

01/09/2020

## Ep64\_DrKimPlompBioarchInterview

00:00:10 **Chelsi**

Hi and welcome to the women in archaeology podcast, a podcast about, for, and by women in the field. On today's episode we are joined by Dr. Kimberly Plomp who is a bioarchaeologist and she's going to be talking with us about some of the work that she has done during her PhD as well as some of the more recent projects such as postdocs and an edited volume. Also on this episode is Emily one of our standard hosts and I'm Chelsi Sloten. I think I forgot to say that. Kim before we jump into specifics do you just want to give us a quick rundown of who you are and what you do?

00:00:50 **Kim**

Sure. So I'm Canadian. I did my bachelor's in anthropology and archaeology at the University of Alberta, and then I move to the UK to do my masters in human osteology and paleopathology at the University of Bradford. And then I went to Durham University where I did my PhD in archaeology and anthropology and my PhD focused on using methods called geometric morphometrics, which are a suite of shape analysis techniques. So they statistically test the differences and shape variation of objects. So in my case I look at bones.

00:01:32 **Emily**

Very cool. And you graduated in was it 2014?

00:01:38 **Kim**

I graduated 2013, long time ago now.

00:01:45 **Emily**

And where you at these days?

00:01:47 **Kim**

I'm at the University of Liverpool. So I did my first postdoc position at Simon Fraser University in Burnaby, Canada, which is right by Vancouver and then I'm doing a second postdoc at the University of Liverpool

00:02:02 **Chelsi**

and I know Schmorl's nodes, which was your dissertation topic is kind of your baby and you definitely want to talk about that and I want to hear more about that.

00:02:15 **Emily**

And I will definitely need a run down on what on Earth that even is. Like I know flakes not what, whatever node.

00:02:26 **Chelsi**

So what is a Schmorl's node? How did you get interested in Schmorl's nodes?

00:02:32 **Kim**

Well, a Schmorl's node is a depression that you can see on the surface of a vertebrae. So we can see it in archaeological skeletons, that's why I studied it. And it's actually caused by a herniation of the disc that's between your vertebrae. So, you know how the vertebrae are stacked on top of each other and in between is the soft tissue disc. Inside that disc is this jelly like substance called the nucleus pulposus. When you get a herniated disc the gel-like substance inside the nucleus pulposus herniates outside of the disc and it can go horizontally or vertically. So horizontally can go directly into your spinal canal and that causes the really sharp pain disc herniations that you've probably known people who have had that or it can go vertically and it can go directly into the vertebral body and bone will react to pressures like that. So the vertebral body will eat away a little portion of it to make room for this herniated fluid that's gone into the bone and it leaves a depression that we can then see in our archaeological human remains later.

00:03:43 **Chelsi**

So this is something that we could still potentially see in modern skeletons as well?

00:03:48 **Kim**

Yeah, we can see, you can see it on radiographs anything like that, you can see it. You can see the the pulposus actually herniating into the body.

00:03:58 **Chelsi**

and a radiograph is an x-ray.

00:04:00 **Emily**

And what would cause something like that to create the node itself? Because that sounds incredibly painful.

00:04:07 **Kim**

So the cause is not really well understood. A lot of back problems in humans, the cause or the aetiology isn't well understood. Back pain is actually one of the most common medical problems today and it is one of the main reasons for disability worldwide. I think it's the second most common reason for missing work as opposed to or secondary to the common cold and it costs the UK,

Canada, U.S., most countries- it costs them exorbitant amount of money in medical care and loss of work and economic costs but we actually don't understand what causes a lot of problems and even if we do know that trauma or certain movements or aging causes certain problems, or at least a certain problem, we don't know why some people are affected and some people aren't. So one individual might be the same age and do the same work as another and both will have very different effects on our spine. And this is what led me to looking into the spine, especially with Schmorl's nodes as I always thought that perhaps bipedalism, which is walking on two legs, is the form of locomotion that we have. Evolutionary speaking we developed bipedalism very quickly and for decades people have said the reason why humans have so much back problems, because we actually have way more back problems than any other animal including our closest relatives chimpanzees, gorillas, bonobos. So we have way more back problems than them and a lot of people said it's because of the pressures and the stresses that we put on our spine walking bipedally. So because we stand upright all of our body weight goes on to our spine especially our lower spine and this might cause us to have more back problems.

00:05:59 **Emily**

So it's all been downhill from there if idiot. darn evolution

00:06:07 **Kim**

So what I did was, I just ran shape analyses and I looked at the shape of vertebrae because I thought if there's something that's going to be a difference between me getting a back problem and you getting a back problem, and if it's related to bipedalism, then the shape of the vertebrae themselves might actually have something to do with it- individual variation in terms of what the shape of my vertebrae are versus what the shape of your vertebrae are and I found there was a really strong correlation between the shape of people's vertebrae and whether they seem to have this Schmorl's node or not.

00:06:35 **Chelsi**

Okay, so for our listeners. Can you give you kind of an idea of what normal variation in vertebral shape and sizes is?

00:06:43 **Kim**

So normal variation would be quite small. In terms of size, you know, a small female will have a smaller vertebra than a larger male. But in terms of shape, there's going to be very little variation that you can pick up with your eye, there might be some but it's not going to be something that is very obvious. But my methods pick up shape that we can't capture with our eyes. So it picks up some very subtle patterns in shape variation, differences and similarities

00:07:15 **Emily**

And are these nodes typically visible by the eye or do they need to require like these more intensive scans?

