

Just Skeletal Remains Identification Transcript

Introduction [00:00:05] Now that is recording RTI International Center for Forensic Science presents just science.

Voice over [00:00:24] Welcome to Just Science, a podcast for justice professionals and anyone interested in learning more about forensic science, innovative technology, current research and actionable strategies to improve the criminal justice system. In Episode 2 of the 2020 R&D season Just Science Interviews. Dr. Heather Garvin, associate professor of anatomy at Des Moines University, about her work with OSTEOID, an online resource for species identification of skeletal remains. Approximately 30 to 40 percent of cases involving skeletal remains received by forensic anthropologists end up being animal bones. Dr. Garvin and her team are working on a free, practical and user friendly online tool to help forensic anthropologists, death investigators, crime scene personnel and law enforcement identify the species of skeletal remains. Tune in as she discusses being a forensic anthropologist. The driving need behind OSTEOID and her work cataloging bone specimens for this project. This season is funded by the National Institute of Justice's Forensic Technology Center of Excellence. Here is your host, Dr. Megan Grabenauer.

Megan Grebenauer [00:01:41] Hello and welcome to Just Science, I'm your host, Dr. Megan Grabenauer, with the Forensic Technology Center of Excellence, which is a program of the National Institute of Justice. Today, our guest is Dr. Heather Garvin, who is currently an associate professor of anatomy at Des Moines University, where she teaches medical students, conducts human skeletal research and conducts forensic anthropology cases for the state of Iowa. Heather, welcome to the podcast.

Heather Garvin [00:02:04] Thank you for having me.

Megan Grebenauer [00:02:06] So to start us off, I'm curious how you ended up as a professor. What did your career path look like?

Heather Garvin [00:02:12] So I started off in undergrad. I liked science. And actually I had watched a lot of stuff on Jane Goodall and I thought I wanted to be Jane Goodall. Lo and behold, I started as a zoology major because I thought that's what Jane Goodall was. And actually, she's a primatologist, which falls under anthropology. And so I learned that midway through my undergraduate career and was able to then dual degree in anthropology and zoology. And as I was doing that, I also began volunteering at the Human ID lab there at the University of Florida. And I started working with skeletal remains and got really interested in what we could tell from skeletal remains.

Megan Grebenauer [00:02:54] So what is a human ID lab. What did they do there?

Heather Garvin [00:02:56] So a human ID lab, that is CA pound human ID lab at the University of Florida. It's a forensic anthropology lab. So forensic anthropologist are experts on the human skeleton. And we'll work for medical legal practitioners to help identify if their skull remains, who that person is and the circumstances around their death. So after the undergrad, though, I wasn't sure what to do with an undergraduate degree. And one of the graduate students in the lab said you should go and get a masters degree. And so that's what I did. I went and got a masters degree in forensic and biological anthropology from Mercyhurst College. And from there, I learned that I enjoyed teaching as well. So then went on for a Phd in functional anatomy and evolution at Johns Hopkins School of Medicine.

Megan Grebenauer [00:03:44] So with your current position, is there a large teaching component to it?

Heather Garvin [00:03:48] There is. At my current position at Des Moines University, I actually teach anatomy to medical students. So it's not as much anthropology. It does include skeletal anatomy in the anatomy that I teach them. And I do have an elective course on forensic Osteology. But really the anthropological aspect of what I do right now is researching casework. I used to teach anthropology and forensic anthropology to undergrad and grad students at Mercyhurst University before taking on this new position.

Megan Grebenauer [00:04:17] So you're primarily doing research in casework now then.

Heather Garvin [00:04:20] With anatomy teaching.

Megan Grebenauer [00:04:22] How did the cases get referred to? How do you get involved in cases? Are you associated with a specific law enforcement agency?

Megan Grebenauer [00:04:28] So I am I have a contract with the state of Iowa as a forensic anthropology consultant, and I was able to apply for that because I'm a board certified forensic anthropologist.

Megan Grebenauer [00:04:39] And so your bio states, you became a diplomat of the American Board of Forensic Anthropology in twenty seventeen. Can you talk a little bit more about the ABFA and what's your involvement in that organization has been?

