

## Content Warning

Camila (she/her):

Today's episode deals a lot with death; specifically, the study of ancient dead bodies. Towards the end we get pretty in-depth about child sacrifice in the Incan Empire. If you find that disturbing, we'll give you a heads-up when we're about to discuss it and let you know where you can skip to to avoid it.

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## *Cocoon Transit - Blue Dot Sessions*

Cindy (she/her):

Think of the stories that your body could tell. The seam in your bone from a now-healed break. The stretch marks from a childhood growth spurt. The fillings in your teeth that will forever represent an excruciating visit to the dentist. So many of our lived experiences are captured in our bodies, and some of them stick around much, *much* longer than we do. Long before the invention of writing, our bodies have been recording stories for future generations to uncover. Today, we talk to the skeletal sleuths who study these corporeal chronicles.

## *CTOR jingle*

Cindy:

Hello and welcome back to Carry the One Radio, the science podcast. I'm Cindy.

Camila:

And I'm Camila. Today's episode is an exploration into our collective pasts - or rather, *how* we explore the past. We're digging deep into a subset of anthropology known as bioarchaeology.

Cindy:

We'll examine the kinds of approaches our guests use in their studies,

Camila:

and most importantly, how personal and cultural perspectives can impact findings and interpretation.

Cindy:

Um, I actually think the most important question is, what do actual archaeologists and anthropologists think of "Indiana Jones"?

Ben (they/them):

My name is Ben Schaefer. I am a queer PhD candidate at University of Illinois Chicago and the Field Museum of Natural History. But I hold a lot of hats <laugh> and so, currently I'm a research assistant for the Center for the Recovery and Identification of the Missing. But then on

top of that I'm a visiting lecturer at Brandeis University in Boston, which is, you know, very much not the "Indiana Jones" way.

Trent Trombley (he/him):

My name is Trent Trombley. I am a PhD student in the Department of Anthropology at UC Berkeley, but I'll be finishing in just about a week or so and starting as, uh, Assistant Professor of Anthropology at Augustana University in Sioux Falls, South Dakota. I'll - I'll fully disclose, um, maybe guiltily, that I liked the "Indiana Jones" movies as a kid and dressed up as Halloween. I kind of regret that now <laugh>, based on some of the ethics of the movies.

Jordi Rivera Prince (she/her/ella)

My name is Jordi Rivera Prince. I use she/her pronouns, also ella in Spanish and I'm currently a PhD candidate at the University of Florida in Anthropology, but I specialize in bioarchaeology and mortuary archaeology. I also never saw "Indiana Jones", and that's not how I got into it. I don't identify with Indiana Jones.

Camila:

Okay, well, there you have it, folks. Our expert panel of Ben Schaeffer, Trent Trombley, and Jordi Rivera Prince resoundingly agree that Indiana Jones is not exactly a fair representation of their fields.

Cindy:

Well, I had been thinking of naming this episode "Indiana Bones"...but now I think that might be a little problematic?

Camila:

That's probably a good instinct.

Cindy:

Okay, well, let's jump right in – what *is* bioarchaeology and why is it so important to study?

### *Sudden Courier - Blue Dot Sessions*

Camila:

Trent mentioned that he'll be an assistant professor of *anthropology*, even though he's one of our featured bioarchaeologists, and that's because bioarchaeology is actually a discipline of anthropology rather than archaeology.

Cindy:

Anthropology, broadly speaking, is the study of human societies, how they developed and how they evolve.

Ben:

So there's four to five sub-disciplines depending on who you're talking to.

Trent:

In the United States we tend to subscribe generally to what we call four-field anthropology, and this comes out of this particular individual, Franz Boas, in the early twentieth century, and he emphasized having anthropology being an umbrella discipline to four subdisciplines.

Ben:

The traditional forms are sociocultural anthropology. So your typical cultural anthropologist goes out somewhere, does some field research. Then you have linguistic anthropology, which is more looking at language and language structure and how people communicate to understand X, Y, Z.

Cindy:

Then you have –

Trent Trombley:

- archaeology, or the study of past communities through the material traces that they leave behind. And then biological anthropology, which is really trying to understand human biological variation. Bioarchaeology is, at the broadest level, the contextual analysis of human skeletal or dental remains recovered from archaeological sites or historical collections.