00:07:21 **Kim**

So the nodes are visible, but I was looking at the shape of the vertebra.

00:07:24 **Emily**

The shape themselves. Okay. Wow and so which populations were you looking at? Like what time in history? Where were they located? What kind of populations are you looking at when focusing on this issue?

00:07:42 **Kim**

So my PhD because I was set in England I looked at Medieval English populations and for my postdoctoral work, I've included populations from a bunch of different collections, including the Hamann-Todd collection in Cleveland, which is a documented skeletal collection of Americans from I believe the early 20th century, and I've looked at, I've included Iron Age individuals, people from China, from Egypt, from Nubia, from Austria, Denmark, and Greenland so my hypothesis that it's something to do with bipedalism means that it doesn't necessarily matter what time period I'm looking at because I want to see human variation as a whole and what I did after I found this correlation between vertebral shape and the disc herniation is I actually took the same methods and I looked at, I compared humans with the Schmorl's nodes to humans without the Schmorl's nodes and I compared them to the vertebrae of chimpanzees and orangutans.

00:08:52 **Chelsi**

Do chimpanzees and orangutan get Schmorl's nodes?

00:08:55 **Kim**

they can but they don't very often. So where we would get Schmorl's nodes say up to 75 percent of individuals can have Schmorl's nodes, prevalence rates change from anywhere from about ten to seventy five percent. Nancy Lavelle did a project and she looked at Schmorl's nodes in eight skeletons and found, I believe I'm on top of my head about two and a half percent in chimpanzee.

00:09:21 **Chelsi**

So is much lower prevalence rates.

00:09:26 **Kim**

Yeah and what I found when I compared the vertebrae of chimpanzees and orangutans to humans with and without Schmorl's nodes is that the humans with the Schmorl's nodes actually had vertebrae that were statistically indistinguishable. That means that my methods couldn't find a big enough difference between them to say that there is a statistical difference between them then they were actually statistically so I'm not saying very well but statistically indistinguishable from the vertebrae of chimpanzees, but they were distinguishable from humans without Schmorl's nodes.

00:09:59 **Emily**

Huh?

00:09:59 **Kim**

So the shape variation between chimpanzees and human vertebrae is very small, but what that relationship tells us is that the humans that have Schmorl's nodes seem to have more similarities in shape with the chimpanzee vertebrae than healthy humans do and my colleagues and I hypothesized, we call it the Ancestral Shape Hypothesis. So we hypothesize that the individuals that have the vertebrae that looks more similar to chimpanzee vertebrae actually have a more ancestral shape. So within normal human variation there's going to be individuals that are closer in shape with our ancestors. So our last common ancestor with chimpanzees. It has nothing to do with evolution, it doesn't mean that someone is more evolved or less evolved it's just human variation and within that there's going to be some individuals who look more similar to last common ancestor and perhaps at that shape that is more ancestral it was less well adapted to withstand the pressures placed on the spine during bipedalism and it might predispose individuals to have this condition.

00:11:05 **Chelsi**

That's really interesting.

00:11:06 **Emily**

That is fascinating and just out of curiosity when you're looking at like medieval populations or those that would have more stressors in terms of like back-breaking work- would you still see the same correlation or does one exacerbate this situation more than another or is it really it's just the shape of the vertebra that causes these things not necessarily the work being done?

00:11:29 **Kim**

So unfortunately, I don't have the information with the populations I looked at exactly what kind of work they were doing. The only thing that I can say is that there doesn't seem to be a difference between people that I can see from Iron Age up until the 20th century in terms of vertebral shape. So we can't pick out you know these are Iron Age individuals, and these are 20th century individuals. There's no population variation in that sense. And also there hasn't been an increase or decrease in

the amount of these lesions through time. So people have these lesions now and people had them back then so it doesn't seem to be something that's strictly limited to certain lifestyles because as we've changed lifestyles, we're still in effect the same

00:12:16 **Chelsi**

Ok so I'm gonna throw curveball at you because I don't know if you will have read any articles on this but maybe and I recently came across, as I'm teaching a Human Origins course this semester and I was looking at bipedal adaptations among various different primates for preparing course materials and in doing that I came across a paper from he's actually a chiropractor I believe. And he's talking about something being termed Millennial Spine, I don't know if you've heard of it, but it's basically doctors and chiropractors are seeing more and more individuals with herniated discs and severe back pain at a much younger age than previously and the thought behind why we're seeing more of that now is people spend so much time, you know sitting at their desk staring at a computer, staring at cell phone and that kind of head forward position is not correct or not morphologically correct, but like it puts strain on parts of our spines that are not designed to have strain but on them regular basis.

00:13:29 **Kim**

Yeah. Definitely. I have back problems and they're exasperated when I hunched over a computer all day.

00:13:36 **Chelsi**

So do you think there's a chance that you might start to be more Schmorl's nodes radiographically?

00:13:40 **Kim**

That I can't say. A lot of back pain is actually idiopathic, meaning that they don't really know what causes it. So a lot of individuals will have spinal lesions so those are the you know the issues you can actually see on the radiograph in the spine, but they don't have any back pain and then other individuals will have debilitating back pain and when doctors look there is no evidence for any kind of problem in their bones or their soft tissue so it can be quite hard to piece together the relationship between pain and what we're seeing in a clinical setting.