Heather Garvin [00:04:50] Yeah. So the ABFA the American Board of Forensic Anthropology is the one certifying body that we have in the United States for forensic anthropology. So if you want to be a board certified forensic anthropologist, you need to go through them. In order to get board certified, you have to have your Phd, have case experience and training and submit a lot of information about your education, your training case reports, and then sit for both a practical and a written exam. And if you pass those portions, then you can become a diplomat. So a diplomat just means that you are board certified, that you're part of that American board of forensic anthropology then.

Megan Grebenauer [00:05:27] Are there any particular initiatives that you've worked on for the ABFA or future initiatives that you're hoping to be a part of?

Heather Garvin [00:05:33] So I do help out a little bit when they're forming questions for the annual board exam or validating questions for that exam. But my role so far has been external. I'm not I don't actually sit on the board.

Megan Grebenauer [00:05:45] But you do help shape what that exam looks like for future forensic anthropologist who wanted to become board certified.

Heather Garvin [00:05:52] Yeah, I mean. Forensic anthropology is a very small field. There are I am the hundred and seventeen person to ever be board certified.

Megan Grebenauer [00:06:02] And that's a surprisingly small number.

Heather Garvin [00:06:04] It is. It's a very small field.

Heather Garvin [00:06:06] And I would say there's probably a approximately 90 actually active board certified individuals that maybe aren't retired or or so forth. So when it comes to our board exam, they do reach out to a lot of practitioners to see what methods you think are important. You know, what testing criteria are you using? And should we include on this exam?

Megan Grebenauer [00:06:29] So when you get brought in on a case, what kind of information is it that they're hoping you're able to provide to them?

Heather Garvin [00:06:35] Each case is a case by case. So once in a while. Say a hunter's out in the woods and they come across some skeletal remains. They might first contact me with pictures and say, is this human or non-human? And then if it is human, I may go out to that scene and help with the search and recovery for additional remains there. And then once we bring him back to the lab, say they're completely skeletonized, they don't know who that individual is. I can run some analysis on the bone and give them an estimate of sex, age, ancestry, stature or something to help them narrow down their missing persons files when they're looking for this individual, if there's any kind of previous trauma that's healing any kind of pathologies. And then we can also provide information about the circumstances of death. So is there any trauma? Sharp force, blunt force? Is there any burning to the bones? And even after that person died and was left at that scene, what happened after that? Did rodents, know on the bone, carnivores scavenge them? Were they moved? Did it look like they decomposed in that area? So we're there to provide as much information as we can about those remains, usually to the medical examiner or the coroner who then is using that to decide the manner and cause of death and the identity of that individual.

Megan Grebenauer [00:07:49] So are those determinations pretty much based on visual inspection of the skeletal remains, or do you have any specialized analytical tools, chemistry type things that you're using on them for analysis?

Heather Garvin [00:08:00] Yeah. So it's not like TV. We don't have very many fancy tools when it comes to forensic anthropology. A lot of it is based on measurements that we're taking. Some of it is visually scoring. So sex traits that we see in the skull. You know, you're mastoid process behind your ear is a big muscle marking. Is it large? Is it small? Will help tell you whether you have a male or female there. We will look at some things under a microscope, you know, especially if they're potentially cut marks to analyze the shape and size of those cut marks. And some forensic anthropologist do histological examinations. So if you look at the bone structure microscopically, there's a thing called osteons. And you can count them potentially for age or use them to determine whether human or non-human remains are there. But majority is just gross examination and measurement and running them through equations to come up with estimates.

Megan Grebenauer [00:08:53] Is there anything you think is particularly important for newer forensic anthropology researchers or professionals looking to get into the field? Any advice that you would give to them?

Megan Grebenauer [00:09:02] Try to get as much experience as you can. If it's something that you think you want to do an undergraduate reach out to their summer short courses. There's field schools. If there's any opportunities at your school to get involved and you're probably going to need some graduate school education. So start thinking ahead about attending a Masters program or a Phd program in that field.

Megan Grebenauer [00:09:26] All right. So we're here this week at the American Academy of Forensic Sciences annual meeting in Anaheim, California. And you presented a presentation entitled Osteoid A New Forensic Tool developing a practical online resource for species identification of skeletal remains. That presentation was part of the NIJ Forensic Science R&D Symposium. If listeners are interested in watching the archived recording of that presentation, it can be found on forensiccoe.org or also the landing page for this episode. So before we get into the details of your project, are there other researchers that you would like to acknowledge?

