Video Transcript – Webinar: The Role of Insect Eating in Human Diets, Past and Present

Video Begins

Visual Description: **[00:00:00] White text on a teal background reads Video Webinars natural history dot SI dot EDU. National Museum of Natural History. Smithsonian. Webinar begins. A woman appears in front of a background image of African savanna with mountains in the distance. She has white skin, short brown hair and is wearing a white sleeveless blouse and headphones.**

Dr. Briana Pobiner: All right. Hi everyone. Welcome to today's program. The Role of Insect Eating in Human Diets, Past and Present. This is part of our ongoing HOT Topic, Human Origins Today, topic series. My name is Briana Pobiner and I'm a paleoanthropologist and educator at the Smithsonian's National Museum of Natural History. Whether this is your first time joining us or you've attended our HOT Topic programs before, we're so glad to have you here.

Before we get started, a few housekeeping notes. This discussion offers closed captioning. You can turn them on or off via the CC button, which should be located at the bottom of the Zoom interface. As you have questions during the program please go ahead and submit them to the Q and A box, which is at the top or bottom of your screen, depending on what kind of device you're on. So we can sort through as many of those as possible, the Q and A really flies by. The Q and A box is also where we'll share any relevant links during the program. So keep an eye out there.

We'll start our program with an opening presentation by our speaker, Dr. Julie Lesnik and then I'll join her here to take your questions.

[00:01:17] Now I'd like to go ahead and introduce our speaker. Dr. Julie Lesnik is associate professor in the Department of Anthropology at Wayne state university in Detroit, Michigan. She received a PhD in anthropology and an MS in kinesiology from the University of Michigan and 2011. Her primary interest is in evolution of the human diet, specifically in regards to entomophagy. Or entomophagy, eating insects. She undertakes research in south and east Africa reconstructing the role of insects in the hominin diet. And her research has been funded by the Leakey Foundation, as well as other organizations. She is also a 2015-2016 recipient of the American fellowship from the American Association of University Women and 2018-19 fellow of the Leshner leadership Institute for Public Engagement with Science, of the American Association for the Advancement of Science.

Her 2018 book, Edible Insects in Human Evolution, reconstructs, what insect consumption likely looked like across human evolution and highlights the importance of incorporating edible insects into our world's current and future food needs through an evolutionary perspective.

So welcome, Julie, if you want to turn on your camera and microphone. She's joining us today to talk more about this topic and how insects play a huge role in our food security and sustainability. So, thanks Julie and while you're giving your introductory presentation, I'm going to turn off my camera and microphone and be behind the scenes. And then I will come back on at the end to facilitate the Q and A.

Visual Description: **[00:02:53] A different woman in front of a white wall with windows. Thin bars go across the windows and a guitar hangs in the window to her left. There are shelves in the corner of the room to her right. She has white, slightly tanned skin and is wearing glasses and a brown collared shirt.**

Dr. Julie Lesnik: All right. Wonderful. Thank you so much. Thanks for having me. Thanks for that great introduction. I look forward to our conversation at the end of my presentation.

Visual Description: **[00:03:03] A presentation slide titled, "The Role of Insect Eating in Human Diets, Past and Present." There is a V-shaped diagram of five silhouetted hominin figures at upper right. Gray text in the bottom half of the slide reads, "Julie J. Lesnik, PhD, Department of Anthropology, Wayne State University, Detroit, Michigan, USA. @JulieLesnik. Human Origins Today. National Museum of Natural History. August 19, 2021.**

Julie Lesnik: So today, I'm here to talk to you about the role of insects in the human diet, from our earliest ancestors to today and looking forward into the future.

Visual Description: **A presentation slide titled, "Outline," with three bullet points: Insects, the food of the future? Modeling insect eating across human evolution. And disgust in the "western" world.**

Julie Lesnik: And so to give you kind of an outline of that, I'm going to start with the future, in, in how people here in the United States are kind of talking about insects as food. But then what you'll see is that, you know, people are talking about as like the future of food, the answer to so many of our problems. And then me as a paleoanthropologist who studies this finds it kind of funny because it's clearly a very important food of the past, present, and future. It should just be considered human food. It shouldn't need all of these qualifiers. But part of the reason why we need all these qualifiers is that we have this great sense of disgust widespread here and sort of, you know what I put in quotes, a Western world. And so Western

being Europe and all of the, you know, colonial kind of history of Europe in the **[00:04:00],** in the areas that today still maintain sort of constant contact with that culture and have become kind of collectively known as this, amorphous idea of Western. And so, but we, it's something you kind of know when you see it. And one way you can know it when you see it is that people don't like the idea of eating bugs.

Visual Description: **Slide with blue and green text and two line drawings of a cricket. At top right is a logo for Entomo Farms. Then a cricket and the text The Future of Food, then a cricket and the text The Planet's Most Sustainable Superfood.**

Julie Lesnik: And so to get started this idea of the future of food. These are grabs from one of the largest cricket farms here in North America. So they are in Toronto. So they're in Canada. They're Entomo Farms. But they are producing crickets on a large scale for human consumption. And so this is relatively new here in the United States. We've had cricket farms producing insects for pet food trade. So if you go into a pet store, you might be used to seeing crickets. So the infrastructure was already there and then all we had to do. You know, sort of in the cricket industry, is update everything to make sure it fits human, you know, food grade standards. And so, so these farms are popping up. There are farms all over the place. And so you can see here that the advertisement for this is very much about the food of the future and really looking at insects as a sustainable food choice.

Visual Description: **Slide with graphic titled, "Less Resources Are Used." It compares resources used to produce one kilogram of protein of beef, pork, chicken, and adult crickets. Crickets are in a column on the far right with lower numbers than the other columns: 1,700 grams of feed and 400 liters of water. Text on the slide reads: "Compared to traditional livestock, farmed insects have reduced: space needs, water needs, greenhouse emissions."**

Julie Lesnik: And so what you can see is when you compare insects to traditionally raised livestock, they require so much less resources to produce the, the nutrients that we then intake as food. And so everything pretty much scales, right? So cows are really large and inefficient and produce a lot of greenhouse gases. As you scale it down, pigs are a little better. They use a little less land, a little less water, produce less greenhouses, and you scale down to chickens. Chickens are actually quite efficient and then, but even insects then are then even more efficient than yet, compared to chickens. And so basically it's a very simple scale. And when we get down to the small scale of crickets, you're essentially getting out what you put in, you put in food to them, they convert it into almost **[00:06:00]** equal amount of food for us. And so they tend to look like they're going to solve all of these problems and they really are a super food. From almost every angle. You look at them from their nutritional quantities, the nutrients that are in them, to these wonderfully more sustainable farming

practices. Well, like I said, this is. You know, the, the idea of farming them at this scale is new and is the future of food, but the insects themselves are nothing new.

Visual Description: **Slide titled, “Human evolution,” with two illustrations on it. On the left is an illustration of five silhouetted hominin figures, in order from left to right, from a chimp or ape-like figure on all fours to a modern human. To the right of this illustration is a blue arrow point to the right with the word “corrected” under it. To the right of the arrow is another illustration of hominin silhouettes, but in the shape of a V. The chimp figure is atop the left line of the V, and the right line has the four other figures spread along it from bottom to top.**

Julie Lesnik: And so when we look about, you know, we think about human evolution, I just want to use this diagram throughout my, throughout my talk. So I just kind of wanted to show you how I, I take this, what we call the March of Progress, which is this poor representation of evolution. It looks like there's a direction, like evolution's always been leading to us all along. But evolution doesn't quite work that way. Instead of evolution, you're fitting into your specific environments and our current form currently works. But there are many forms that currently worked in the past that with environmental changes, no longer work. And so that's sort of why I have this correction. It gives us this idea of time to it as well.