00:14:17 **Chelsi**

Okay, that's interesting.

00:14:19 **Kim**

Also pain, there's a lot to do with, in terms of perception of pain it has a lot to do with society, individualism, how someone experiences the pain themselves, and whether it's appropriate to

complain about the complainer not too. So it could be a difference in those things as well as a difference in posture and sitting and how we use our spine.

00:14:44 **Chelsi**

Well and I know that there's kind of an ongoing debate within the bioarchaeology of care, bioarchaeology of disability, about how much modern scholars can assume a particular theory of disease or boney tubercle or you know something that you're seeing in the skeleton, how much we can assume that impacted the life. So kind of what I'm getting from this is it you can say that Schmorl's nodes existed and that they're herniated discs, but we basically can't make any assumptions about whether or not that would have impacted the life of the individual.

00:15:22 **Kim**

Exactly.

00:15:22 **Emily**

Okay, so it doesn't necessarily ensure that that individual would have been in pain.

00:15:27 **Kim**

No, it doesn't

00:15:28 **Emily**

Like you could have the nodes without being in pain?

00:15:30 **Kim**

Exactly. Yep.

00:15:31 **Emily**

Oh that is fascinating. And so it's hard to kind of make that leap. If you have all these folks with nodes like oh you have a entire Township, that would have been complaining about their backs

00:15:43 **Kim**

No exactly so I think, personally all we can do is look at the clinical literature, find out the correlation between perceived pain and reported pain and presence of certain lesions and then when we look in the archaeological record, and we look at a population and we find the prevalence rate of the same lesions, then we can say okay well, maybe 40% of them probably experience back pain at some point, but we wouldn't necessarily be able to point to who.

00:16:14 **Emily**

okay, that's interesting. And with the the nodes do you usually see other issues with the spine as well? Like it's like more compounds with that or is it just it's really a case by case.

00:16:27 **Kim**

It's really case by case. There's a lot of problems with the spine that relate to aging such as osteoarthritis, but Schmorl's nodes actually effect, seem to affect younger adults more often. So it also depends on when the individual dies, if they died as a young adult they may have schmorl's nodes and no osteoarthritis, but if they had lived longer than they might have developed osteoarthritis as well.

00:16:53 **Emily**

There's that sad pride of it like with the... It's like oh if only we had a bigger, you know population of certain aged individuals like oh wait, no, that means that people would have had to die younger. That's yeah...

00:17:08 **Kim**

That's one thing. I found interesting with my project with the evolution of bipedalism and back pain. I'm hoping to expand it to look at beyond just Schmorl's nodes I'd like to look at it in a clinical setting with disc herniations that we know that cause pain as well as other lesions in this spine. And what interests me is that evolutionarily speaking back pain is not going to be something that necessarily affects your fitness. Fitness being be your reproductivness so something like catching tuberculosis when you're young and dying before you had a chance to have kids that affects your fitness but having back problems, if you keep going and keep beating yourself and your family keep reproducing it's not necessarily going to affect your fitness. So it's not necessarily something that's going to be a disadvantage to us in terms of evolution

00:17:59 **Chelsi**

That is very interesting and it's also making me me think of, there's a famous among bioarchaeologists and oft-quoted paper on the Osteological Paradox and in there their talking a little bit about the fact that this tends to affect younger individuals. it made me think, you know, but what else might be seen on their their skeletons because often times when we see older skeletons that they're very ill or they have a lot of evidence of having disease or a hard life people want to say- Oh, well, these individuals must have been really ill, really sickly but the fact that they have survived long enough to have the evidence on their bones actually suggests they were relatively healthy and they lived with the condition for a long time.

00:18:46 **Kim**

Yes. Exactly.

00:18:48 **Chelsi**

Right and I'm now looking at the clock and realizing that we're pretty much at the end of our first segment, but if you wouldn't mind talking a little bit about that at the beginning of our next segment, that would be great.

00:18:57 **Kim**

Okay, perfect

00:18:59 **Ad**

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00:19:35 **Chelsi**

Hi and welcome back to the Women in Archaeology Podcast. On today's episode we have been talking with Dr. Kimberly Plomp about her work with schmorl's nodes, which relate to herniated discs. And the end of the last segment we were getting into the osteological Paradox a little bit. So Kim if you want to just touch on how your work relates to that?

00:20:00 **Kim**

Sure. So when I'm looking at archaeological human skeletons, there might be younger individuals who have spines that don't show very many problems whatsoever and there's going to be older individuals who spines are just a mess. They're going to have tons of osteoarthritis. They're going to have disc herniations. It's just going to look very painful. And so initially what your interpretation wants to be, is that the older individual is less healthy because they have so many problems. But in reality they survive to that age to develop all those problems where the younger individual died young and so they were probably the unhealthy one depending on how they died.

00:20:44 **Emily**

It's like the reverse of what you would expect in the archaeological record.

00:20:50 **Kim**

Exactly. So for example, the plague, we don't see evidence of the plague on skeletons because it killed people too quickly but diseases like tuberculosis or leprosy that you can survive for a long time- we see evidence on the skeleton for that. So you might find a plague ditch and everybody in

their looks perfectly young and healthy and then in another cemetery you find individuals that are quite old and show really horrendous problems all in their skeleton that indicate tuberculosis or syphilis or something like that. And in reality that person survived that long even with those conditions, so even though the bacterium was ravishing their body and probably made life miserable. They survived it for that many years that it actually left evidence that we can see on the bone.

