Experimental Archaeology with Angelo Robledo
Ologies Podcast
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Oh heeey, it's that tattered Halloween wig you *know* is gonna come in handy someday, Alie Ward, back with another episode of *Ologies*. Okay, this one's big. If you have come to rely on *Ologies* for very detailed, very weird information about stuff you never knew existed, and some historical gossip, and strangers' unbridled passions making you feel okay about being alive - hot diggity damn, this is an episode you may just cherish forever. Hop in the jeep, hang tight, this is about to be a journey!

But first, a few things. Thank you to everyone in the Patreon club for supporting at a dollar a month or more. That gets you in and you can submit questions to the Ologist before we record. Bonus: if your questions didn't get answered here in this episode, our guest this week went back and answered them all personally, which was just magical of him. Thank you to everyone who tells friends about the show, who subscribes, and rates, and of course reviews the show. It matters more than you know. It keeps us up in the charts, and I read them all. Then like a crisp, chilly pickle, I select a fresh one to savor each week, such as this week NattyDaddyLite says:

I live and work at a state park - WHAT! - *with little to no internet access. So every week I drive 30 minutes to the nearest town and very creepily sit outside a coffee shop in my car poaching the WiFi (the owner and I have an understanding) so I can download the latest episode of Ologies. Firstly and foremostly, Alie Ward has been my father all along* - yes, it's true - *and secondly, there is so much I don't know, but the best way to overcome all of the not-knowing is to ask stupid questions.*

NattyDaddyLite, my child, and to everyone who left a review, I read it with my heart, thank you for letting me internet-dad you all with weird facts and advice.

Okay, experimental archaeology. Experiment comes from a root word meaning 'to try' or 'to risk', and archaeology comes from the root for 'ancient things'. Experimental archaeology is to risk ancient things, which sounds dicey, but that's not really what it means. You'll see. This Ologist and I have been Twitter friends for a while. He tweeted at me a few years back about wanting to be on the show and - fun fact - I almost showed up at his house unannounced a year ago to just shove a mic in his face to surprise him. But I figured that's probably technically illegal.

We have had to reschedule this interview probably five times in the last month because of me traveling to be up here with my folks; I had my own weird ER trip involving an infected spider bite that turned out to probably just be an infected scratch from carrying firewood. We don't need to talk about it. Also my laptop's screen shattered this week, so I have rescheduled this person over and over, but he was so understanding and such a joy, and we just chatted about everything from the first tools, to bows and arrows, to spear-throwers, aka atlatls.

If you don't know what an atlatl is or how to say it, that's fine, that means this is going to eff you up even better. In the history of *Ologies*, I have never met anyone so passionate about a thing, and it just goes to show you that even though this person is an undergrad, his level of knowledge and engagement in the field makes him likely one of the top experts in the world on this one particular item. It's astounding. So get ready to learn about early human axes, Indigenous populations of North and Central and South America, tales of field work, some new archaeology heroes, tools versus weapons, what to do if you find artifacts on a hike, and the physics of how far you can lob ancient weaponry, with member of the board of directors of the World Atlatl Association - which you'll

understand and know how to pronounce by the end of this episode - Experimental Archaeologist Angelo Robledo.

Angelo Robledo: I am very honored to even be on your radar and even more honored to be on this podcast. It has been, probably, the number one professional goal of mine for two years.

Alie Ward: Really??

Angelo: I distinctly remember I tweeted, "I wish I could just get my PhD tomorrow for the sole purpose of being a guest on *Ologies*." I'm shooketh. That's what I am, I am shooketh.

Alie: Oh, I'm so excited to have you on because as soon as you told me what you were into, I was like, "A what-L-what-L?" [*Angelo laughs*] I had no idea. I put you on the list immediately. Can you tell me a little bit, where are you studying right now? What is your research about?