Visual Description: **Slide titled “Human evolution,” showing the V-shaped diagram of hominin evolution. A blue arrow points down to the figure near the bottom of the V. A caption on the side reads, “Australopithecines” = Species associated with the genus Australopithecus.**

Julie Lesnik: And so the, the furthest down here on this diagram is who I refer to as the Australopithecines. They are some of our earliest hominid ancestors living around four to two-and-a-half million years ago. And there's a lot of different genera associated with them. So kind of collectively we can call them, they're not all Australopithecus, so collectively I like to refer to them as Australopithecines.

So these Australopithecines in a lot of ways are very ape-like. Their brain size is very chimpanzee-like. Their body size is very chimpanzee-like, and so when we're kind of trying to figure out what they were doing in the past, looking at chimps and our other ape relatives helps us try to figure out what life for these Australopithecines were like. They were walking on two legs. They're upright. So they definitely are our ancestors and share **[00:08:00]** that with us. But when it comes to what they're eating, what they're thinking, what they're doing, they're probably much more like chimpanzees than they are like us today.

And so when, and to go back to that, when we think about these hominins for, I would say for the last 50 years or so, if you asked a paleoanthropologist, “Did these Australopithecines eat insects?” they'd say, “Yeah, sure. Probably.” Because we know our ape cousins do, we

know people around the world do. So it makes sense, but it's really hard as a paleoanthropologists to reconstruct parts of the past that we don't have direct evidence for. And so, although paleoanthropologists would answer that question positively and say, yeah, they were probably eating these insects. We didn't really talk about it in the literature.

Visual Description: **Slide divided into four rectangles: one with an illustration of a hominin using a stone tool; one photo of what look yellow and brown discolored bones; one close up image of grooves or marks on two objects; and some text that says "Swartkrans South Africa ~1.7 mya. The striations on the artifacts match that of tools used to dig into termite mounds. (Backwell & d'Errico, 2001)**

Julie Lesnik: But then in 2001, these bone tools from a site in Swartkrans, South Africa. These bone tools. We have almost a hundred of them from across a few different sites. They, I compare them to like the size of a Sharpie Marker, you're going to hold it in your hand. The, we know they're tools because one end, you can see it across the top, here, is worn in polished and kind of made into a point from use, and then the back end is just broken off. So like the other half of this, we would never identify as a tool unless it was also used to dig. So basically sort of the, you know, well, the processes that could have sort of accidentally lead to this are unlikely because there's so many of them. So there's not going to be 100 bone fragments sticking in a river and getting river worn. So the best explanation is that it was produced by tool users by the hominins that were at this site.

And so Lucinda Backwell in 2001 did experimental research to try to understand these preserved wear patterns on the ends of these tools, the, the marks, the scratches, the, the dings, every little mark on these tools. And she did a bunch of her own experiments with **[00:10:00]** tools she made from, you know, bone that was available to her. And she compared the wear patterns. She did different tasks like digging into the ground for tubers, stripping bark off trees, but then she also dug into termite mounds. And what she found was the best match in the pattern was what was in, where were the tools that dug into the termite mounds. And most of this is because of these sort of striations being parallel and really narrow. We don't have a lot of scarring. We don't have a lot of big rock percussion marks.

And so if you think about an Australopithecine digging in this way, it's a pretty, you know, lateral direction. And so you get this sort of all the striations going into one direction. They're also all very narrow and uniform because the termite mounds are finely sorted soils, they had to be carried by those tiny termites. So they're not carrying boulders when they're making their termite mounds.

So this was a huge find. And so in 2001, or not even, a huge research discovery. Cause we've known these tools since the seventies. And so

this is one of those great stories of like pulling artifacts out of a drawer and kind of rediscovering knowledge about them. And so in 2001, we started talking about insects differently and thinking about how these tools were used and why she even tested it in the first place, is because chimpanzees use tools to forage for termites.

Visual Description: **Slide titled "Chimpanzee tool sets" with text, "The tool-use ability of these hominins was likely just a small degree more complex than the tools chimpanzees use to forage for termites. (And on a new line) Social insects are easy to locate and abundant in those locales."**

Julie Lesnik: And so when we think about chimpanzee tool usability, one thing they do is they have the ability to use a tool set, to see tasks as like a first and then second thing. So use one tool and then follow it up specifically with a second one. And so these bone tools that the hominins were using, might've been part of a toolkit because just turning a mound into dirt isn't really useful. So they might be just doing things slightly more complexly than chimpanzees. And so I have a video here of of a chimpanzee using a tool set to forage for termites. And another really important thing about these termites is that there's so many of them available in the mound. They're, eat, if you can access them, there's so much nutrition available. And the mounds are pretty easy to spot **[00:12:00]** when they're large on the landscape. So they are a very useful, pretty reliable resource.

Visual Description: **A video appears of a female chimpanzee walking on the ground in the woods with a stick in her hand. She stops next to a large termite mound, which looks like a tree trunk, and pokes the stick into the mound. She removes the stick and then takes a second stick from between her teeth, inserts it into the mound, pulls it out, and puts the stick in her mouth to eat the termites attached to the stick. Credit slide reads, "Goualougo Triangle Ape Project, www.congo-apes.org"**

Julie Lesnik: And so what we see here on this is a video from the Republic of Congo. And she approaches with one tool in her hand and she's going to perforate open an exit hole that of the termite mound. She has a second tool in her mouth. So if you watch closely, she's now going to grab that second tool, she threads it into the mound, and then the termites attack that tool like it's a breach, right? It's a, it's an attacker. And so these termites have pinchers that go pretty much work in one direction. They bite and don't let go, because their job is to protect the mound. It's the soldier caste. So chimpanzees take that to their advantage. They, they use these mandibular pinchers of the soldier termites and use that against them to pull them out of the mound.

Visual Description: **Slide titled, "Chimp females are expert tool users" with a photo of a chimpanzee next to a termite mound, focusing intently as it inserts a**

long blade of grass into the mound. The chimp is also holding a baby chimp.

Julie Lesnik: And so when we think about this, there's a few things going on here, just in this one video. One, it's chimp females are really the adept tool users. Males tend to be more worried about their place in the social hierarchy. And females tend to worry a little bit more about getting the right nutrients that they need to survive and reproduce.

Visual Description: Slide titled "And provide opportunity for their young to learn." It has a photo of a younger chimp with a blade of grass in its mouth.

Julie Lesnik: And so then they also provide opportunity for their children to learn. And then the female offspring tend to stick around longer and get really adept at this task.

Visual Description: The previous slide with the chimp inserting the blade of grass into the termite mound while holding her baby.

Julie Lesnik: And so this is a photo I took and you can see that if you look closely, she is nursing her young daughter here, and then after her daughter was done nursing, the mom left this spot on the mound …

Visual Description: The slide with the younger chimp with grass in its mouth.