00:21:52 **Chelsi**

If anyone is interested in learning more about and the plague stuff that Kim just mentioned Sharon DeWitt has done some really interesting research on that. Just like some future reading. That was a really good summary Kim of the Osteological Paradox

00:22:08 **Kim**

I appreciate that.

00:22:09 **Emily**

I was just curious. So when we're looking at those impacts on the skeleton, just out of curiosity and I apologize if this is out of your purview. I'm just curious how would then archaeologists know that they have a plague pit if it's not leaving any impact on the human remains themselves? Is it usually just like inference in the time frame, like well it was probably the plague because there's this many people and during this timeframe.

00:22:36 **Kim**

Yeah, exactly. So it would have more to do with the strangeness of the burial. So group burials like that would be abnormal in medieval Europe where Christianity dictates that people have single burials in a certain alignment with headstones and a churchyard. So to have mass graves dating to the 13th century or so or 14th century indicates that was likely going to be the plague because they had so many dead bodies at one time that they needed to just bury them. They couldn't give them the proper Christian burial that they would have wanted to at the time if people were dying at a more normal rate.

00:23:19 **Chelsi**

There are also occasionally historical records that will mention that there were plagues in certain places at certain time periods and you can use the historical records to kind of triangulate some of what you're looking at. It's not always the case, but it's nice when it happens.

00:23:37 **Kim**

There might be times also where you know a certain battle or war took place and you might find a mass burial there, but they're going to likely have trauma on the skeletons that you can relate to warfare and it's going to be where the historical battle took place and you put those together.

00:23:55 **Emily**

Are there historical records that note back pain?

00:23:58 **Kim**

I believe so. I haven't looked into that very much. It's a good idea though, but my instincts would say that back pain probably although would have been annoying on a day-to-day basis when you're living with other problems in the world that they would have had at that time. It probably wasn't a huge for fear

00:24:15 **Emily**

Plague, warfare...

00:24:17 **Kim**

Yeah, but there are there are you know in some literature and in some paintings and whatnot. There are indications that they did suffer from back pain.

00:24:27 **Chelsi**

So you mentioned earlier Kim you occasionally have some back pain. I don't know if that influenced your interest in Schmorl's nodes or Emily was asking in the break about kind of how you got interested in bioarchaeology specifically?

00:24:41 **Kim**

Well, I've always weirdly been into dead things. When I was younger I said dead things are really cool.

00:24:48 **Chelsi**

exactly...from the other bioarchaeologist.

00:24:51 **Kim**

From as long as I can remember I wanted to be a paleontologist. And my plan was to be a paleontologist and then do archaeology as a hobby because at that time I thought that that was a possibility and when I went to U of A for my undergrad I took some paleontology courses and they were interesting but my biological anthropology and bioarchaeology courses were just absolutely

fascinating and the idea that you can look at human skeletal remains and be able to provide so much information about what life was like in the past that really just fascinated me.

00:25:24 **Emily**

That's really cool, and just, one of my students actually asked me this this week and I think it'd be a good thing to explain to listeners as well. Like what's the major difference between bioarchaeology and forensic anthropology since both deal with dead people essentially.

00:25:39 **Kim**

So the main differences are the questions involved and the time period. So forensic anthropology would deal with cases that are about, some people say it has to be younger than 50 years since death, some people say a hundred since death, so it depends on who you're asking but the idea is that if someone has died and you find their body, if that was to be done in suspicious circumstances anybody that would have emotional attachments to the body- so a close family member or friends- are no longer alive. And also if there, if it was a murder the murderer is probably no longer alive. If it's been that long then it would be classified as archaeology. If there is a chance that, you know if someone died when they were 20, and it was a chance that the murderer was also 20 and so they could be alive still then that's forensics because the question, you know, the answer to the questions that you'd be looking into of who are they, sex, age, identificatio, how did they die? All of that would be relevant to people living today on an emotional level, on a personal emotional level whereas once all of that is gone and nobody really remembers that person and nobody can be taken to trial or punished for the crime then it starts to become archaeological.

00:26:59 **Emily**

That's a great explanation. And I think it can be said for probably all three of us is like we don't like just dead people stuff or just dead people. We like particularly OLD dead people's stuff [muffled laughter and agreement], and I don't know if that makes us sound stranger or more eccentric or not, but like no, not current dead people, old dead people.

00:27:19 **Kim**

Exactly. So the skills are actually the same in terms of aging, sexing, looking at pathologies- so disease or injury on the body- looking at cause of death. The only difference is that in archaeology you're not necessarily trying to identify the individual unless it's cases like with the Richard the Third that was in the news a couple years ago where they actually wanted to be able to identify the individual; whereas forensics the main lead is to identify who the person was and find out how they died. So a lot of the skills are the same, but you're putting them on to answer different questions

00:27:58 **Emily**

and I get, I apologize for a topic shift, but it just made me think about like since there are so many topics in bioarchaeology if you had to study something else other than the the nodes, what do you think would be your your next topic of interest or if you even just for fun? What would you be interested in studying next?