Ben:

The fifth one is more of an applied. And so this is where you have anthropology being used *for* the people rather than this, like, more academic setting. It's not just, like, a subdiscipline, but doing more of the work that's helping to kind of give that individual their identity back and provide some closure for the family if they're able to identify.

Camila:

Sociocultural and linguistic anthropologists study the cultures and contexts of historical people. Archaeology and bioarchaeology both deal with material remains, but archaeology focuses more on artifacts and buildings that people created, while bioarchaeology is all about, well, the biology of those humans.

Finally, we have applied anthropology, which takes from all of the anthropology disciplines to do things like direct policy making or returning remains to the communities they came from. I have to admit, I find it a little difficult to keep all of the disciplines straight.

Cindy:

We'll talk more about it later, but yeah, anthropologists do borrow from each others' lanes because you kind of have to in order to get the whole picture. So, anthropologists share the common goal of understanding people in the past, and for now, we just need to remember that bioarchaeology is all about studying human remains - bones, teeth, even hair - to understand more about the society those remains come from.

Jordi:

As we live in our world, we are shaping our world, but our world also shapes us in return. When you live your life, everything you're doing, you're doing in a specific environment. And our environment also impacts our bodies. Looking at, for example, someone's stature, because that can be also influenced by your nutrition. If you have adequate nutrition as a kid, you'll often grow higher than people who are malnourished. There's other skeletal stressors that we can look at; for example, indicators in the skeleton that suggest that you had low iron.

There's also other aspects of the lived experience that we can look at in bones. Advanced tuberculosis, for example, can affect the skeleton, and so there are changes to the bones that we can see. When an individual goes through pregnancy, there are skeletal changes to the body. When you give birth, sometimes you can get microfracturing throughout the pelvis because of the birthing process, and it's very stressful on the body.

Camila:

Just looking at the overall structure of skeletal remains can tell you a lot about what that individual may have lived through while they were alive. But depending on what you're interested in, though, you don't need to look at the whole skeleton. Instead, you can focus on specific parts of the remains, like the teeth.

Trent:

Teeth can actually hold a lot of information about people's lived experiences as well as even portions of their growth and development. We don't get continuous sets throughout our lives, like some other organisms might, which means that any sort of damage or things that happen to teeth oftentimes stay there. If you were to crack a portion of your enamel off, that enamel actually can't regrow. Unlike other parts of your bones, which can remodel or repair themselves. So any sort of thing that happens to the enamel is really cool for us, because it, it almost becomes trapped, in a sense, in that enamel prism, and we could see what happened then, you know, hundreds or thousands of years later when we end up looking at those teeth.

The enamel portions of teeth grow almost similar, I think you can say, to tree rings. They're in, sort of, these step wise concentric rings. And we might not see it with the naked eye, but if you put a tooth under a microscope, you'll see these incremental lines. If the individual, during this period of when the tooth is forming, is subject to, say, a tremendous stress event - it could be something very small, like a fever, but also something more long term like chronic malnutrition - the body will reroute energy elsewhere to more sort of important structures, like the brain. And as a result, we end up getting the small little defect in the enamel that has a little ring or spotting where the enamel basically wasn't deposited to the full extent that it could have been.

Cindy:

Wow, so our tooth enamel creates a ring pattern just like tree trunks? That is crazy.

Camila:

Yeah and that's just a few examples of everything a single tooth can tell you. Like Trent said, thinner rings could mean that the individual was in starvation mode, and so to conserve energy, less enamel was deposited on the tooth. It's kind of similar to how trees will grow thinner rings in times of drought or when nutrients are lacking.

Skeletal and dental remains are great examples of physical insights into an individual's past, especially when other remains have long since degraded, because the kinds of defects that Jordi and Trent mentioned will basically last forever.

Cindy:

I have to imagine that when people first came across remains, either systematically for research or randomly, that they would have looked for the most obvious differences between what they observed versus what was already familiar to them. It's really cool that, even though this a simple concept, just noting physical differences in remains is still a valid technique today.

Camila:

Yeah, honestly, sometimes simpler is better. But you know, of course, as technology advances, our understanding of the human body gets better and the range of things that we *can* study only gets broader. That means that we can even use clues at the molecular level to provide us with snapshots of someone's life. If one were to zoom into a strand of hair, for example, one could use the traces left behind by fluctuating hormones to gain insight into the state of mind of an individual way back then. Like cortisol.