Julie Lesnik: … and the daughter took over that active termite hole. So it it's not directive teaching, but it is opportunity for her to explore and kind of do what her mom was doing. And eventually she learns to fashion the tool, learns to use it.

Visual Description: Slide titled "How about hominins?" There is a photo of two termites and there is text divided into five bullet points about the termite genus Macrotermes.

Julie Lesnik: And so one thing, another thing about these, these chimps and what they're doing with these termites is that there are a lot of different termites available in their habitats and they're very strongly selective of the ones of the genus Macrotermes. They have those mandibular pinchers as their defense mechanism, as opposed to like a toxin-spitting defense mechanism, **[00:14:00]** so they can use it to fish for them. But they're also larger termites compared to others. They're really high in protein and rich in fat. So when thinking about what the hominins were doing, These are a very nutritionally useful resource. So maybe these are a good termite to think about in these reconstructions.

And then what I do, theoretically, when I've reconstructed these models, I've used Macrotermes and the nutrition they offer to reconstruct the hominin portion of the diet. And this is because Macrotermes are essentially unchanged for 20 million years. They evolved over 20 million years ago during the Miocene period, which is the same time our ape ancestors were evolving. And so we know that they were available on the

hominin landscape and we know that they were as nutritionally dense as they are today, because really they're no different genetically. And so I recon, I use them in my reconstructions, but again, it's just been all in theory.

Visual Description: **Slide with map of Africa with Tanzania highlighted on the east coast of the continent, and another map showing where Olduvai Gorge is in northeastern Tanzania. Plus a photo of an archaeological dig site with layered or laminated rocks exposed.**

Julie Lesnik: Until a few years ago at the site of Olduvai in Tanzania, one of the most famous fossil hominin sites, about a, with layers about 1.7 million years ago that are hominin activity layers, we have their bones, we have their tools. And we now have their bones and tools right next to a preserved termite mound. So this is my ongoing research. I was sent a photo of this feature. And, and I've been working with a geochemist colleague and we've been doing every sort of chemical assessment we can of the soil to confirm that it is indeed not only Macrotermes, but also ancient Macrotermes, that this isn't a recent inclusion because termites are colonizing and, and take over landscapes. And so we've done every sort of test and it is amazing that we can actually demonstrate without a doubt in our minds that this is definitely an ancient termite mound, that the hominins were hanging out by. So I still can not prove to you that they literally put those termites in their mouth and digested them for nutrients. **[00:16:00]** Can't do that at this point without a time machine, but we have almost every sort of evidence, tangential and directional evidence pointing to this. Saying that if these hominins are as smart as we give them credit for, they should be taking advantage of this resource. So that was my big, you know, research project over the last couple of years. And we're going to be working on writing this up soon.

Visual Description: **Slide titled “Human evolution” with the diagram of the five hominins in a V shape. An arrow points to the hominin in the middle, the third of the five. Text reads “Homo erectus – Evolution of the human-like form”**

Julie Lesnik: So that's Australopithecines right. They're going after termites, are going after the social insects, just like we see chimpanzees and orangutans and gorillas do. But when we kind of go up this, you know, you know, getting closer to us in time, we look at the, our genus, when we're looking at Homo erectus. What we're seeing with Homo erectus is that morphologically, behaviorally, they're starting to resemble us a lot more. So to try to understand their behavior, chimpanzees probably no longer provide the best model.

Visual Description: **Slide with a graphic of progressively larger hominin skulls. There is also a graph showing cranial capacity over time, with a sharp spike up on the right side, starting at about 1.7 million years ago. The largest cranial capacity is Homo sapiens at top right of the graph,**

with about 1,500 cubic centimeters. Text says, "The greatest increase in brain size occurs with the genus Homo, not the hominid line."

Julie Lesnik: What we're seeing with Homo erectus is that brain size in Homo erectus jumps up greatly compared to what we saw in earlier human evolution. So this is one of those biggest brain size expansions. And so we're starting to see Homo erectus brain size be on the cusp of modern human brain size. So we know they're smart.

Visual Description: Slide with images of tools places next to each of the five hominins on the V-shaped illustration. There are hand axes and other stone tools next to three of the hominins; there is a smart phone next to Homo sapiens at upper right. Text reads "Homo erectus tools show complex forethought in their production."

Julie Lesnik: We can look at their tools and we can tell that they are using complex forethought in order to make those tools. Earliest tools are, are very simple. You kind of hit two stones together. You have to get the angle just right, but it's really just one hit. You're going for with the, these hand-axes that are, are very common for Homo erectus. You have to have the idea of what a hand ax looks like in your brain, and then do all the right steps in order to make it. So we know Homo erectus is is more intelligent in their behavior as well beyond that, of what we see in chimpanzees.

And so we're trying to reconstruct what they're doing in the past and what their insect portion of the diet looks like …

Visual Description: Slide titled "Using modern foragers as models," with two bullet points: One, modern foragers are modern humans; two, there are correlates of foraging that are consistent across regions (from the tropics to the Arctic).

Julie Lesnik: We should be looking at modern foragers. And so it's important for me to say that when we use modern foragers **[00:18:00]** in these models of past human behavior or the behavior of our ancestors who are not fully modern human yet. It's really important for me to note that these modern foragers are modern humans. They have the same intelligence as us, the same physiology as us, the same bodies as us. They are fully modern human.

The thing that makes them different is that they live within their environment, right? They live in environments that are useful to us for understanding the past. If you look at what I'm doing, I'm in a house with air conditioning. I sleep on a magic bed that adjusts to my body weight throughout the night. Like my behavior is not useful for understanding what was going on 2 million years ago. But somebody who has to find a way to use natural elements provided from the forest to provide shelter for

themselves and to find food and to get enough energy and nutrients, to be able to survive and reproduce. Their behaviors are much more aligned to what we could expect our, our ancestors were doing who are living in similar environments.

So in this idea of using modern foragers as a model, and we know that there are correlates of foraging, no matter what environment these foragers are in. So they could be in the tropics. They could be in the Arctic, they could be cold, they could be hot. They can be wet, they could be dry. Like doesn't matter. We have these correlates of foraging.

And what we see is that when a group of humans is living within their natural environment, group size must stay small, or else you're going to outstrip all your resources. You have to be mobile because you will outstrip your resources in local areas and need to continue moving in order to keep everyone fed. When you're living this way, you're not really storing resources like you are if you're farming, right? You don't have granaries to store your resources. And so when you're constantly moving, you can't store resources like that, which means you can't store power.

And so we see egalitarian societies here. We might have respect for elders, but in general everybody's equal. **[00:20:00]** But within that equality, we do see what's called sexual division of labor. Men and women in these societies do some things differently, especially when it comes to procuring food.

Visual Description: **Slide with a quote on it attributed to Illgner and Nel (2000). The geography of edible insects in Sub-Saharan Africa: a study of the mopane caterpillar.**

Julie Lesnik: And so here's just a quote from a 2000 paper that was studying some foragers in Sub-Saharan Africa, it says that it would appear that the consideration of gender cannot be excluded from a discussion on entomophagy in terms of what is consumed and who is involved in the gathering and processing of insects.

So we know that if you look close enough at insect eating in these foraging groups, you have a little bit of, of sexual division of labor showing up.