00:28:18 **Kim**

Well, actually I'm working on a different project now. So my first post doc was on the evolution of the spine and how that influences back pain and right now, I'm actually working on, I have a Marie Curie Fellowship that

00:28:30 **Emily**

Oh Congratulations!

00:28:32 **Kim**

Thanks. It's almost done though. And what I'm looking at is I'm using my same methods and I'm looking at the shape of human crania and face to try and map migrations of people in northern Europe in the early medieval period and Viking age, so I want to see, I want to look at individuals in Iceland and to compare them to individuals from the same time period of those from the British Isles and from Scandinavia to identify who founded Iceland. So right now most evidence is pointing to it being Scandinavian men that stopped off in Ireland, picked up women, and then carried on Iceland and founded Iceland. So I wanted to see if the cranial shape of the founding population shows that. So women would look more like people from the British Isles, men would look more like people from Scandinavia and I'm also looking at Anglo-Saxon burials in the United Kingdom to see if we can identify who's actually buried with an Anglo-Saxon burial. Was it only the Saxons that came in that got Anglo-Saxon burial rites or were indigenous britons adopting that culture?

00:29:42 **Emily**

That is so cool.

00:29:44 **Chelsi**

And that will be really interesting from the Scandinavian perspective as well because there's been a lot of debate among Viking scholars about how can you identify a viking grave because when the Vikings went to the UK they really did assimilate rather quickly and the local population also started picking up some Scandinavian customs. You'll occasionally find tortoise shell brooches and things so if you had a morphological way of saying these skull states are more similar to Scandinavians versus the contemporary British population, that would be really interesting.

00:30:35 **Kim**

Yeah. Hopefully, I'm collecting the data for it now and I'll hopefully start analyses in the next few months and hopefully it works. There's a reason, there's other studies that have used the same type of methods on different populations and shown that it has a potential to work and if so, then I hope, I think it could help ancient DNA analysis because a lot of times people want to look at relatedness and populations and either don't have money to run all of the ancient DNA analyses that they would want or the collections won't allow them to take destructive sampling. So if you were to use that in conjunction with these methods which are non-destructive, I don't take anything from the bone, then that actually might help studies that look at relatedness between populations in the past.

00:31:31 **Emily**

That is fascinating and so did you go to, are these collections in Iceland and in the UK and so forth. Are do they tend to be within one collection?

00:31:41 **Kim**

No, they're all around. So I've been to Iceland and Denmark and a lot of places throughout Britain and I'll be hopefully going to Norway in April.

00:31:49 **Emily**

Oh, that's so cool. It's wonderful when research can let you travel as well.

00:31:54 **Kim**

Oh, yeah. It's been great for my spine project. I actually, a paper that is under review right now includes vertebrae from fossil hominins which are on the same branches as us after we split from chimpanzees, after we split from the last common ancestor with chimpanzees. Sorry. So they are more closely related to us than we are to chimpanzees, some of them maybe our ancestors. So I've included them in the analyses and so that allowed me to travel to amazing places like Uganda and South Africa and Israel to actually look at the fossils and that was amazing. That was beyond what I could have hoped for when I was 7 years old and choosing this line of work.

00:32:34 **Emily**

I'm in the wrong field of archaeology [laughter]. It's like I want to go there too. Even though you said you haven't started the intensive analysis yet, have you seen anything that is already surprised you when gathering your your research information?

00:32:52 **Kim**

No, not yet. I had a student. Her name is Lucy Timber. She's actually doing her masters at the University of Cambridge right now. She did her undergraduate dissertation on, I gave her scans of crania from individuals from a pictus, a Scottish pictish monastic cemetery. And then the Romano

British Cemetery in London. And so she used my methods, the methods that I use, on those two skulls to see if she could identify differences between what should be very closely related populations. They're separated in time and geography but not as much as different, you know Scandinavia to Britain or more widely dispersed populations like that. So my hope was that if, when she run this proof of concept study, we would actually be able to identify statistical differences between the two populations, and she was able to. We've put a paper together that is under review as well. So hopefully that gets put through and hopefully she's doing a PhD in Liverpool. Hopefully soon.

00:33:58 **Emily**

Keep working together.

00:34:01 **Chelsi**

It's always been you know that your research methodologies are panning out, to have that kind of pilot study. Like okay, this is worked.

00:34:10 **Kim**

Yeah, exactly. Like there have been studies that you've used similar, used the methods on and looked at populations from different countries and found that they were seeing differences, but I wanted to see if we could use it, because if we could use it for even closely related populations that would increase the benefit of the methods even possibly for forensic anthropology where if we got a big enough data set of different individuals, so we had this widespread dataset of human variation, then perhaps that would help identify ethnic background of people who are found when they're completely skeletonized and there's no soft tissue to be able to identify ethnic background.

00:34:51 **Emily**

That is so cool. Is there any, out of curiosity Chelsi and Kim, any crossover in both of your research? So it sounds like there's some similar populations you both are looking at

00:35:02 **Chelsi**

Yeas, so it was actually kinda funny. I was in Denmark over the summer as most of our listeners should know and had been told that you know, a researcher was coming to do some photogrammetry scanning things but it was not given a name and I didn't think to ask. I was just like "great another bio person" and I walk into the lab one morning and there's Kim and I'm like, "oh I haven't seen you in you know 7 or 8 years", but I did my masters at Durham when Kim did her PhD. So there was some overlap there, the last like two weeks of my data collection period. It was great time have a familiar face.