Heather Garvin [00:10:01] Yeah. So while I'm the P.I. on the project, I do have 2 co PIs on the project. So Rachel Dunne, she's an associate professor of anatomy at De Moyné University and she's a mammalian paleontologist. So she's an expert when it comes to mammal and fossil and animal remains, which is important on this project. And my second co PI is Sabrina Schultes. She's a biologic anthropologist and a curator at the Smithsonian Institution over in Washington, D.C.. And so we've collected a lot of our data from the museum over there at the Smithsonian, both photographic and measurements. And she's been overseeing student work over on that side.

Megan Grebenauer [00:10:36] Can you give us just an overview, big picture of what the project is, what the purpose of it is and what you're hoping to achieve?

Heather Garvin [00:10:43] Yeah. So as a forensic anthropologist, about 30 percent of the time where I'm contacted about potential human skeletal remains, they actually turn out to be non-human, meaning their animal bones. Sometimes I'll send them to me through text messages or e mails. And as a forensic anthropologist, I'm an expert in the human skeleton. So I can usually take a look these pictures and say within a few minutes, hundred percent not human. And so then they know that they don't need to secure the scene. They don't need to do more searches. You don't need to stop construction at that site. But they always follow up with the question, well, then what is it? And that's a little bit harder to answer because I'm not an expert in every single animal's skeleton. So a single bone that comes from a pig might be difficult to identify. And so there are some tools out there. Some forensic anthropologist are lucky and they have a comparative collection. So they have a bunch of animal skeletons so they can go to and actually compare that bone and decide what it is. Those are time consuming and expensive. It's amazing how much a pig skeleton costs. I actually just spent I think it was almost a thousand dollars on a pig skeleton for my lab and otherwise there's a few books out there. The books can also be expensive and you kind of need to know what species you're going to when you're flipping through the books and photographs may or may not be the greatest in them. So we really lack resources for identifying these non human remains. And I happened to come across an avian osteology web page where they had bird bones. And what you could do is you could put in just the length of the bone that you had. And from that length, that would tell you what potential species that bird was. And that to me was awesome. And I thought to myself, why can't we expand that beyond birds to all the animals we generally encounter in forensics and use the measurements to help narrow down the potential species that we could then look at really high quality photographs of those species and make those identifications.

Megan Grebenauer [00:12:44] To your knowledge, is this the first time anyone's tried to create a resource like this?

Heather Garvin [00:12:48] There is a Web site out there that has animal bones where you can pick the species and they have certain photographs of certain elements. The search

engine doesn't work the best way. I was having issues using and it wasn't very helpful to me and it didn't incorporate that measurement aspect. So nothing to narrow down what species you might be looking at.

Megan Grebenauer [00:13:08] As you mentioned, your work involves creating this new online resource that can help improve that process of species identification. So what is the workflow look like now without this resource in place? What are the steps that have to be taken?

Heather Garvin [00:13:20] So it depends on the case. Once in a while, the law enforcement will contact the medical examiner's office and medical examiner's office will then generally contact me if they have clear photographs. I might be able to do it from photographs or at least tell them it's not human. If they want more species, I might have to ask them for more photographs to determine the species and different angles. Once in a while they'll actually drive the bones all the way into the medical examiner's office. So using time and money to get there or call me into the office to look at these bones, just for me to say that's a deer tibia or deer femur. So it can be streamlined. And with this web tool, law enforcement will be able to use it if they're at the scene and decide right then in there, hey, this is definitely not human. It looks to be a bear humerus, for example, or the death investigators can use it so they won't have to call in those extra resources and really get an immediate response on that species identification.

Megan Grebenauer [00:14:21] So where are you in the project?

Heather Garvin [00:14:23] So we are right in the middle of the project right now. We've been working on this for a year and we've been collecting a lot of metric data. So a lot of measurements, right? Because for this to work, we have to go to have a good representation of bone sizes for all these species. And we're including 28 species on this first go in this web tool. So we've been traveling to museums and collecting measurements on a wide range of species and incorporating a wide range of sizes. And we have to have really good quality photographs as well. So we've been traveling to museums, taking those photographs. We want to make sure we have all sides of a bone represented. So front back both sides and then the top in the bottom so that you have as much information as possible when you when it comes to identifying these bones. And so at this point, we're almost at the end of that data collection phase and we're editing all those photographs so that they look very nice and how I'll have the same scale on them and so forth. And at that point, then hopefully the next couple of months will turn everything over to the web developer that we're working with and they can start creating that actual web tool.