Ben:

Cortisol, although it's a stress hormone or a hormone that gets secreted during stressful periods, it's also a hormone that gets secreted in daily life. Like you need enough cortisol to wake up, to go to bed, to stand up, to start the birthing process if you're pregnant, right? Like it's kind of like this all-contextual hormone.

Camila:

A doctor might order a blood, or urine, or saliva test to check your cortisol levels if they're trying to diagnose your symptoms. But, those aren't the kinds of mortuary remains that stick around long enough for us to test them. But luckily for us, it turns out that you can detect cortisol...*in your hair*.

Ben:

It almost acts like...honestly, just like a receipt of biological experience, right? Our hair just continuously grows, it grows about a centimeter a month. And so just knowing that allows me to, like, segment it and then kind of track the various cortisol movements from, essentially, last cut.

Cindy:

Oh my god, that is so cool! And here I was thinking that the most important part of the hair was the root, because you can test for a person's DNA like they always seem to do in CSI. But um, that seems like a really niche thing to study, right...?

Camila:

You're not wrong. As we'll learn, scientists like Ben are using this stress hormone, cortisol, to tell us more about ritualistic human sacrifice in ancient South American society. We'll talk more on that later. But, like true anthropologists, we should take a step back and explore our guests' *pasts* to contextualize their work *now*.

*Paloma 12*

Trent:

I always, as a kid, kind of had an interest in archaeology, but there's no real opportunity to study archaeology, at least not in high school, and so it kind of had to be put on the back burner - until I got to community college. I *thought* I was really gonna like archaeology, but I actually really liked the biological anthropology course. This really goes into the sort of human fossil and primate fossil record, and that's really where I sort of piqued my interest.

Ben:

I actually really wanted to go to uni to study world languages and become an interpreter specifically for, like, the UN or do more, like, high status-type things like that. I had no interest in becoming a scientist at all. Like, I used to joke and say science was magic and would tell my physics teacher that in high school and just be like, you're making this up. Like this ain't real <laugh>. And so naturally my ignorant opinion told me that, going for world languages, I won't need sciences, I really need more the humanities stuff. So I kind of shifted a little bit more towards linguistic anthropology actually. And was more interested in language and how that can help us understand culture, gender politics, sex, sexuality, you know, like all these very salient indicators for human behavior.

And then I was like, well I don't need to be a linguistic anthropologist to speak a language. Like I can always speak a language and then do more cultural things. And then somehow got into forensics that way. And so by the time I was going to uni, I was very much like biological anthropology. And then over time I feel like I've become this like poster child <laugh> for um, you've probably heard this, like "I'm never gonna use algebra" or "I'm never going to use chemistry, physics, biochem", And now I do like all these molecular analyses, <laugh>. If I told myself, 10, 13 years ago, 15 years ago that this is what I would be doing, I would laugh.

Jordi:

So, I ended up in it completely by accident. I, from high school, was really into the TV show *Bones*. And so I used to, like, watch *Bones*, like, religiously. I loved the show, I loved watching Dr. Temperance Brennan doing what she did at the Jeffersonian. And, so from, like, the very beginning, I knew I wanted to get into skeletal analysis, and, like with the show, for forensics.

And so when I went into undergrad, I did work with skeletal analysis there and then after I finished school, I did an internship and then eventually a contract position at the Smithsonian National Museum of Natural History where I was doing skeletal analysis.

Following my year at the Smithsonian, I did a Fulbright open research to Peru, where I was doing a full-on bioarchaeological project. So that's also where I did extensive excavation and helped on a project there, which ended up being my dissertation work, on the north coast of Peru, in a small town called Huanchaco. So I excavated and then I also did lab work during that year, and that's what really solidified my interests and specialization in bioarchaeology specifically.

I hadn't had any experience with archaeology previously. So it was kind of like, I entered in through more of, like, the human biology side and human osteology.

Cindy:

I always think it's sweet when your childhood dream manifests into your real adult life.

Camila:

I mean, we're both academic scientists, too. We all do this because we love what we study...but, yeah, it's definitely not for the money.

Cindy:

<fake coughing> What money? Uh, but back on topic. So Trent wanted to study archaeology and ended up falling in love with anthropology instead. Ben was interested in linguistics, which morphed into their pursuit of linguistic anthropology.

Camila:

Yup.