00:35:41 **Kim**

Yeah, in bioarchaeology, there's about a degree and a half of separation compared to the usual six.

00:35:50 **Emily**

It's an even smaller Community than you'd expect in archaeology.

00:35:53 **Kim**

Yeah.

00:35:54 **Emily**

That is so cool. Is there anything you guys think where you'll have crossover where you'll be using each other's research? Or is there enough of a difference in terms of what you guys are studying. I'm just curious how that all comes together

00:36:07 **Chelsi**

I will actually say that I will a hundred percent be using Kim's research. I actually identified individuals with Schmorl's nodes from the Viking Age in the Danish population and will be referencing Kim's work for the identifying factors for schmorl's nodes

00:36:26 **Kim**

Yay and those individuals of probably included in my paper that's in review because I went to Denmark for that data collection as well.

00:36:36 **Emily**

That is so cool. I love it when you get cross over like that, like I can use this, you can use this and it's all helping each other Horay.

00:36:43 **Chelsi**

Yeah, Kim and I also talked a little bit while I was in Denmark about the photogrammetry software it she is currently using for her study. I am very interested in some of it's applications as well as the speed with which it's been adopted, I guess by the archaeological community versus the amount of testing that has gone into identifying the amount of error based on different programs, what different cameras you're using, that sort of thing. Maybe hitting her up about a post-doc in that sort of thing.

00:37:23 **Kim**

Ooo interesting

00:37:23 **Emily**

That is so cool. And yeah photogrammetry it's amazing and I honestly had not thought about it in terms of using it with skeletal remains because I've primarily only seen it used with artifacts and that's probably because the work I do in the United States, you can't have images of human remains. So it's amazing you guys can create these really unique scans of these individuals. And so when you're looking on them and the computer, are you able to do like the full 3d turn around and like is it almost as good as being able to handle the remains themselves?

00:37:58 **Chelsi**

So that's a big question and we are at the end of 20 minutes. So maybe we jump on that in our next segment.

00:38:04 **Emily**

Okay,

00:38:04 **Kim**

Excellent.

00:38:05 **Chelsi**

See you after the break

00:38:07 **Ad**

During this break why not check out the women in archaeology blog and see the types of posts we've been putting up over the last two years. We've been discussing many different types of topics from surveys that have been done in the field on what archaeologists are experiencing, all the way to subjects that interest us at this time. You can also see the backlog of episodes and it's also a way you can contact us about your interest in the episode and in topics you would like us to cover sometime. Thanks for listening.

00:38:43 **Chelsi**

Hi and welcome back to our listeners. On today's episode we're joined by Dr. Kim Plomp. We've been talking about some of her work with schmorl's nodes as well as photogrammetry and kinship studies based on cranial measurements. Kind of at the end of the last section Emily you had a question. If you want to just recreate that for us real quickly?

00:39:08 **Emily**

Sure. I was curious with with the work of using photogrammetry and creating these beautiful scans and what not using all these photographs and you're getting this 3D image. Are they almost as good

as being able to have the actual individual in front of you? So like if you had to study it again later, or you forgot to get some measurements. Are these images you're getting almost as good as being there?

00:39:36 **Kim**

So photogrammetry when I complete a skull I can put a mesh on top of it that makes it look exactly like the skull. So any kind of discoloration or you know a tooth cavity, any kind of pathology I can see on that image. So in terms of that yes as well for measurements, although Chelsi's correct that we haven't completely tested the accuracy and error of that, we would be able to use them just as well as the crania in real life. What would come into question would be, for my methods, if I were using these shape methods that look at very subtle differences, and if I was looking at taking on marks on the actual skulls and then taking landmarks on the scans and putting them together that might cause error and actually I have a paper in prep that's going to discuss that but if I were to look at only all the skulls, the error should be small enough that what I'm picking up in terms of different populations, different sexes, different that is going to be larger amount of variation than what the error would be caused by having this scan as opposed to the real one. My colleagues have tested the difference between using photogrammetry and using laser scanners and they found that they're comparable so you can take images that you've gotten from photogrammetry and you can take images that you've gotten from using laser scanners and you can put those together in a dataset and that was published in the Journal of Archaeological Science if anybody wants to go look that up. One thing. I really like about using the photogrammetry, especially with something like cranial heads of archaeological collections is that not only is it non-destructive, but it actually creates a digital archive of the bone. So if something were to unfortunately happened to the bone, someone were to drop it, or to break we would then have a high-quality, three-dimensional image of that skull. Another thing too is that as we, bioarchaeologist with this large increase in students and professionals in the field, which is great, but it means that there's more students going to these collections for their studies, for their research, more postdocs are using them, everybody is coming to use these and so they're being handled more and more and so if we can kind of cut back on that and if someone can use digital copies instead of going to the actual collections and handling them. It actually might cut back on this direct one-on-one contact with the remains which are obviously invaluable and irreplaceable. It also could allow for researchers from different countries who may not have the funds to be able to travel to somewhere like Denmark for a few weeks and do data collection. So once I'm done my project, I'm going to make all my scans Open Access that's going to be up to, a lot of it to the museums. So there's some museums that won't want it to be open access. So what I'll do is I'll give them the scans of the collections that they house and then people can come to them to ask and they can use their discretion whether they release them or not. And there's some museums who are fine with me just releasing it. So once I'm finished there's going to be open access and so researchers will

be able to use them for as long as this technology is available and used. I think that's a really helpful thing for archaeology in particular.