Visual Description: **Slide titled “The !Kung San” with a photo of a group of five brown-skinned people sitting on the ground and digging in a brown grassland area. One person is holding a tool in the air, about to pound it down on a mound of earth below – possibly a termite mound.**

Julie Lesnik: And so three examples from three different continents. So in Southern Africa, the !Kung San, what we see is that when the women are out in their normal foraging patterns every day, if they come across a really productive termite mound, they will stop and sit there with their friends

and eat all day. And then they'll take some back to then help prepare for a group meal. But there's something social about this too. It's not. It isn't just a nutritional resource for this group, it is important. And it is a way that these women connect with each other when they're foraging for these insects.

Visual Description: **Slide titled "The Ache" with a photo of a woman in a wooded area, carrying a small, limp animal that looks like a striped pig. There are three text bullet points. One says, "Women average 15 minutes a day in search of various insect larvae." Another bullet point says, "12 different insect species, mostly beetle larvae."**

Julie Lesnik: In South America, the Ache, what we see as that insects are so important that the women in their foraging trips spend a dedicated 15 minutes a day to their collection. So to me, that means that they are important enough to carve time out for. And then again, if they come across these insects, usually beetle larva is what they're going after, when they come across these beetle larva, anytime in their foraging routine, they will collect them when found. So again, showing that value. But so they eat a variety of insects, but again, mostly beetle larva.

Visual Description: **Slide titled "The Arrernte," with a photo of a bare-chested, brown-skinned woman holding a child on her shoulders. Two bullet points mention that women go out in search of social insects (quote from Bodenheimer, 1951) such as termites, caterpillars, and ants.**

Julie Lesnik: The Arrernte is a indigenous group of Australia, and this quote from a monograph in 1950s, I really like because it highlights kind of why women are, are maybe going after insects more than their male counterparts. **[00:22:00]** And what we see here is that women, accompanied by their children, carry digging sticks and go out in search of small fauna, including social insects that are available year-round. So we're seeing termites, caterpillars and aunts being consumed by this population. But what we're seeing is that it's a low risk activity. You can bring your kids. They're not going to get hurt. And you're going to likely go home successful, having found the insects you were looking for.

Visual Description: **Slide of a numerical data table, with six nutrients listed in the left column, with adjacent columns titled "Men," "Women," "Women – pregnant," and "Women – lactating." In every category, such as protein in grams per day, or calcium in milligrams per day, the columns for pregnant women and lactating women have higher numbers.**

Julie Lesnik: And so when we're thinking about this division of labor and why women are eating insects more than men. That reliability, that reduced risk of failure for acquisition When going out for insects, is a big part of it. But when we look at it nutritionally, women and men have different nutritional needs, especially when women are reproductive, when they are pregnant or lactating. We think of men as needing more protein than women

because they have more muscle mass than women on average, however, when women are pregnant or lactating, their protein needs go up beyond that of a man's. And so they actually need more protein. And so instead of relying on risky, you know, hunting of animals that you might go out and not succeed, or if you don't go out because you're worried about the, your wellbeing or your kids' wellbeing, and you're waiting for somebody else to bring back meat, that's even a worse strategy. But to be able to go out and procure your own protein from insects seems like a really great strategy.

And we can see that when we look at the insects that I was just talking about. All of these nutrients that increase for women when their reproductive, folic acid, calcium, protein, general energy like lipids. They they're all available in insects. And especially if you eat multiple, the more variable your diet in general, the more. Assortment of nutrients, you'll be able to get. And same thing, the more varied your insect diet is the more of these nutrients you'll be able to get. Just to note, these dashes are not that that resource isn't available, it's that this is still a very young field **[00:24:00]** and we don't have all the knowledge, not every insect has been researched in terms of its nutritional contributions.

But what we can see is that in general insects provide these nutrients that women need. And so it's likely why they consistently across the continents and all of these origin groups go after insects more than their male counterparts. And interestingly, it matches what we see in our primate cousins as well. So we see it in chimps, but I could actually, if I had more time, I could show you other examples of monkeys and apes that show a similar disproportion in insect parts of the diet across male and female.

Visual Description: **Slide titled "Homo erectus," with text saying "likely diversified their insect foods over their large range." There is a map showing Europe, Africa, the Middle East, Asia, Indonesia, and Australia. An area shaded in dark green includes Africa, the Middle East, much of India, much of China, and all of Southeast Asia.**

Julie Lesnik: So we're thinking about the Homo erectus diet, when we look at Homo erectus fossils, if we look at their teeth, if we look at the chemicals in their bones, we can tell that their diet, individually, as individuals, is more variable than what our Australopithecines ancestors were doing. And so again, more variation in your diet, you're getting more nutrients, you have, it's sort of the blanket approach. If you try, if you eat everything, you're going to get all the nutrients you need, because it was in something. And so that's probably more with the Homo erectus diet looks like. And so if we think about the insect portion as well, we're moving beyond the social insects and adding more of that caterpillar and beetle larva, insect portion to their diet, most likely. So when I'm reconstructing Homo erectus and looking at the modern foragers, I look, I think they're eating insects more variable than just the social insects.

Visual Description: **Slide with the V-shaped illustration of five hominin silhouettes, with a blue arrow pointing down at the second-highest on the right side of the V. Text reads, "Neanderthals. Likely ate few insects in their colder environments."**

Julie Lesnik: Moving closer to us here, I just want to stop at the Neanderthals for a minute, because they are really important when we're talking about this, why we don't eat insects. When we're talking about that Western diet, that's really a European diet, Neanderthals are the ancestors in Europe. So their diet is ancestral to the European diet. And so, so when I think about what they were doing, Neanderthals were living in glaciated Europe. It was cold, harsh environments. They had to eat meat, **[00:26:00]** because they can't eat the dead grass, so they have to eat the animal that can eat the dead grass in order to extract nutrients from the environment.

So they likely ate very few insects because, one, it's redundant to the animal meat that there's expert at, experts at obtaining, but two, they're not available year round, maybe seasonally, maybe at the southern end of their range, but it would not be a reliable resource in Neanderthal habitats. Like it is in Homo erectus or Australopithecine habitats.

So when we're thinking about the, the Neanderthal diet or the Western diet or the European diet, insects were, do not have a deep history in this diet.

Visual Description: **Slide titled "Europe under ice until 18,000 ya" and a map of the globe showing white covering much of what is Canada and Scandinavia today.**

Julie Lesnik: Because of this glaciation history, where Europe's been covered in ice for so long.

Visual Description: **Slide titled "Latitude and insect eating," with a map of the world. Some of the continents are colored different shades of black and blue, with black indicating more than 300 insect species per country, and light blue only 1 to 5 insect species per country. In general the areas closer to the equator are colored darker blue and black, while Canada, much of Europe and Russia are white.**

Julie Lesnik: And so we can look at this map of number of insects species consumed per country. And you can see on this map that it's largely a tropical resource. China's kind of a outlier here. It kind of screws up the visual of this map, but actually within China, it's the Southern provinces where we see most of the insect eating, so falling in the subtropics. And so if this is the insect eating around the world, it maps beautifully with latitude on a gradient. The further away you get from the equator, the less likely you are to eat insects. And so that's what we're seeing in the European history, is this environmental history playing through on why insects were never a major part of it.

