this, this was a joy.

Danny: Sure, thank you, it was fun! Thank you.

Alie: I'm not scared of skeletons anymore!

So, ask smart, kind, non-creepy-but-totally-sweet, intelligent, and committed scientists stupid questions, because not only will you be able to walk into a lobby filled with dead people and be comfy, but you will also be comforted. And perhaps have a greater appreciation for the extraordinary machine that you are, if I may borrow that term from a Fiona Apple album title. So, to find out more about donating to Dr. Wescott's work, either in money or in your bodily form if you're done using it, there are links in the show notes, as well as sponsor links.

And *Ologies* merch is available at OlogiesMerch.com. Thank you, Shannon Feltus and Boni Dutch of the podcast *You Are That* for making that possible. Thank you, Erin Talbert and Hannah Lipow for managing the Facebook Ologies Podcast group, and happy, happy, happy birthday to the strong and flexible assistant editor and a skellie that gives me heart-eyed emojis and stomach flutters all year, Jarrett Sleeper. Don't worry, I'm not just his creepy boss, he's also my boyfriend. And of course, the ligaments that hold all these tiny pieces together every week, editor Steven Ray Morris, who hosts *The Purrrcast* and *See Jurassic Right*. I'm convinced his skull has a mustache. Nick Thorburn wrote and performed the theme music.

And if you stick around until the end of the episode you know I tell you a secret. This week's secret is that sometimes, you know how if you get new jeans you're like, "Woo, new pants!" but for some reason the denim powers that be put extra blue dye in it that rubs off on your hands and your car and it gets under like the teeniest fingernail shelf? And it makes you look like you've just come straight from replacing a carburetor. I hate it so so much, this is my plea to denim makers: just, like, scale back on that indigo. Please don't make me look grosser than I already do. Kthnx.

Also: back next week with another Spooktober episode! Aren't you curious what it'll be? I decided to stop telling you! I was telling you in advance for a few of weeks, but I decided, nah, I'm gonna make you wait for it. It's more fun. And I love ya.

Okay, berbye.

Transcribed by Emily Staufer, that one old lady who wears vintage maxi dresses and makes jewelry out of tiny rodent bones that she collects from owl pellets or on hikes – check out this cool necklace, that's a meadow vole hip bone!

Edits by Kaydee Coast who reminds you; don't lick toads, check your crevices, milk your thumbs, and never apologize for asking questions. Kthxbi.

Some links that you may find of use:

Dr. Wescott's CV
CLR dissolving your chicken bones
NAGPRA
More on NAGPRA
NAGPRA listen in on the phone call
Cast-iron human-shaped coffins
Dr. Wescott's published report
OpID
Donating your money to Texas State Forensic Anthropology Research
… Or donate your body?
Will drinking soda dissolve your bones?
Weather, bones and barometers
Let's talk about dickbones aka bacula
You'll need a laptop and a human skeleton
More studies about cola and bones
Osteoporosis facts
Teeny tiny seed bones
Brittle bone disease: a collagen problem

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