00:43:29 **Chelsi**

Yeah, I think you made some really good points in regards to the digital archive and the accessibility of the scans is really important and there are some cases in which the 3D reconstruction is good enough, you know and you can get the information off of it. There will be some other situations, I do some work with enthesal changes, which is where muscle attachments are. An enthesis is a muscle attachment on your bone and for looking at that it's kind of done on a grade or a scale as to how and you know, intensive and robust the changes are that you're seeing and for some of the higher end of that scale you will be able to see them from a scan but some of the smaller numbers are not just a visual assessment. It is also a kind of textural assessment, so it is important to have the actual bones in front of you because you can't feel it if it's on screen, you know, you might not be able to pick up on it. And then, as well if you do end up printing them the texture of whatever material used to print the bone may also impact your ability to identify those features.

00:44:49 **Kim**

Yeah, exactly. There might be a point in time with the, I mean the technology has advanced so much in the last few years that there might be a point that we reached a stage where that can be done. But yeah, I agree with you right now looking at those type of features or you know, a minor infection on the bones that leaves just a little bit of evidence on the bone might not be easily recordable on scans.

00:45:14 **Chelsi**

Yeah, and I think the best bet, you know, what I was talking about earlier about kind of managing the error bars or identifying the error bars. One of the reasons that I think is really important to get that baseline level of understanding of what the errors are, what causes that, you know different, different cameras, different resolutions, that sort of thing. If we have that information and it's really like solidly established it does make it easier for the technology to advance and for us to figure out what these scans can be used for and what they are not so useful for.

00:45:55 **Kim**

yes, I agree.

00:45:57 **Chelsi**

Yeah. We'll figure it out because said more and more people are being interested in photogrammetry because it is relatively inexpensive compared to 3D scanners and it doesn't require power source and are many many good things about it.

00:46:12 **Emily**

And I think it's really cool when, I mean I've seen it when museums are trying to create virtual museums for the public and I just I think it's such a unique tool. Like if you can't, at least if you can't go see something at least you're getting something much better than just a photo.

00:46:29 **Kim**

Yes. Exactly. The University of Bradford has a cool program called digitizing diseases where their making scans of a lot of their pathological examples in their collections.

00:46:41 **Chelsi**

Cool, I didn't realize they were doing that.

00:46:43 **Kim**

Yeah, something like that is good for teaching as well if you could get access to them and use them for teaching because there's a lot of times, you know doing a bioarchaeology course in the UK we're quite lucky to have collections that have a lot of these leprosy, tuberculosis all these different pathologies. But in Canada, we don't have that. We don't really have access to skeletons like that. So you may not be able to see actual examples, you might just be limited to what you read in books and articles so being able to bring up a three-dimensional scan might give the students a better idea of how these things affect the bone

00:47:25 **Emily**

that sounds like a really cool, cool project and endeavor, it makes me want to go check out their website see what they already have up.

00:47:32 **Kim**

Yeah. It is cool

00:47:33 **Emily**

and speaking of research and articles and books whatnot. We would love to hear about the book you're editing.

00:47:41 **Kim**

Oh, yeah, so I'm quite excited about it. I am co-editing a volume with Charlotte Roberts, Jillian Bentley, and Sarah Alton. All three of them are at Durham University. Charlotte Roberts is in archaeology and Sarah and Jillian are both evolutionary anthropologists. The book is kind of exactly how I want my research to go. So I like bioarchaeology and disease in the past, but I would like to

use my research to answer questions about things that bother us today. So that would be my interest in the back pain. So the book is called *Evolving Health: paleopathology and evolutionary medicine* and there's about 17 chapters from different authors in fields, each chapter is authored by people in archaeology paleontology, and then also somebody in biological sciences, Health Sciences, evolutionary anthropology so we're going to, each chapter is going to have more than one viewpoint and they're going to discuss health issues and how paleopathology can actually help provide information and insight into conditions that are relevant for evolutionary medicine today. Evolutionary medicine is becoming more and more recognized as an important part of medicine and medical training. So I think that by combining the two and being able to say this is how using paleopathology information to help provide answers to questions of evolutionary anthropology and medical problems today. And then also taking evolutionary theory, evolutionary medicine and applying that to questions that were using in paleoanthropology or sorry paleopathology and our research in paleopathology how combining the two can actually strengthen the research that has been undertaken.

00:49:29 **Chelsi**

That sounds really cool.

00:49:30 **Kim**

Yeah, hopefully. The proposal has just been accepted with Oxford University Press so it'll probably be about a year and a half before it's out. But I'm pretty excited to get it started.

00:49:40 **Chelsi**

Congratulations on that! It's a big achievement to have an edited book accepted.

00:49:46 **Emily**

And are the chapters from scholars all over the world are primarily in the UK?