Visual Description: **Slide titled “But why are they disgusting?” with a photo of a woman with her mouth open, leaning against a tree that is swarming with bugs. More text says, “BUGS!” and “Fear factor moments.” Credit is @JulieLesnik.**

Julie Lesnik: But that doesn't. Explain why insects are considered disgusting, right? Not having something, a part of your diet shouldn't automatically mean that you have this strong negative opinion to it immediately when you think about it.

Visual Description: **Slide titled “Ethnocentrism” with two bullet points: We tend to judge others by our own standards, and we tend to think if it is different, it is wrong.**

Julie Lesnik: So that's a little bit more complicated. And what this comes down to is, you know, Anthropology 101, ethnocentrism. We tend to judge others by our own standards. And so if we don't eat bugs, when we see somebody else eating bugs, we tend to think that that must be wrong, **[00:28:00]** because I would never do anything that was wrong. I've made decisions for myself and it's an informed decision. And what I do must be right. And so somebody doing something different must be wrong. That tends to be how we tend to look at others and other cultures. So we tend to think if it's different, it's wrong. But what we see then is, if we look through.

Visual Description: **Slide titled “European Colonization” with a color illustration showing light-skinned men in European dress on one side, carrying spears and swords, and a group of brown-skinned men wearing loin cloths on the other side.**

Julie Lesnik: Sort of the colonial history of Europeans who do not have insects in their diets, in their environment, traveling across latitudes in a way that had never be done, been done before. So Columbus coming to the Caribbean and encountering indigenous populations consuming insects, it was a surprise. But also these explorers had ulterior motives here. Right? They wanted that land. They wanted these people to be slaves in their sugar plantation. And so it becomes a, a sort of propaganda to talk about these people as more animal-like because if you can show that these humans are more animal-like, you can start treating them like animals with less worry on your conscience. And so the letters home from these explorers were very …

Visual Description: **Slide titled “Diego Álvarez Chanca, companion of Columbus on his second voyage (1493), with a quote on it.**

Julie Lesnik: … very clear to explain that this insect consumption was, was very animal-like. And so we see from Diego Álvarez Chanca from Columbus's second voyage, writing that they eat all the snakes and lizards and spiders and worms, they find upon the ground. So that, to my fancy, their bestiality is greater than that of any beast upon the face of the earth. So this is racism playbook play one, is to make people look more animal like,

and then you can start degrading them. And, and what we see here, we know the history of Columbus's voyages and the genocide and such that follows.

Visual Description: **Slide titled "Over 350 years later (1842).. John C. Fremont, U.S. Senator & participant in the California genocide, with text in quotes below it.**

Julie Lesnik: But even then we can go 350 years later with John C. Fremont, who was a U.S. Senator **[00:30:00]** and participant in the California genocide. So the California genocide is the murder of thousands of indigenous peoples during the California gold rush, when, when, when everybody was moving to California to try to strike it rich finding gold, you needed more space for more white people. And so genocide of the indigenous populations there was done by the U.S. government. And here in this quote, "Roots seeds and grass, every vegetable that affords any nourishment and every living thing, insect or worm, they eat. Nearly approaching to the lower animal creation, their sole employment is to find food and they are constantly occupied in a struggle to support existence."

And so these narratives are a part of our history. And so when we're thinking about our attitudes towards edible insects, it's really important to remember where our food culture comes from and how big of a part this is.

Visual Description: **Slide titled "The disgust is real," with three bullet points, including that kids learn from the reactions of adults what is disgusting.**

Julie Lesnik: And so. Here I'm saying that our reaction to insects is cultural. Right. But you might be sitting there going my stomach is churning and I kind of want to gag when you, when you mentioned eating insects. And so how can that be cultural?

Well, disgust is one of the few learned emotions, we learn it really young and it gets programmed deep in our brains. And so it becomes automatic and physiological.

So if you think about it, a kid, a two year old will put anything in their mouth. You have to stop them from playing in the garbage or in a toilet by giving them a big disgust reaction. Oh no that's disgusting, no don't put that in your mouth, right? And that trains the pathway in the brain to avoid that because it can be harmful, there's pathogens in garbage or in the toilet, but we can transfer that and make. Disgust reactions to things that are not harmful. And so eating insects is not harmful. They're very good for us. People for millions of years have been eating them. And so when we give our disgust reaction, we are taking away a nutritional resource from somebody who might need it.

Visual Description: **Slide titled “Don’t Yuck My Yum,” with multicolored illustration of a cricket, with different sections different colors and labeled, in the manner of a cow, “Chuck,” “steak,” “tenderloin” and so on.**

Julie Lesnik: **[00:32:00]** And so I really liked this phrase of just, don't yuck my yum. Because it's really hard to overcome this. We are part of our culture and this has been ingrained in our neural pathways. But if we can start acknowledging that, just because we don't want to eat them doesn't mean they're harmful and that we probably shouldn't take that away from people who do want to eat them, we can just politely say, no, thank you. We don't need to have these big performative disgust reactions, because you don't know what kids are around. It's really hard with TV and media always portraying insects as this, this fearful thing, as these disgusting things. Cause our kids are always seeing that.

And so my hope is when I think about the future of insects,

Visual Description: **Slide titled “Final Thoughts,” with text “As we think of the future of food and the need for more sustainable options, insects provide an appealing choice. How we talk about food matters. The opinion of the western world drives global perceptions.” At the bottom is the color logo with a cricket and the words “The Planet’s Most Sustainable Superfood.”**

Julie Lesnik: I really think of it as a generational turnover. We have been programmed this way for so long, but if we start making the effort and start raising our kids with the idea that insects can be good, if a kid wants to put a bug in their mouth that they found in the garden, don't say oh, gross. Say, oh, put that one down, let's get you bugs that are safe to eat. Right. We have ways of approaching these topics. Now we have the knowledge and we really can make the change. And so if we're really thinking about a sustainable future. Insects really are a super food. They really check all of the boxes of what we need to solve so many problems. And so we got to start talking about them differently.

So, thank you so much for having me on,

Visual Description: **Slide with four images: A book cover, “Edible Insects and Human Evolution,” by Julie J. Lesnik; the Entomo Farms logo; an image of cookies on a plate, under the words “Dr. Julie’s stupid-good cloven cricket cookies”; and a Gym-N-Eat Crickets logo.**

Julie Lesnik: I have a list of resources for you. One, I have my book and I have a link for that. That will be in the chat. Entomo Farms is that large farm. I really like them. And I buy from them a lot. Gym-N-Eat is in Iowa and is a small startup. And I just love her and love what she's doing. So I buy a lot of my crickets from her as well. And then I gave you a link to my favorite cookie recipe that uses cricket powder. And it has a lot of strong flavors. It has

clove and cinnamon and coffee. And so all of those flavors are beautifully aromatic and strong flavored that the cricket, **[00:34:00]** you can taste it, but it acts with them instead of against them. So like instead of trying to make a chocolate chip cookie and adding cricket powder to it, where you get just a bad chocolate chip cookie, this really incorporates the crickets into something that I eat way too many of and often make myself too sick from eating the whole batch myself. So I wanted to provide you those links. And I am happy to take your questions.

Visual Description: Briana Pobiner appears on screen.

Briana Pobiner: Wow. Fantastic. That was such a wide ranging presentation. Julie, thank you. I will. Thank you. Great. So we have some questions already, so I will dive right in. So a question from Akash, and I'll paraphrase. And I think you started to touch on this at the end, but how can we bring awareness among people that like consuming, about consuming bugs as food?