Megan Grebenauer [00:15:29] So you mention 28 species that you're starting with. How did you sign on that number and then those particular 28 species that would be included?

Heather Garvin [00:15:38] So we started off with a list of species that we commonly encounter in North America at this point in forensic cases. And we focused primarily on mammals, but we do have maybe one or two species of birds and maybe one or two turtles in there as well. But we also had were limited by the number of species represented in museum collections. We wanted to make sure that we could get the sample sizes we needed to represent those species.

Megan Grebenauer [00:16:07] And who is it taking the photograph? Is it professional photographers? What kinds of skill set is involved in that part of the data collection?

Heather Garvin [00:16:15] Yeah. So actually, it's myself and our Co PI. I'm Rachel Dunn. So we're not professional photographers, but we have a lot of experience, especially in forensics, documenting bones and forensic cases. And what it comes down to is we end up taking thousands and thousands of photographs. So because sometimes you're in the museums and the museums, the lighting is different or suddenly it's coming in this way or that way. So we're taking, you know, with flash without flash and using. Different camera settings to make sure that that final product. You can see the morphologies, the differences in the bones that are really important for identifying those species.

Megan Grebenauer [00:16:50] What has the response been like for the museums when you contact them and tell about your project and asked to come and photograph their collection? Are they supportive of it? Have you been in any resistance?

Heather Garvin [00:16:59] No, extremely supportive. And actually was really funny when I went to Washington, D.C., to the Smithsonian last time, I was going to collect data on birds and photographs on birds. And lo and behold, they had started a similar project years ago for bird species identification. And that just kind of fell through. It didn't get followed through, but they had photographs that they willingly handed over to us for this project. So that kind of cut back some of our time there. It's always nice when it works out. Yeah, yeah.

Megan Grebenauer [00:17:29] Beyond knowing that a bone, whether it's human, what information is really gained by knowing what species it is. Can you recall a certain case or certain instance where that provided some valuable information?

Megan Grebenauer [00:17:40] Yeah. So first of all, I think being able to identify the non-human species, what animal it is, really provides support and confidence to that determination that it's not human. When you tell that in law enforcement, they tend to believe you a little bit more when you're able to say it's not human. This is a pig versus just it's not human.

Heather Garvin [00:17:58] But I don't know what it is. So I think that's really important in building that confidence with those agencies. But there are some cases that in more means might be involved. I've had a forensic case in the past where someone had burned a body in their actual fireplace and then burned the cat as well because they thought that it would be disguising their remains in there and that we might not be able to differentiate what was human or what was non human in there. So it's hard to imagine the use because every case is just can be so bizarre and so unique. But there's also wildlife forensics out there, right. Say, you know, they have a bird skeleton. Is it a protected bird species or is it just your average species? Did someone happen to kill an eagle? So I think there's ways to expand this even beyond just the human versus non-human realm.

Megan Grebenauer [00:18:52] For listeners who, like me, may know very little about bones, what are the big picture, key characteristics that you're looking at when you make that determination initially of human or not human? What are the giveaways?

Heather Garvin [00:19:04] Yes. So your bones are shaped to be best adapted to what we do. And humans are pretty unique because we're bipeds. We walk around on these two legs. And so for that reason, our bones tend to look a little different than, say, a quadruped animal walking around because they have to function differently, the weights going through them differently. And so then all those muscle attachment sites on the bone are going to be positioned or shaped a little differently to help support those muscles and those actions

that you're doing. So a lot of it is just subtle changes in shape. So when we talk about morphology, really, we're just talking about shape differences, these features that are on the bones. So, for example, your femur, your thigh bone. You have these greater trochanters on the side of it where some of your glutes are attaching, to. And so in us, they're fairly small. In other animals, they go up much higher and might have a little hook to them. And so we're looking for these shape differences to help correspond to what species it is.

Megan Grebenauer [00:20:06] So are there certain bones then that are more discriminatory, like a rib versus a femur?