Cindy:

But it sounds like Jordi's experiences leaned much more into the bio side. Like, she started with an interest in skeletons and then wanted to learn more about the societies they came from.

Camila:

Yeah, I mean, at some level, it's going to be hard to stick to a single lane and not draw from adjacent fields, right?

Cindy:

And what's cool about Jordi's research is that she's working in a cemetery in Huanchaco, Peru where people were often buried with material items, like jewelry or pottery, so she studies the bodies themselves and the items they were buried with.

Jordi:

I'm working at a site that we call José Olaya la Igelsia Conlonial, which is - José Olaya is named for the primary school - a public primary school that the site is actually inside of. We have evidence that people were continuously occupying it from the initial period. So we're talking like 2,000 BC - well, 1,800 BC-ish - through present day.

But the time period that I'm specifically interested in is one that's like very understudied in Andean archeology. In 400 BC, approximately, there's a cultural phenomenon...there's still a lot of debate on what it is, specifically, but it's called Salinar.

Cindy:

Andean archaeology refers to aboriginal peoples who lived in the Central Andes mountains in South America and it encompasses a ton of different cultures. Salinar, which Jordi studies, is a culture that developed in what's now modern-day Peru. Salinar emerged after the decline of an earlier culture called Chavin, and was followed by a culture known as Moche.

Camila:

Okay, so the timeline goes Chavin, then Salinar, then Moche.

Cindy:

Exactly. It's unclear why Chavin culture collapsed but the emergence of Salinar culture marks a very transitional time where society was becoming much more divided into upper and lower-classes.

Jordi:

And my dissertation specifically, is looking at this phenomenon of emergent inequality. So from the perspective of the human remains, I'm really interested in looking at how does or does not inequality become embodied by the people of Huanchaco following the collapse of Chavín.

And what's hypothesized now is that different river valleys along the Andes, and the Andean foothills where I work is the Moche Valley, were dealing with this collapse in different ways that were regionally specific. And also of note at this time period, is that, following the Salinar, which is this time of like after-collapse, you see on the other side, during the Moche, the emergence of institutionalized inequality.

Camila:

Institutionalized inequality is when the policies and practices of the world around you basically force people into different statuses. The presence of institutionalized racism here in the United States is something that has gained a lot of attention recently - but, you know, not nearly enough to really correct the problem.

Cindy:

At Jordi's site though, they were looking at a single people - the Salinar people who would become the Moche people - so the inequality here could have been along any number of social distinctions. Jordi was looking for evidence in burial remains, mortuary remains, to see what this institutionalized inequality looked like at its very beginning.

Jordi:



In the mortuary remains, we definitely see a clear social inequality. And what I mean by that is, there are a lot of individuals who are kind of buried similar, where they have maybe one or two things. But we also see people in, like, a middle range where they're buried with a high number of objects, but they're nothing, like, exotic for the context. And then on the other side of the spectrum in Huanchaco we find there's a few burials that are, instead of just a pit into the sand, we see people with adobe and stone-lined tombs that were specifically constructed. They're buried with gold. We have people buried with dogs. We have people buried with fineware vessels. So there's evidence for the inequity. It's not as strong in the bodies.

Cindy:

So basically, there are very clear signs of societal inequalities present in the *material* items that these people are buried with, or even where they're buried. Some people are in special tombs while others are just placed in the ground.

Camila:

But what Jordi and her team *didn't* see were any signs of inequalities in the bodies themselves. Any differences between the bodies she found didn't really correlate with material wealth. They actually mostly correlated with the age of the body.

Cindy:

And we know that societal inequalities like these can be embodied. Nutritional deficiencies, for example, can show up in skeletal remains. So what these findings suggest is that there is some sort of lag time between when social inequalities show up, and when you can actually see them in the body.

Jordi:

So what I'm arguing is, after this collapse of Chavín, is that you need to have the I, I guess I'll say institutional structures, even though it's not the kind of institution you would think of today. But you need the environment to exist that facilitates people living in inequitable experiences before that can become embodied. Clearly, there's diversity in the mortuary objects, and it appears that we have this spectrum of inequity that's present. But it looks like it's taking time for generational changes to happen, where you get these clear, delineated lived experiences that are becoming strongly embodied.

Cindy:

When Jordi looked at these bodies, she did a very high-level analysis of the entire body. She wasn't necessarily looking at one thing in particular; she was synthesizing information from every part of the body to make her conclusions.