Angelo: Okay, so right now I am an undergraduate student. I'm going into my senior year. I'm a double major in anthropology and philosophy at the University of Nevada, Las Vegas. Within anthropology - which is, especially in American universities, a broad category, the study of humanity, basically - there's four sub-fields. One of those sub-fields is archaeology. My specialization, or my focus within anthropology, is archaeology. And then my focus within philosophy is political theory, but that's completely different. I bounced around a few labs at UNLV. What's great about that university is that they have a designated building for archaeology laboratories. Most people think, "Why does an archaeologist need a laboratory? They're digging in the field." In-lab work is not something that most people associate with archaeology.

UNLV invested heavily in… I think there are 12 or 15 separate designated archaeology laboratories for different fields of archaeology, different material specialties, different regional specialties. One of those labs is an experimental archaeology lab and I've been working with that lab since I was in high school. My sophomore year of high school I was talking to my school counselor and she goes, "Angelo, what do you want to do with life?" And I said, "Well, since first or second grade, I have written down that I wanted to be an experimental archaeologist when I grew up."

Alie: What?!? How did you even know those words? [*laughs*]

Angelo: Oh, it's crazy. I've wanted to be an archaeologist since kindergarten. I fell in love. It started with Egyptology. Shout out to Mrs. Drake, who was my elementary school librarian, who had noticed that I really liked a fiction book about Egypt. So she said, "Well, there are these nonfiction books about Egypt," and I had no clue what nonfiction was. There were picture books filled with pictures of daily life in Egypt, and I just fell in love. I quickly moved on to other cultures and civilizations around the world. By first or second grade, I knew that ancient tools and weapons were what I was most interested in and wanted to study the most. In high school I told my counselor I wanted to do experimental archaeology and she goes, "Well, did you know that one of the students here is the daughter of the experimental archaeology professor at UNLV?"

Alie: No way.

Angelo: I mean, what are the odds of this happening? My high school had 3,300 students and it is in the fifth-largest school district in the country. There are around 60 high schools in Las

Vegas, and I was at the one with the daughter of the experimental archaeology professor at UNLV. So she put me in contact with her. The professor's name is Dr. Karen Harry and she specializes in experimental pottery work. She has graduate students who are doing experimental leather tanning work, and architectural work, and stuff like that, but she's a ceramicist. She specializes in ancestral Puebloan sites in Northern Arizona, in the Shivwits Plateau area, part of Parashant National Monument in Northern Arizona, kind of in the North Rim of the Grand Canyon.

I emailed her and I said, "I've been obsessed with experimental archaeology and archaeology since I was little. I'll come clean test tubes for you, I'll do whatever, I just want to be in the environment." She said, "Well, me and three grad students are going off into the desert for a month this summer, would you like to come with us?"

Alie: Ohhhh… my god!

Angelo: And of course, my parents were like, "Oh, I don't know about that." But they eventually said yes, after meeting her, and it was myself, Dr. Harry, and three of her Master's and PhD students. We stayed out in a National Park Service cabin out in the Shivwits Plateau. Then every day we had to get into a pickup truck and barrel over boulders. It would take us maybe 45 minutes to drive three miles, because that's how slow we were going. We probably could have walked faster, but we had so much equipment, we didn't want to do that.

Once we would park, we'd then have to hike another hour and 15 minutes. Now, this is in June, in Arizona. It's 115 degrees, we've got between 30- and 50-pound packs on us with gear and stuff like that. [*clip from Mr. Mom: Jack, "Eww, I'm all grimy and sweaty here."*] But once we got to the site, it was magnificent. The site itself was just… You couldn't really tell it was a site unless you knew what you're looking for, because this was at a time when people weren't necessarily living in one place the whole time, they weren't investing a lot into the architecture; the beginnings of the Puebloan culture in that area that built those kinds of big Mesa Verde-type places.

Aside: I was not sure what Mesa Verde-type places were, but I looked it up, and in Mesa Verde National Park, near the Four Corners, there's a series of cliff dwellings, like Cliff Palace. That's an almost 1,000-year-old gorgeous, complex, ancient Puebloan structure built into this jaggy, rocky cliffside. If you look up pictures of Cliff Palace and don't gasp, you should call a doctor.