Visual Description: Julie Lesnik appears on screen.

Julie Lesnik: I think that, you know, one of my, I've been amazed at how well it's worked when I've mentioned insects as food and people have had that strong disgust reaction. I point it out to them. I was like, like that reaction, what you just did is visible two rooms over. And so these big reactions are, are, are probably more than like, if you think about it, do they really need that big of a reaction? Has eating a bug ever hurt you? Do you know anybody who's eaten a bug who was hurt by it? Like why? And so I pick at people's big disgust reaction and I've, I've been surprised at how open-minded people have been to going, oh, I never thought about that. Right. Because we do, we just. I think, especially as women, we get attention, ewww, like. It's just part of our culture. And so we use these ways of communicating that just fall into the patterns of, of what's expected of us, instead of thinking about it. And so I've started challenging people to think about the reaction. And then if they're engaged, then I talk about things like colonial history. And I've been really amazed at how well people have taken to that.

Visual Description: Briana Pobiner appears on screen.

Briana Pobiner: Nice. Thank you. So here's a question maybe at the other end of the spectrum, **[00:36:00]** but from Danella, are there some insects that are harmful to eat, just like we can eat some mushrooms, but some are deadly.

Visual Description: Julie Lesnik appears on screen.

Julie Lesnik: Yes, a hundred percent. And that's why this for forager knowledge is so important too. And in, in truth when, when I'm thinking about like our consumption of insects, I'm always giving you links to farms. Wild foraging

of insects is something that if you're already, if you already forage for mushrooms, if you already forage for wild greens that you use in your salads, if you're already a forger, then learning, which insects to forage is a very similar, you know, educational curve of learning, which ones are harmful. And, and they have signals like bright colors usually means something's not good about them. They're either poisonous or toxic in some sort. Lots of barbs on their legs, like, you don't want those in your throat. So there are some tricks like for like, so now, you know, those two things. So if you have you're stuck in the woods, like those are kind of basics. But, yeah, but you got it's the learning curve just like mushrooms and you can learn which ones are harmful and which ones to avoid. But if we all start, go foraging for insects, right now we are on the cusp of what people are calling an insect apocalypse, because as climate changes, insects are so tiny and so well adapted to their tiny, tiny environments. And so the smallest changes affect them. And so we see lots of insects species dying off right now. And so if we add all of a sudden, every American's going to start wild foraging, we're going to do a lot of harm to our biodiversity. So I think foragers should be able to continue foraging, but for us who don't forage, the farmed insects are held to the standards of, you know, USDA. You know, regulations, you know, they're safe.

There is some worries about allergens. People will tend to put a, a broad statement of if you're allergic to shellfish, you may be allergic to insects. Truthfully the **[00:38:00]** link is, is isn't very strongly like I haven't seen a really good correlation of that in the literature, but it's so scary. It's such a severe reaction so that all the cricket farmers just want to be super safe. But for the most part we tend to eat some bugs all the time, accidentally. And I think it keeps our bodies primed and we don't see as many allergies to insects as we do almost every other food right now In the United States. So I think there is a positive pathway for insects for us in terms of allergens that way.

Visual Description: **Briana Pobiner appears on screen.**

Briana Pobiner: Nice. So I'm gonna follow up with two questions from different people that are kind of follow-ons from what you were talking about. Lily, Levy, Anna Maria and George all together asked, how many insects. Are edible. Do you have any estimate or something like that?

Visual Description: **Julie Lesnik appears on screen.**

Julie Lesnik: We, so some amazing human went through all of the literature and tried calculating our current knowledge. And so this is our, our academic knowledge of insect species. So this is not actually fully exploring the traditional knowledge of all of the foragers and the knowledge we've lost from the marginalization of these people. But we know from these records of studying what, what has been observed by researchers, over 2,000 species that are consumed around the world. And so that and that is, like I said, the small little slice that we can actually provide evidence on, but

truthfully, there are so many insects species we can't count them, that there will always be nutritionally, useful insects species available to us. And that is one of their kind of powers as a super food.

Visual Description: Briana Pobiner appears on screen.

Briana Pobiner: Nice. I think you may have sort of answered this already, but Stephen asks, we eat crustaceans. Why are land-based bugs any different?

Visual Description: Julie Lesnik appears on screen.

Julie Lesnik: My husband really likes shrimp and every time he's eaten it, I'm like, Ooh, sea crickets. Just trying to kind of like change that narrative and it is, it's just cultural and a lot of like, I should probably learn this, I should learn **[00:40:00]** this history better, but at the same time, it's kind of full knowledge at this time. But lobster being what was fed to prisoners so much that the prisoners complained that they got fed so much lobster, to then becoming a elite food. And so we see these foods make these huge transitions. And so we're kind of hoping crickets will make that same journey, like lobster, like sushi. So it's funny to me, because of all that, like, we tend to like plastic package and not see the animal in our food. And so that is part of it. When you say insects, it's the whole insect, unless it's powder, and you see the eyes, you see the legs. So that's why, you know, It easily triggers people, but then people do love lobster and crawdads and, and shrimp that they have to de- whatever, devein and pull the shell off and you see their eyes. But that's okay cause they've done it since they were a kid or. So it's just that, what you're used to.

Visual Description: Briana Pobiner appears on screen.

Briana Pobiner: Here's a great two-word question from Madeline. Why crickets?

Visual Description: Julie Lesnik appears on screen.

Julie Lesnik: Why crickets, that is a great question. One, because of the infrastructure that we already have. So we've been feeding crickets to lizards and other pets for a long time. Part of that is that we eat them in their adult form. So a lot of the things I was mentioning people eat are beetle, larva, caterpillars, mealworms are beetle larva. And so you have to catch them in their correct life stage, which makes the harvesting more complicated because you have to catch them the right moment. So eating in the adult form is one thing that makes it really easy. And two, their habits. Like, I like to say it, like, if you think of where you find crickets, you find them in dark cramped spaces, like you lift a rock and there's some crickets. And so they do well in the boxes that we cover them in, in, and farm them in. So they don't need like termites have incredible, their termites are incredibly amazing from like every angle **[00:42:00]** on, they're architects, they they keep a well-ventilated mound that's a constant temperature and how they do this is phenomenal and amazing, but we can't reproduce that very easily. Like it's very hard for us to create the habitat of a termite

mound and raise termites for eating. So there are a couple of different things. In terms of their sort of life cycle. But then the other thing I would say is that we just tolerate crickets a little more. Jiminy Cricket was cute, they're lucky in some cultures, they chirp, they sing, they don't sting, they don't bite. So we just have more positive associations with them, which allows them to kind of, we can kind of build on that to get people more familiar with them.

Visual Description: Briana Pobiner appears on screen.

Briana Pobiner: Awesome. Thank you. Here's a good question that follows up on this question from May. Can we raise our own insects to eat?

Visual Description: Julie Lesnik appears on screen.