Camila:

But that's not how every bioarchaeologist goes about their research. You know, there's a wide variety of approaches that range from general, like Jordi's approach, to very, very specialized.

Jordi:

Like many different disciplines, there's people who are maybe generalists, and then there's people who specialize in one specific thing or one method or one - in our case, in one region of the body. So, for example, we have people that do specifically dental anthropology, and they'll look at teeth, and that's what they study. And there's so much to be learned from the teeth. And then you also have people, for example, who might only look at paleopathologies, or like ancient disease, and that's the only thing that they look for. I would consider myself a generalist in the sense of, I do look for a number of different factors, like a lot of different data when I am doing an analysis.

So I do collect data on teeth, maybe not as detailed as someone doing a fine-scale dental study. I collect data on health, and I look for other changes to the body. A lot of times it is, you're looking for what's not normal. That's generally the approach that I take, is looking at multiple different traits throughout the body to kind of do a more holistic understanding of the individual versus focusing on one thing specifically, and both approaches have their benefits and their drawbacks.

Camila:

I can definitely see the benefits of Jordi's generalist approach. It seems like there's so much information to discover in a *single* body; I'd want to study every bit of it.

Cindy:

Yeah, definitely; but there is always a trade-off with how deeply you can study any one part of the body. Sometimes, you need to hone in on a single part. Trent, for example, tends to focus on teeth.

Trent Trombley (He/Him):

You start to get into really, really interesting niche sub-sub-disciplines to the part where, yeah, sometimes to the detriment, we specialize in certain sub-tissue. So I was kind of the tooth guy. So we all kinda like divvied up portions of the skeletons in part because we could look at them a bit easier. But all we also, you know, interacted with each other on part of our data sets.

Camila:

To get into Trent's research, let's fly out of Peru and make our way across the Atlantic Ocean to the Mediterranean.

*Story - William King*

Trent Trombley (He/Him):

The first project that I worked on - and I'm still a collaborator on it - it's a lovely project called the Villa Mania Project, and this is looking at a rural community to the southeast of Rome that lived in and around a sort of monastery area, at least in the central and later medieval period. And most of the everyday people were buried there in association with the monastery.

There's sort of a popular misconception that medieval teeth in the past were just outright bad, <laugh> that people had terrible teeth. And that's somewhat true. But the issue is, that hasn't really been borne out in a lot of bioarchaeological evidence until people have started to document it more systematically. So a lot of the stuff that I've done is look at what we would call "oral lesions", or really more broadly, oral health. So any sort of cavity that becomes big enough will be permanent. And so that, as long as the tooth preserves and is recovered by archaeologists, we can actually see the degree of cavities and the location of those cavities, as well as the frequency of those cavities. How prevalent was it? Did it vary by certain groups within the cemetery, did certain people have access to different diets that maybe predispose them to more cavities than others?

Cindy:

As small as they are, you can really tell a lot from teeth! Both Jordi and Trent can look at abnormalities in the remains to understand how institutional inequality emerged in ancient civilizations and, in Trent's current work, cultural differences in burial rituals.

Trent:

The region that I've worked in in Portugal is quite interesting because you have a history of different religious communities occupying the peninsula at different points of time, and, in fact, some of them cohabitating throughout the medieval and later post-medieval period, so principally Muslim, Jewish, and Christian communities.

And so, I was very interested in trying to see how religious differences might manifest in some sort of thing that might embody themselves in the skeletons and bones and teeth, to where I can see oh, can we see aspects of activity that maybe differ along religious lines? Or can we see aspects of diet that maybe differ, or are similar across or between religious communities that are buried there? So what I ended up looking at was a cemetery, a series of cemeteries, really, that had Islamic and Christian burials side by side, sometimes in the exact same sort of cemetery space.

Camila:

In the beginning, Trent planned to explore how the *lived* experience of Christian and Muslim people in Portugal might affect their bodies differently, but it turned out that one of the most interesting differences came about after they *died*.

Trent

Many times, if you're doing archaeology and trying to let the data lead you, rather than you constrain it, just because we're not an experimental science most of the time, things can become very surprising. But I think all the more interesting if you give into that.