Angelo: We get to this area and I'm like, "Oh, this is interesting," because it's not exactly what I was picturing. They were like, "Oh yeah, here's a house here, and here's another pit house over here." And I'm like, "Sure, if you say so, because it just looks like a pile of rocks to me!" At that time I didn't know what I was looking at, but the site was situated basically at the rim of the Grand Canyon, in a place that was inaccessible unless you were an archaeologist working on the site. So we were able to have our lunch, kind of, just perched there on the North Rim of the Grand Canyon, and it was just absolutely beautiful.

She said she'd brought one other younger student out on that trip, and after the first two or three days, they were like, "You know what? Archaeology is not for me." I had the exact opposite reaction. I was completely, fully invested after the first day. At night, at camp, we would do experimental archaeology stuff. We'd throw atlatls, we'd throw slings, we made our own rope out of yucca, stuff like that. It was just an incredible experience. [*"Noice!"*]

So that kind of led me into working in that experimental archaeology lab. Then in the last year and a half, I moved over to the lab next door, which is the Paleoethnobotany and Ancient Agriculture Lab. It's run by Dr. Alan Farahani. Paleoethnobotany just means old cultural plants. So it's any plant remains that were used by humans at some point. It's mostly seeds. They study the beginnings of agriculture and the domestication of grains in Southwest Asia, specifically in Jordan and then also separately in Armenia as well.

Aside: Angelo's lab work right now focuses on stone tools found in the Jordan area, and investigating why they were made and used in the period they date from, rather than the more contemporary materials of the time, like iron and copper. It's kind of like trying to figure out people who love to listen to vinyl. It's cool, it's intriguing. Or people who have a CD collection. Is that sad? Why are they doing it - myself included? So many questions!

Alie: When you say experimental archaeology, what exactly does that mean? Does that mean how new methods are created, how new tools are created? How do you define that?

Angelo: Experimental archaeology is the process of recreating ancient technology and attempting to use the tools and weapons in order to better understand how ancient peoples would have used them and how that might've impacted their daily life. That's kind of one aspect of it, is the actual recreation of the tools, and how hard it is to collect wheat using a scythe made out of flint, or whatever. The other side of experimental archaeology is purposely recreating the tools and then breaking them while using them in order to see what that looks like in the archaeological record.

To give an example, we find arrowheads or projectile points and an experimental archaeologist will recreate some of those weapons. They'll fire them at, let's say, a pig carcass, or ballistic gelatin, or something like that and notice, okay, what happens when you miss? If it hits a rock, it breaks this way. If it hits bone, it breaks that way. If it hits wood, it breaks this way. Once you collect enough data points, you can say, "Okay, I know for a fact that this arrowhead broke when it hit a rock, because I was the one who broke it by hitting it against a rock." Then you look in the archaeological record and go, "Here are these 2000-year-old arrowheads. If they present similar fracture patterns as the ones that I found by throwing it against a rock or whatever, I'll know that that's how it was broken."

Aside: Another thing an experimental archaeologist might do is build old tools, like a sickle, and then go harvest a bunch of wheat with it, and then look at the sickle microscopically to see how the blade is worn down by the plants, or what sheen the plants left on the edge - it's literally called sickle sheen - to try to match markings found microscopically on found ancient blades.

Imagine someone finding your kitchen knife thousands of years from now and they're like, "Bleep blorp, this person loved to use a dull butter knife to cut cold pizza. Wow, what a queen. She must have been royalty. I wish I could have hung with her." Then they'd use traces of my DNA to simulate a hologram of me and we'd party.

Alie: Okay, now walk me through a little bit of a timeline of materials. Because you're talking about flint, I know that you have to do your own knapping of obsidian and things like that. When did humans use different materials and where? And how do you even wrap your brain around that?

Angelo: Oh, I still can't wrap my brain around it. I probably will go to my grave not fully understanding how ancient humans figured this out, because flint knapping is possibly the hardest thing I've ever taught myself to do.

Aside: Knapping, with a k, means to chip away at a rock, which is very difficult, as opposed to the 'napping' that most of us have mastered the last few months.

Angelo: I have taught myself a lot of weird skills over the years both related to archaeology and not related to archaeology and I've never had to put more effort both mentally and physically into understanding flint knapping. For years I could give you a lecture on the fracture mechanics, and the physics, and the geometry *behind* flint knapping. I understood it on a conceptual level, but when I had a rock in my hand I was never able to complete an arrowhead. It kind of just took a lot of practice.