Julie Lesnik: Yes. Yes. Yes. Yes. So, this is exactly how I think we could actually solve some of the global problem, because as much as I love what the large farms are trying to do, and what they're trying to do is going to be better than traditionally raised livestock. Eventually they're going to be these giant central cricket farms that require great distribution and all of the energy resources that it needs to take a truck full of crickets across the country, when the greatest avenue towards actual sustainability and helping people, like who have a hard time affording what to eat, you can have small cricket farms or mealworm farms. Those two both exist. And you can take control of your own protein needs. Sorta like chickens, but even easier. And so it's, it's not that hard to learn. There are programs around the world trying to get these sort of at-home cricket farms at the hands of people that are. In food and stable, unstable areas. And so it's really it's that cultural disgust about them again, **[00:44:00]** that, that stopping this from spreading. But there is so much potential at urban gardens or at your own home or co-ops, or to do it really locally and solve so many problems. Again, they really check all the boxes.

Visual Description: Briana Pobiner appears on screen.

Briana Pobiner: Awesome. So, I guess, sort of a personal question, there are two questions that I'll combine. The first is from Rob. Did you try any annual cicadas this summer and what was your favorite dish? And the second question is from Mindy. Are there any cookbooks out there that you would recommend?

Visual Description: Julie Lesnik appears on screen.

Julie Lesnik: I did not try the cicadas. They were not in my area in Michigan. So I was going to have to travel. But I'm going to be very honest with you. I don't eat a lot of bugs. Like I eat crickets. But like I was a picky eater growing up and so every new bug that I try requires like a steeling of myself and ate, oh, you get paid to do this sort of like approach to it. It. And, and so that's why I'm really like what I do, because I know who I'm talking. Like I

I'm, if I can convince myself that these are the answer, then I know how to convince other people. And cicadas are, again, are big. I do much better with smaller bugs so I can do handfuls of crickets and mealworms. I'm actually really like June bugs are really crunchy and enjoyable, but the bigger they get, the wearier I get. So I wasn't like rushing out of my house to go try the cicadas. So that is me being very honest with you.

Cookbooks. I believe there is a book called Bugs for Beginners. It was in production so I believe it's out now. If you search it, at least they should have a website. That is a great starting place. And so I, there are other cookbooks. There's an Eat a Bug cookbook, which has been around well before this current movement, but that chef really likes celebrating the whole insect. Right? So it's like skewers with grasshoppers on it. **[00:46:00]** And so that's not, again, that's not Bugs for Beginners. That is, you tend to work up to the Eat a Bug cookbook.

Visual Description: Briana Pobiner appears on screen.

Briana Pobiner: Nice. So here's some questions more about your sort of career. So Akash asked, how did you get interested in entomophagy and paleoanthropology? What did you study to get into the field? And Ben asked, how did you get interested in this line of research and what are the big remaining questions for your research?

Visual Description: Julie Lesnik appears on screen.

Julie Lesnik: I entered grad school with a personal statement wanting to study brain evolution. And, and so that, I was very interested in the time period that I ended up studying this like 2 million years ago where brain size was like incrementally increasing. Cause one thing we know in evolution is that whatever happens, what happened right before it is really important. So, so we have to build on what came before. And so the large brain expansion that explodes with Homo erectus and with modern humans is, is, is piggybacking off the little expansion that happened in Australopithecines. And so that's what I wanted to study.

And so then two things kind of shifted me in the direction was one, in studying brain expansion you have to study diet, right? You can't expand these brains without the diet to support it. So food and brain size evolution became very intertwined in, in my mind. And so then I started studying food a little bit more in my interest with brain evolution.

But the other thing is that. I'm just an animal person. I used to train horses. I have dogs and cats. And so animal behavior is something that's always been important to me to kind of understand. And I had never really taken primatology until I got to grad school. And so it was once I was at Michigan and John Matani was there, who studies chimpanzees. And I started taking his classes. I started realizing that I understood chimpanzees really well. I understood **[00:48:00]** animal behavior and I could incorporate it into my models of human evolution. And so then it

was very obvious like, well then tool use and brains clearly goes together and chimps are smart, so they use tools. And then I started just recognizing that people didn't talk about the actual termites like they talk about chimps using tools and how smart chimps are for using tools and teaching their kids to use tools. But we never talk about what they actually owe for termites. Right. Like, we don't really focus on, on that part of the diet and all of the avenues that we can think about going into the past. And so I just realized it was this gaping hole, and then those bone tools happened to get published right around the same time. There's a lot of interest in insects, in what their chemical makeup was and could we see it in the fossil bones? So I was just in grad school at a time where insects were a little bit more interesting than other times, but I also just kind of had all the right skills to kind of get into this.

Visual Description: Briana Pobiner appears on screen.

Briana Pobiner: Awesome. Thank you. Speaking of tools, here's an interesting question. and related to food from Rowan and Sersha. So they're wondering if an ancient humans used tools to clean their teeth after eating.

Visual Description: Julie Lesnik appears on screen.

Julie Lesnik: That's a great, we have evidence of that for Neanderthals. We actually have scratch marks on teeth that don't match up with anything other than using a stick to pick. I don't think we have anything older. Briana, do you know anything?

Visual Description: Briana Pobiner appears on screen.

Briana Pobiner: I don't think so. Yeah. I remember it in Neanderthals.

Visual Description: Julie Lesnik appears on screen.

Julie Lesnik: Yeah, so it is cool. We definitely have it. Oh, somebody asked me questions that I still have. Well, one thing that I'm waiting for is that we're starting, we have the technology to study like the DNA of all of the components that make up dental plaque. And so we are gonna start finding bugs in teeth in hominins. Part of the problem is that we used to clean this off the teeth. So the fossils in the museums are all beautifully clean teeth and we erase this amazing Information-rich **[00:50:00]** resource, because we didn't know where technology would go in the future. And so finding the teeth that preserved that dental calculus or, or the plaque, we're now having to start sort of at, at square one and hope to find all new fossils that we can really test on this. But the thing is, is that the people researching this, my goal in my career is to get people who research this stuff to ask to, to ask the questions related to insects, cause we've been ignoring it. And so by me being out here and loud enough, people will start asking these questions when they do come across that dental calculus, as opposed to it being one of those things that has to be dug out of a drawer 30 years later, when somebody wants to ask it in the

future. So I do believe that in my career, we will find some really cool insect remains in dental calculus.

Visual Description: Briana Pobiner appears on screen.

Briana Pobiner: Awesome. So I think that's a good, at least one answer to this next question. We'll stick in the past for a moment and then I'll switch back to the present. So Rob asked, given that recent work on isotopic and tooth wear signals of diet have challenged some assumptions about what certain signals might mean, what do you see as some promising new routes for reconstructing hominin diets?

Visual Description: Julie Lesnik appears on screen.

Julie Lesnik: Oh, my goodness. Okay. So. So I, I'm, oh come on. Isn't it.

Visual Description: Briana Pobiner appears on screen.

Briana Pobiner: Aside from, you know, being able to maybe find traces of insects in dental calculus.

Visual Description: Julie Lesnik appears on screen.