And so for my research, what was really interesting was seeing just how different the bones actually preserved, despite being in the exact same sedimentary, kind of geological, geographical space. I would have assumed that both of these communities had the intent, in the past, to bury the body for preservation, sort of in preparation for the afterlife. And that there

would have been a large, let's say, preserved sample of both Muslim and Christian individuals; and what I ended up finding in my dissertation was that was not quite the case. And this is where that pivoting came into play, because, as I was working on these remains day in and day out, over the course of many months and years, in fact, I started to realize that these Islamic remains in particular were very fragile, and many times very fragmentary. Sometimes, despite being buried *right* next to a Christian individual that looked really well preserved.

So I decided to sort of pivot my research to say, what's going on here? Let's try to figure out, is there sort of pattern here that we could detect? And sure enough, there was a massive sort of preservation bias in favor of the Christian burials, but not so much the Islamic ones. And this started to kick up some interesting conversations with my collaborators, who work and excavate in the region, and trying to figure out, is there a reason for this? Is it because of construction? Are Islamic graves more susceptible to modern construction? Maybe they're a bit shallower and closer to the surface. And so we're still, still teasing some of those things out.

Cindy:

To understand the significance of what he was seeing in the bodies, Trent needed to have a strong understanding of how these cultures prepared their dead for the afterlife. He mentioned that he had to assume that both the Christian and Muslim people intended to *preserve* their dead for the afterlife. Knowing what we know about how those religions are practiced today, that's probably true.

Camila:

That's not universally true for every culture. For example, [Tibetan Buddhists often practice sky burials](#) where the body is prayed over and then taken to the mountains to be eaten by condors. They consider these condors to be holy birds that take the body into the heavens to await their next reincarnation. So Trent would have to change his assumption if he was studying remains from Tibet.

Cindy:

To better understand the funerary practices of the cultures he was studying, Trent turned to a field of archeology called mortuary archeology.

Trent:

This is a sort of branch of archaeology that focuses on treatment of the dead and burial treatment, and how we can reconstruct aspects of how the body was prepared in the past as well as what we would generally call ethnohistorical context. That is the sort of cultural historical context of the region. Knowing this is from documents for maybe artistic depictions or funerary manuals written at the time that describe the procedures for how the body should be prepared, and how that might find itself into the grave, or the ground that then later archeologists, or bioarchaeologists, end up uncovering. And so this is where I think cultural relativism can be really important.

Cindy:

Cultural relativism is a big term in anthropology. So, anthropology is the study of human societies and we are humans who live in our own societies, so sometimes we bring in biases from our own culture when we're trying to study another one. Cultural relativism is a practice of interpreting everything in the context of the culture *it* comes from, and putting aside our own personal, modern-day interpretations.

Trent:

And certainly we have to implement that with bioarchaeology because we can go in with our own understandings. I think the biggest one that really hit bioarchaeology in the late twentieth century was ideas of sex and gender. People would go in and be able to use osteological - that is, bony - indicators of whether or not someone is a maybe a male or a female, based on things like the pelvis, morphology or things like this. But not all communities in the past saw things so cleaved along these sort of sex or gendered lines. And this is where things like gender start to become really important when someone sees a skeleton or analyzes it, and maybe estimates their sex to be, let's say female, and some sort of case. That doesn't inherently mean that they were treated as a woman in that culture.

So it could be along sex and gender lines. It could be along age, who was considered adults at different periods of time. So we might osteologically - or in the bone - see this person as a, a non-adult. That means they're under 18. But culturally that person could have been an adult by the age of 8, or maybe 12, depending on that particular culture, right? And so, all these sorts of things, I think, have become absolutely crucial.

Camila:

That's a really interesting point. Our understanding of "childhood", and I'm using air quotes", is way different now than it was even when our grandparents were growing up. So it would make sense that it would look much different in ancient cultures.

Cindy:

And this point is really crucial to Ben's research because they primarily study the bodies of children. Specifically, they study the bodies of children who were ritualistically sacrificed by the Incan Empire - and, as this is the child sacrifice bit we mentioned at the beginning of the episode, you can skip ahead to 36 minutes if you don't want to hear about this.

*San Diego Sunday - Blue Dot Sessions*

Ben:

When it comes to the Inca, and the imperial style of sacrifices is probably something more familiar, I always talk about it in, like, Hunger Game-style where children would be selected, wined and dined for about a year, brought to the capital, so Cusco, and then be marched, um, throughout the empire, like throughout coastal - or the Pacific - South America, usually up to Apus or mountaintop areas. They were drugged with coca leaf, ayahuasca, given chicha, which is like a maize drink. And then they would be bludgeoned over their head and then, like, left.