00:49:52 **Kim**

No, there's authors from all over the world. So when we approached authors, we looked at their research and topics and then a lot of times we even put authors together that didn't know each other beforehand, which is pretty cool. I think it's really cool that they've agreed to do that. So they're actually working with new people on a project so, you know someone who looks at cancer in medical research and then someone looking at it in bioarchaeology, they're coming together with their different viewpoints, different backgrounds, different experiences, and they're going to write a chapter on using the bioarchaeology of cancer and evolutionary theory to tell us what we know about it now and how we can use that information in modern evolutionary medicine looks

00:50:41 **Emily**

Nice

00:50:41 **Chelsi**

It seems like such a Charlotte Roberts project, right because she started out in the medical field didn't she?

00:50:47 **Kim**

Yeah she was a registered nurse. That's why when I came up with this idea for this book, I went directly to her cause I knew that she would be not only incredibly supportive, which she has been, but that she would like this idea and I thought it would fit her portfolio quite well.

00:51:05 **Chelsi**

Yeah for sure. Well, I'm definitely looking forward to reading, it's a great idea.

00:51:10 **Emily**

I hope the the women in archaeology group can potentially do a book review. Maybe...

00:51:15 **Kim**

Yeah, that'd be great. I mean all all for editors are female so

00:51:19 **Emily**

Excellent

00:51:19 **Chelsi**

So it looks like we've got about five minutes left in the last portion of today's show. I don't know if there's anything else that you want to touch on Kim?

00:51:30 **Kim**

hmm that's hard to say, I guess since this podcast is aimed towards women in archaeology, hopefully males are listening as well, but I would just say that if you are a female in archaeology and you feel uncomfortable or inadequate or something like that just to reach out to somebody else in the field even, even if you don't know them, send an email, talk to them, supporting each other in what has historically been a male-dominated field is quite important and I think podcasts like this and movements like this can quite help especially with it being a field-based discipline. There unfortunately can be issues with sexual harassment, sexual abuse comes up as we saw a couple years ago with all the stuff that came to light. I won't name names, but I'm sure everybody's heard about it.

00:52:24 **Chelsi**

Well and we have some episodes that discuss that and might name some name's.

00:52:30 **Kim**

Good. I mean I guess what I want to say is that it's important to keep that conversation going and for women in the field, whether you're you know, established in the field or new to the field to find people, other women that can help support you and fight for you and you're not alone and you don't have to put up with it.

00:52:56 **Chelsi**

Yeah, and I think that's a great point to make. We do have some resources for that and as always people can email us at [womeninarchaeology@gmail.com](mailto:womeninarchaeology@gmail.com) or we're on Twitter and we have a blog and we're happy to support people where we can. You know it was kind of the point of this podcast to increase female representation and provide a space for female archaeologists to have conversations.

00:53:24 **Kim**

Exactly and most people in the field are supportive, wonderful, enthusiastic, lovely people.

00:53:29 **Emily**

And we don't mind being bothered

00:53:31 **Kim**

and just like pardon?

00:53:33 **Emily**

Just that none of us usually mind being bothered via email

00:53:38 **Chelsi**

We love hearing from people when you email to be honest. It's all about helping out, you know those connections in the community? That is so important to archaeology.

00:53:47 **Kim**

Yeah, exactly. And there's a lot of things that you, you know as a student or someone just coming into the field that you're not necessarily taught and we've all learned by trial and error kind of blindly walking through it and sometimes you're lucky enough to have a supervisor who will explain it to you. But quite often we don't have much, so always just reach out and ask somebody because

most people are more than happy to share their experience that will help you believe you're not quite so much in the dark as we were.

00:54:18 **Chelsi**

Yeah, for sure that is a very good point and hopefully some of our podcast episodes, even if you don't necessarily want to ask the question of someone, they can maybe provide the answers.

00:54:32 **Emily**

Yeah, that's the fun thing to about this podcast. So I mean Kim I have never met you but now I've virtually met you and I've never met Chelsi in person, although we have talked a lot. And so I think the more and more outreach we can do and talk to folks, hopefully not only they're going to learn some stuff about like bioarchaeology, but hopefully they'll be like, yeah this the communities pretty friendly.

00:54:55 **Chelsi**

Yeah for sure. For me I'm really looking forward to the the SAA's that are coming up in April because I will finally get to meet you in person

00:55:07 **Emily**

Kim hopefully if you're ever in back in the States, hopefully I'll get to meet you too, because that would be...

00:55:13 **Kim**

Yes. Sounds great. I usually go to conferences. This year I'm sitting in most out though because I don't have my new data yet but next year I'll be hitting them all

00:55:21 **Chelsi**

Kim is amazing though.

00:55:23 **Kim**

Well, I think it's amazing you guys put this together

00:55:26 **Emily**

It's fun. Come find us at the Society for American Archaeology. We'll be running around with pins and stickers and whatnot.

00:55:33 **Chelsi**

Definitely. Probably do a live recording as well with all of us sitting in one room, which will be novel.

00:55:41 **Emily**

Yeah. Exciting

00:55:42 **Chelsi**

Well that just about brings us to the end of the episode. So Kim, thank you so much for coming on today. It was absolutely fascinating getting to talk to you.

00:55:52 **Kim**

Thanks for having me

00:55:54 **Emily**

And good luck with all of your research and analysis and congratulation on your on your grants and fellowships and whatnot. That's wonderful all the stuff you're doing.

00:56:03 **Kim**

Thank you.

00:56:06 **Chelsi**

So thank you so much for being on here. And please subscribe to the women in archaeology RSS feed and we'll see you next time. [all: bye]