Heather Garvin [00:20:12] Yes. So the larger bones have more features on them and so they're usually easier to identify. So the long bones, you know, your arm bones, your humerus radius on the femur, your tibia. We have a fibula on the side of our leg. It's long, it's skinny. It doesn't have a lot of great features. And so it's not as good at doing that. But the other thing I forgot to mention when we're looking at human versus non is one of the first things that goes through my mind is size. So is it bigger than what a human is expected to be? Is it smaller than what a human is expected to be? Is that animal an adult and small versus a juvenile and small? And that's really why these measurements actually work when you're trying to separate these species.

Megan Grebenauer [00:20:54] So do you have a favorite bone? When like when someone tells you we found some skeletal remains, we want your help, is there something that you're crossing your fingers saying, man, I hope it's a this because that that would be, you know, nice and easy?

Heather Garvin [00:21:05] A favorite bone for non human. I don't think I do. The skull is the easiest because different animals. I mean, they have long snouts rate compared to us. And the teeth actually tell you a lot about an animal because teeth are formed by what you're eating. So are you an herbivore, an omnivore? So teeth can be really diagnostic. And so skulls tend to be pretty easy. I have elements I dislike such as ribs. Ribs are harder. There's not as many features on them. When you get to the risk bones, the carpals and the tarsals, they're harder to identify those non-human species. I can tell. They're not human. But beyond that, there's not a lot of pictures out there of these kind of elements.

Megan Grebenauer [00:21:44] You mentioned that you're initially focusing on North American, specifically North American mammals. Is that right?

Heather Garvin [00:21:51] Mostly mammals, a few birds and a few turtles in there as well.

Megan Grebenauer [00:21:56] How is osteoid curated? Are you in the co PIs the sole people deciding and looking at the images that are going in? Do you have any kind of a panel review board helping you out?

Heather Garvin [00:22:06] Yeah. So right now it's myself in the co PIs. The students are working on photos, shopping and editing those images. Then I go through them as their first review and then I send them the Rachel Dunn, the mammalian paleontologist, to go through them for a second review, make sure everything is correct there before we decide to put them on to that Web site.

Megan Grebenauer [00:22:25] So I imagine initially the Web site will be funded from your NIJ grant. What do you envision as the long term sustainable plan for this? Will it be a free resource? Will there be a pay for use? How is it going to be?

Heather Garvin [00:22:39] The plan right now is that this web tool will remain free. That's the whole idea of it. We wanted to be accessible by anyone. Even the public can use it when they find a bone out in the woods there. It's a fairly simple Web site designed. So the cost of maintaining it, if there's not large edits that need to be done, aren't very high. And when I wrote this grant, my university Des Moines University did agree after the grant is done to help maintain that Web site going forward.

Megan Grebenauer [00:23:08] How quickly do you think that you'll be able to expand it?

Heather Garvin [00:23:11] So the first thing we want to do is we want to get this up and live with those 28 species. The first time you do something, you're always going to find areas where you can improve and make things better. So our goal is once we can see how that's working the first time and how our species are lining up, and once we start getting feedback from users like I wish we had the species in there, then we're going to apply for other external funding. The use of this tool extends beyond forensics. So Zoo archaeologists or bio archaeologists they're working with more historic material is not forensically relevant material, but they're still having they do the same thing identifying these non-human remains. So we might try for NSF or other grants to expand it to include more species for them as well.

Megan Grebenauer [00:23:58] Do you anticipate there being like user submissions that staff at museums may send you their photographic collections on their own? You wouldn't have to go and collect them yourself. Are you going to want to be more hands on with everything that goes into it?

Heather Garvin [00:24:12] No less for work? For me, the better. I mean, the goal is to make this tool as optimal as possible. So on the Web site, there will be contact information where if anyone's willing to contribute data or photographs or 3D scans, we're going to include 3-D scans with this as well that they can reach out to me, will want to verify and make sure that what they're sending is valid and so forth. But then we can incorporate that in there.

Megan Grebenauer [00:24:37] So you mentioned earlier in our conversation here about the potential users of this and how there's so many different applications.

Megan Grebenauer [00:24:45] But one of them might be like your crime scene investigator who feels empowered by having this tool at their disposal. Are there any concerns about maybe people going a bit beyond their means and making determinations that they're not qualified to make and not calling in the forensic anthropologist when they should?