Cindy:

The sacrifice practices of the Inca are well-documented, but one thing that has been somewhat overlooked is the experience of the sacrificed children themselves. It might be tempting, from our modern perspective, to assume that they had *no* idea what was going to happen to them, but Ben says that kids have a lot more understanding than we give them credit for.

Ben:

Kids occupy this really interesting area within one, you know, modern era, but two, outside the western kind of academic sphere of what kids do, right? They can, they work at their parents' shop, they clean, they have all these agency, right?

We have children that are, like, literally wayfinders for water at age two or three and I would trust them with my life more than some of these political leaders in the government now, right? Because they have so much knowledge in what they could actually bring. So it's like, no, these kids aren't just like happy-go-lucky, like, little actors that are happening. Like, they also have some say in it, whether or not it's listened to. And so I think, like, it's possible that the children knew what sacrifice was but probably didn't understand the full intent of it.

Camila:

So, the specific sacrifice site that Ben studies is called Huanchaquito-Las Llamas and it's also located in modern-day Peru. It was discovered relatively recently but there's already been a ton of work done on this site because it's located on very loose soil, which, there's some concern that it might erode away completely so archeologists have had to excavate rather quickly.

Cindy:

Wow, talk about a time-crunch.

Camila:

Yeah, seriously. So, other anthropologists have already studied these remains to figure out things like how the children were sacrificed, how old they were and even where they were originally from. So, Ben used archeological cortisol in the hair of the sacrificed to ask, among many other questions, how much understanding did they have?

Cindy:

As you can probably imagine, measuring cortisol in very old hair is quite the process.

Ben

I feel like a hairdresser in some ways 'cause I feel like I take better care of *these* hairs. But like I wash 'em, I think I go through three to four washes just to make sure I get all like the sebum and other potential contaminants and soil and whatever off the hair. And I ultrasonically clean it too. And you have to cut them up and that takes a while. So I'm usually watching like a show or *Drag Race* or something like that.

Cindy:

So after measuring the cortisol levels at the time of sacrifice in all of these hair samples, Ben saw that the levels were really different depending on the age of the child.

Ben:

So with the children, younger children are being sacrificed first, their cortisol levels are kind of like all over the place. But when it comes to the older individuals, it shows them being incredibly lower.

And so 200 to 600 is like, clinical typical, you know, not too bad, like, cortisol levels, anything above 600 is essentially a specific stressor or like a one-and-done type of thing. So you fell and broke your arm or you experience some kind of stressor in the moment. And then it goes down. Your body regulates that with that fight or flight. But over time it becomes normalized. So now it takes a lot more stress for you to actually get up to that area again. And so by watching the younger kids be sacrificed first it looks like the older kids watch them and then eventually knew what their fate was going to be.

The stark differences in the cortisol results were so variable where it really started having me think differently about human sacrifice. And part of the reason why I don't use the word victim when I speak about them, 'cause although of course they're state-sanctioned killed or ritually executed, basically the main question is were they knowledgeable participants or did they just kinda like wake up that day and we're like, "hey, sorry you're gonna be sacrificed today". And so because of that it's like, well, because we don't exactly know, it's probably not the best to apply our own modern judgment on it.

Cindy:

And that is cultural relativism again. It is *such* an important concept.

Camila:

Jordi actually has some interesting thoughts on the subject. So, while she definitely agrees that cultural context is important, she also recognizes that you can never fully separate yourself from your research, and that's not necessarily a bad thing.

Jordi:

Being from multiple marginalized identities, including my class background, I am very intimately aware of the impacts of social inequality in the present day, and also as a practicing bioarchaeologist in the field. And so, knowing that, there is also a personal element to why I'm also interested in social inequality in the past. And so I think, too, having personal connections to me doesn't devalue the work. It actually enriches the work.

Sometimes there's- there's a hesitancy to put yourself into your research, and I don't think I put myself into my research beyond anything that's appropriate. I - the questions I'm asking are informed by my lived experience. But I'm never projecting my experience onto ancient peoples from a different time in a different country; like that's, to me, not the goal, but the goal is to understand that your lived experience shapes how you do your research, and instead of ignoring it, recognizing it and speaking to it.