Julie Lesnik: Yes, exactly. So for me, so there are, there's sort of the, like, experimental work we can do to understand those things more. So that's sort of, one of the points I was making is that we tend to do these analyses and look at a bunch of things as possibilities that don't include insects. One of them that drives me crazy is grit on teeth. People say, oh their teeth are worn it's they must've been consuming grit. There must have been dirt on the meat they were eating. I was like, **[00:52:00]** much easier to get grit from a termite mound. Right. So, so it's that sort of like gap in logic in sort of our field that we need to narrow. So to me, grit, if I, to me that screams insects. If I, when I see grit as an explanation, but most people aren't me. And so then they, they come up with more convoluted explanations for it that don't hold up to testing as well. But these are sort of those just so stories that we can't really test. And that is the hardest thing about insects in the diet. We do have the ability to start finding molecular evidence of insects. So that's how we found that that feature was a Macrotermes mound, is that 100% we know that Macrotermes were there. And so that sort of chemical research can start being applied to just soils in general, like understanding the insect fauna that was available at a site and just reconstructing these insect parts of the environment. Just like we do with, we're able to do it with animal bones, right. And then by doing it with the animal bones, we know what's available and we can reconstruct the environment. So if we can start doing that, if there's interest to start doing that with insects, we can start understanding micro-environments a little more, and that's going to give us a more narrow idea of what the foods available were, including the insects. So it really just, it comes down to all of the indirect ways we can find insects, cause we're never going to find a bug on a plate. Or in a

stomach, right. We're just not, it's too old. We find that for more recent remains, mummified remains. But for the ancient stuff, it's just so hard. So we just gotta keep getting smarter with how we kind of sleuth them out.

Visual Description: Briana Pobiner appears on screen.

Briana Pobiner: Yeah. So I think, I think you've answered this question. So Steven asks has termite DNA been found on Australopithecus teeth?

Visual Description: Julie Lesnik appears on screen.

Julie Lesnik: **[00:54:00]** Not that I know of. And again, it's mostly because we don't have it. The Sediba finds in South Africa team came out after we knew about kind of dental calculus. So we have Sediba dental calculus. So it's an Australopithecine in South Africa. And they didn't find insects, but I also haven't harassed them enough to ask if they looked. So maybe I need to do that. I think they might've, cause I think, I think they came to me and said, oh no insects. And I was like, oh, darn. But I don't, I didn't ask them enough. So yeah, it really is. It's just getting people to think about it and to look.

Visual Description: Briana Pobiner appears on screen.

Briana Pobiner: Nice. So well, I'll turn back to the present for the last couple of questions. So Walter said, I didn't know, there was so much sexual dimorphism in the forging and eating of infect in present day equatorial people. What did the men do while, when the women are foraging?

Visual Description: Julie Lesnik appears on screen.

Julie Lesnik: Oh, geez. So the, the nice answer is that they are out hunting. The honest answer is they're often. Not doing much. And, and, and I kind of, and, and sadly so, because honestly what you see in a lot of, of places is if they have access to alcohol, you'll see men that are spending their days drinking while the women are foraging. And, and so we had sort of modern society has intertwined with these populations. They aren't as pristine as we like to pretend when we're talking about them and making these reconstructions. So that's sort of the historical answer is that men are, are, are going after the riskier resources. So we tend to think of them as hunting large animals. But we also, it can be mushrooms, right? Mushrooms grow on the sides of cliffs and places that are, are, are riskier to get to. So they'll go after the riskier mushroom instead of the more easily available mushroom. So that's what we tend to see men going after the riskier resources. **[00:56:00]** But as sort of modern globalized society infiltrates into these communities, the hunting and stuff becomes harder because you don't have the range of land to use. You're using, you might be hunting some, but you're not spending your whole day going after them. And so we tend to see, we do see patterns of alcoholism in men in a lot of these foraging populations.

Visual Description: Briana Pobiner appears on screen.

Briana Pobiner: All right. Thanks. I think this may be the last question we'll see. Or maybe we'll get one more in after this. I know we have many that we weren't able to answer. This question is from Megan, who says, I live in California where I work with indigenous folks and I've been taught about cricket or grasshopper drives. These drives have been coupled with cool, good prescribed burns. I wonder if you could speak to this practice.

Visual Description: Julie Lesnik appears on screen.

Julie Lesnik: Yes. So. Awesome that you know about this, great question. And the prescribed burns are so important. So, so relevant right now in, in the U.S. west. So prescribed burns, what a prescribed burn does is that you intentionally burn an area, paying attention to the wind, knowing that the wind is then going to take this fire maybe to a river or something, that's going to stop it, the Great Salt Lake or something like that. A lake or some sort of feature that will stop the burn. And so you, you line up in a way you work with the winds. It's very intelligent and understanding of natural environment and in the prescribed burn, what it does is it then burns up all the undergrowth that in the event of sort of a lightning struck, strike, that's or, you know, what we see now with cigarettes or whatever that stuff goes up so fast in travel so fast. So by doing these prescribed burns, you're keeping that undergrowth at a manageable level so that in the event of some sort of natural fire, you don't lose so much land so quickly.

So in doing that though, another thing, if you do it at the right time, **[00:58:00]** when the grasshoppers are there and you're burning the grass of the grasshoppers, you're not only just clearing that underbrush, you are driving all of the grasshoppers to that exact same place that you want the fire to stop. And so now you can send people to the other end to collect those grasshoppers. And so usually what I think it's usually something like digging troughs. And so then they'll kind of go down in the trough and the fire will go by and then you can kind of cover the trough and collect the grasshoppers. And that is the indigenous knowledge is amazing. So the prescribed burn, so relevant, but one of the narratives of why we don't eat insects is people associated with agriculture. They're like, oh, well, once we started farming, insects became a pest and then we hated insects and so now we try to kill them and it adds to our anti-insect mentality. But when you look at small scale farmers across the continents and people that are farming in their backyard for their own nourishment, or maybe they're selling crops, bringing it to market or something, the easiest, most natural pest control is to go pick the grasshoppers or other pests off the plants. You're not using any chemicals and then eating those grasshoppers. So not only did you stop the pest from hurting your food crops, you also just got a protein-rich, animal-based food that you can now utilize in your diet. So we see that across the continents. And so this incredibly intelligent land management using the consumption of insects as part of the way to to maintain the land, is is, is really our history. And so everything we do now is opposite of that.

And what we're realizing is that maybe we need to start making food choices that are more in harmony with the land. And so insects are a great example of that.

Visual Description: **Briana Pobiner appears on screen.**

Briana Pobiner: That seems like a perfect place to end for today. So thank you. I apologize to everybody whose questions we didn't get a chance to get to, **[00:60:00]** but this concludes today's virtual program. So please join me in thanking Julie for sharing her work with us.

I'd also like to give special, thanks to those who made this program possible. This includes our behind the scenes team who helped sort through your questions, our donors, volunteers, and viewers, like you. And finally to all our partners to help us reach, educate, and empower millions of people around the world, today and every day, we thank you.

So I hope you'll join us for our next program coming up on September 30th. Where the director of the Smithsonian's Human Origins program, Dr. Rick Potts, will talk about doing field work or virtual field work in the time of COVID. So we've put a link in the Q and A where you can find information about our upcoming programs and how to sign up for the museum's weekly e-newsletter. That's really the best way to stay informed on upcoming programs and learn more about the museum's research and exhibitions.

After this webinar ends in just a moment, you'll see a survey pop up, asking for some feedback about the program. Please take a moment to respond. We're really curious to know what topics you might be interested in seeing for future programs and we appreciate your input. Again, thank you to our participants, thank you to Dr. Lesnik, and thanks to the audience. We'll see you next month. Take care.

End of transcript.

Return to the web page for this video, "The Role of Insect Eating in Human Diets, Past and Present."