Heather Garvin [00:25:01] Yes, there are definitely going to be big disclaimers on there where if there's any chance in your mind at all that this could be human. Please contact your law enforcement. But really, the bottom line right now is some investigators, some people in the public that are just searching for bones are already making these decisions on their own from Googling and so forth and using unreliable material. I mean, our biggest fear would be that someone would find a human bone and determine that it's not human. So we're gonna make sure that human materials well represented in this. Now, if they find a pig bone and they end up saying that it's a cow bone, it probably won't have that much human impact forensically. But it still does come down to like you have to be confident that final's species identification is a visual ID done by that individual.

Megan Grebenauer [00:25:50] So how does that work with the human remains? You need a kind of special releases or are the privacy concerns associated with having photographic images of human skeletons in there?

Heather Garvin [00:26:00] Yeah. Not in this case. So, right. All the skeletons are from deceased individuals and they're the pictures are all coming from museums. So the museums have received our research proposals and have signed off on them. So the Smithsonian Museum, for example, has a Terry collection there. That's from the early 19th. Nineteen hundreds primarily. And so we're using photographs in those skeletons.

Megan Grebenauer [00:26:23] So that's an interesting point. Is there a large variation based on the time? I know people are getting taller. Things are changing. You need to have bones from someone from the early eighteen hundreds vs. now.

Heather Garvin [00:26:37] So you might have sized differences. And one year that's going to be incorporated with those measurements, right? So we're taking much more for the humans, we'll have measurements for over three thousand individual because I have previous data on humans that will go into this. So those measurements will incorporate recent and larger sized individuals. Now, the actual shape of our femur or thigh bone, for example, really hasn't changed because we're still walking around on two legs. We're still the same humans as we were back then.

Megan Grebenauer [00:27:05] Have you learned anything surprising during this process?

Heather Garvin [00:27:08] Well, I've definitely been able to update my skills. Looking at these animal remains, especially when you get to birds and turtles, had been a few years since I really sat down with those skeletons and go through them. And it's been great to talk to the curators as well, because we had a couple of turtle species. We decided we'd include it in there. And that curator and the turtle collection was able to tell us all, you know, when you expand, you might want to consider X, Y and Z species because a lot of people eat those turtles. And so maybe not forensically, but even bio archeologically, you might encounter them a lot more frequently since people eat those turtles and discard their remains.

Megan Grebenauer [00:27:49] And have you run into any hurdles?

Heather Garvin [00:27:51] Time. Time is our worst enemy. You have to estimate how much time all of this is going to take when you apply for a grant and things never seem to go the way you want them to.

Megan Grebenauer [00:28:02] So if you had to do it over again, would you have asked for more time?

Heather Garvin [00:28:04] Yes, definitely for more time. If we had to do it over again, too, I think I would explore further. So a lot of people come up to me and asked me about will it be an app? And I don't know much about making apps and so forth. And that's definitely direction we'd like to go that we can use it out in the field instead of just a Web site on your phone example.

Megan Grebenauer [00:28:23] Like I have one. If I see a flower that I want to know, you take a picture of it and within minutes or seconds.

Heather Garvin [00:28:29] Exactly unfortunately the way the grants work right is you submit for a certain project and you get funding just for that project. So the amount of funding we need to then turn that into an app, you would need to apply for further funding down the road.

Megan Grebenauer [00:28:42] So is that something you you think you would pursue with further funding proposal?

Heather Garvin [00:28:46] I think so. I think that could really increase the utility of it. I think once we can show that this works as a Web site and as a Web tool, it'll be easier to convince people to spend the money to turn it into an application after that.

Megan Grebenauer [00:28:59] When are you hoping that the Osteoid Web site would go live? What's your best case scenario?

Heather Garvin [00:29:04] Yeah. So we technically we have one more year left in this grant. And the ideal situation would be that it would be live at the end of that time. I am fairly confident that we will have a Web site up by that time, but may still be fine tuning it because a web developer there, not an anthropologist. So there's a little bit of back and forth between and making sure that things work the best that they can. So I think at that point we may still be fine tuning it. So maybe a year and a half.

Megan Grebenauer [00:29:33] So sometimes spring to summer then of twenty. Twenty one. Yes. When you think to have it ready to. Is this an all consuming research project this time. Do you have any other research interests that you're pursuing simultaneously?