*San Diego Sunday*

Cindy:

This is true for any field, really, but it seems like every bioarchaeologist brings something different to a project, whether it's a different approach or a unique perspective.

Camila:

That's why collaboration is so important. Jordi takes a generalized approach in understanding how institutionalized inequality came about in ancient Peru. So, when she looks at mortuary remains, she looks for what stands out in all kinds of samples, like skeletal and dental deformations in those from different social classes.

Cindy:

Meanwhile, specialists like Trent and Ben hone in on specific types of remains - teeth and hair, respectively - and can get really granular on what exactly they look for in those remains. Trent focuses on the differences in dental remains found at neighboring Christian and Muslim burial sites to understand how the burial rites might have differed.

Camila:

And you can get even *more* granular than that. Like Ben, for example, who analyzes the amount of cortisol - this stress hormone - in the hair of child sacrifices found at Incan burial sites to get a glimpse of how these children *felt* leading up to the ceremony. So, there is just so much that you can learn from a single body, and what you end up focusing on depends on the type of question you're trying to answer, and what materials are available for you to study in the first place.

Cindy:

It also depends on your perspective. Are you looking at mortuary remains with a modern lens and your own biases? Or are you trying to *contextualize* your findings in a way that would make sense for the people *of that time*? For Ben's work, our gut reaction might be - "well, of course the children were scared! Human sacrifice is abhorrent and should never be excused."

Camila:

But from the Inca's point of view, well, sacrifices were rare and necessary and it might have been viewed with great honor. Going back to the *Hunger Games* as an example - some of the tributes were terrified of the Games, and some tributes were absolutely thrilled to have been chosen for the opportunity to compete. And those tributes were children. So, your modern biases might not be appropriate here.

Cindy:

On the other hand, maybe you do have to bring a bit of yourself into your work. Maybe your lived experiences as a certain kind of person helps you to more fully understand the circumstances of those you are studying. That works for Jordi, although she's cognizant of not letting her experiences interfere with her work.

Camila:



I guess what we're trying to say is that bioarchaeology is just a huge field with so much potential.

Ben:

There's many of us that do this type of work, but we're all working on different things. And so these more "other" integrative questions kind of lead into human biology. And as you know, the academy loves its sub-disciplines and disciplinary areas. So kind of becoming more transdisciplinary is becoming more accepted.

Trent

I think there's certainly a historical trend towards the sort of proprietary vert model of, like, "these are mine. I'm looking at them my way. You look at your way you know, in your area". But I think there's undoubtedly more and more collaboration as the field has grown. Bioarchaeology is a field we sort of articulate as crystallizing in the 1970's or so, 60's or 70's.

So it's still fairly recent as a formal field or discipline, but it's just growing so fast, because students have a tremendous interest in bones, what we can learn from them. We have all these things that we do throughout our lives we have no idea actually become recorded in our bones and teeth, and it's amazing that we can analyze them for that sort of information. So I think there's more and more collaboration thankfully now, and I think that is opening up.

Jordi

I think that a lot of people know about archaeology and excavations. But there's also an element of, I don't want to say power in like a - in in like, with a bad connotation. But there is power in helping write narratives of the past. There is a power and a privilege in that.

Trent

Our goal as bioarchaeologists, a lot of time, is to reconstruct the lived experience of the everyday person, not just the aristocracy, and that's where bioarchaeology's power, I think, really lies, is being able to analyze people via their bones and teeth, and reconstruct a degree of their lived experience that was omitted in historical documents, that maybe they weren't worthy of maybe documenting historically like, the aristocracy.

Bioarchaeology has a tremendous potential. It doesn't mean, at an ethical standpoint, that we are obligated or entitled to look at remains. You know, as bioarchaeologists, I feel very, very privileged to be able to look at human remains when it's permitted, or when it's accepted or encouraged by the communities that I work with or the collaborators. So they are undoubtedly a tremendous source of information to past communities, but that doesn't mean we necessarily need to treat that above the wishes of the living descendants, or the communities or stakeholders that live with and around those communities today.

CREDITS

This episode was written and produced by Maggie Colton, Cindy Liu, Camila Benitez, and Deanna Necula with help from the rest of the team at Carry the One Radio. Thank you so much to our wonderful guests, Ben Schaeffer, Trent Trombley, and Jordi Rivera Prince for their time and incredible insights. We've linked their research in the show notes on our website if you want to learn more about their work.

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And, as always, stay curious.