Heather Garvin [00:29:44] I do. So the thing about being a forensic anthropologist is we have to apply so many different aspects of skeletal anatomy and skeletal research to these cases that we tend to have research and a lot of different areas. So I have research, you know, on this project looking at human and non-human species identification. I'm also on another NIJ project that just ended that was looking at creating new sex and age standards from some adult from kids remains.

Heather Garvin [00:30:14] And then really, as questions arise, as I'm doing my cases and I come across a question like, oh, I wonder if you could do this or I wonder if you could do that. All these little side projects start up. And I've been trying to get students involved in those and just got to follow them through to the end.

Megan Grebenauer [00:30:32] In your presentation, you mentioned that DFA results are going to be presented at AAPA, I don't know what other those acronyms are, could you spell that out for me?

Heather Garvin [00:30:44] So DFA stands for discriminant function analysis. And so with that metric data, I've already run some preliminary analysis. I want to see how well, just a simple. All they are are lengths and breadths of bone so that you, me, anybody can take these lengths and breadths. All you need is a ruler right. To take these measurements. And so we're taking 54 measurements per specimen. And at this point, we have over a thousand specimens in there. And what I want to see is based on those measurements, running some stats on them, statistics on them. Can a computer can the statistics tell me what species this belongs to? I have a bone here. I have a length and I have two breadths. Tell me what species it is. And that's what the discriminant function analysis does. It takes

these measurements into account. And it is how well can I classify the correct species based on these measurements?

Heather Garvin [00:31:39] And what we're finding I tested it on 21 different species so far and they're all medium to large sized mammals. So none of the small rabbits or anything like that. And we had six hundred and fifty two specimens in there. And if you see humerus or femur and just a couple of measurements, we're getting over 90 percent correct on this species identification out of those 21 species. So it's just a couple of measurements really can help you narrow down what species that may be. And so we're presenting those results at AAPA, which is the American Association of Physical Anthropology. And a lot of forensic anthropologists also belong to this association. And they have their annual meeting in April, actually back here in L.A..

Megan Grebenauer [00:32:22] I'm sorry, I'm stuck on the DFA results. You were mentioning there. Do you need to know what bone it is you're looking at when you put the, do you say that this is the measurements of a humerus?

Heather Garvin [00:32:33] Yes. But that's actually easier than you think. I've tested this out on undergraduate, no experience and also medical students before they've had any kind of skeletal anatomy. And if you're given a picture or a couple pictures of what a femur or a thigh bone looks like and you have a bone in your hand, it's easy to match up and say this is a femur. This is a humerus in general, even though we have these subtle differences in the shapes and sizes. A femur looks like a femur that looks like a femur across most taxa.

Megan Grebenauer [00:33:05] We're running near the end of our time together.

Megan Grebenauer [00:33:07] Are there any other final thoughts or things we didn't discuss that you wanted to mention?

Heather Garvin [00:33:11] Yeah. The one thing I only briefly mentioned was the 3D scans. So as part of this project, I also have a 3D scanner and we are making 3D models of these animal bones and we're putting them on morpho source. It's a free Web site that you can download these models that can handle the size of these models. So you could potentially, if you think you have, you know, a raccoon humerus, you can pull up the 3D model and rotate in and actually look at what it looks like or even download it in 3D printed and create your own skeletal collection as well.

Megan Grebenauer [00:33:44] You don't have to pay thousand dollars for a pig skeleton. You could download and print your own.

Heather Garvin [00:33:48] Exactly.

Megan Grebenauer [00:33:50] All right. Well, I think that's about all the time we have for today. I want to thank our guests, Dr. Heather Garvin, for sitting down with just science to discuss her NIJ funded grant. So. Thank you, Dr. Garvin.

Heather Garvin [00:33:59] Thank you for having me.

Megan Grebenauer [00:34:01] I'd also like to thank you, the listener, for tuning in today. If you enjoyed today's conversation, be sure to like and follow just science on your podcast platform of choice. And for more information on today's topic and resources and the

forensic field, visit Forensiccoe.org. I'm Megan Grebanauer and this has been another episode of Just Science.

Voice over [00:34:23] In the next episode, Just Science sits down with Dr. Carl Wolf from the Medical College of Virginia Hospital's. Opinions or points of views expressed in this podcast represent a consensus of the authors and do not necessarily represent the official position or policies of its funding.