Generally, to go over the timeline, the oldest stone tools we know about date to about 3.3 million years ago, which was way before the human species even existed. These were super rudimentary flakes and choppers; they were not sophisticated arrowheads. They were, like, a rock that had one or two flakes broken off to then be used to chop some wood, or chop a bone, or something like that.

Then there's the *Homo habilis*, which is one of the hominid ancestors to *Homo sapiens.* It literally means 'the handy man'. They date to about 2.3 million years ago, and they were the first ones to kind of have cohesive stone tool technology called Oldowan tools - at least that's what we call them. They were still pretty simple choppers, but they are similar enough to each other where we can make a determination that, "This group of hominids all created their stone tools in the same process." That shows a little bit of standardization and a little bit more complexity to be able to repeat the same thing over and over and over. They stopped being random and started being planned, and that's kind of when we see a little bit of a mental shift in hominid species and the ability to work out problems like that.

A lot of experimental archaeologists, especially ones that work with stone tools that are millions of years old, point to this complexity of the tools as a way to analyze how complex hominid brains were becoming. So it's really cool because it takes so much brain power to understand how to make these stone tools that it shows that they must have had better brain capacity, or at least better abstract thinking and conceptualization to be able to repeat these processes, to make similar looking tools over and over.

Homo erectus was the first hominid species to leave Africa and they did that about two million years ago, and they kind of spread all over mostly Asia. Then they went up southwest Asia, and then east. They made Acheulean handaxes…

Aside: **"**What is an Acheulean axe?" you want to ask Google. That's okay, I already did that for us. Babes, it's a doozy to spell. So 'Acheulean' is *très français.* It's named after a site in France where some of these were found. And if you're thinking 'handaxe', you're probably thinking like a cute hatchet, but a handaxe is actually a rock that has been chipped away at one end to come to a point. It helps cut things. So it's like a sharp rock. That's what that is.

Angelo: These are really standardized. We find a lot of these big handaxes that were all flaked the same way, that all look the same way. So at that point it's apparent that these hominids were teaching each other how to replicate this tool, and it was part of the same material culture where this shape of tool and this way of making it was prioritized for some reason. And it was important for everyone in the community to make them the same way, so we find a lot of these Acheulean handaxes made the same way. What's also important about an Acheulean handaxe is that it's flaked on both sides. So it's one of the first bi-faced tools.

If you look at a knife edge, it's beveled on both edges, so that's bi-face. A chisel is flat on one edge and beveled on the other edge, like a wood chisel. That's called a uni-face. So most choppers were kind of uni-facial, they would just have one striking edge, but these Acheulean handaxes were specifically flaked on both sides to give it a bi-face. Bi-faces are sharper because they come at a steeper angle to the edge. They can be sharper, they can even be a little bit more durable as well. It takes a lot more skill to make a bi-face AND to be able to replicate that same shape over and over and over.

Alie: What type of stone were they making these axes out of?

Angelo: The earlier Oldowan tools were river pebbles or river cobbles. As we move into bi-faces, you need a stone that's going to be more predictable in its flaking pattern. Silicate-based crystalline stones like flint, obsidian, or chert are really good for that because they act almost like glass. They have a uniform, homogenous, crystalline structure that allows you to be able to predict how the shockwaves will interact with the ridges on the rock to create tools in a better way. If you have a really coarsely grained rock, it's going to break in unpredictable patterns. It's not going to lend itself to a good tool.

Aside: Okay, how is this person so young and so knowledgeable and also, we haven't even gotten to atlatls. Already I'm learning so much. Anyway…

Angelo: So then around 500,000 years ago - which is still before the *Homo sapiens* species - in Africa, as the evolutionary lines were branching to what would eventually become *Homo sapiens,* we find, potentially, the earliest evidence of hafting. Hafting is when you take a stone tool and you affix it to some sort of handle or other implement, like a wooden handle, or a wooden spear, or even an antler handle. So we find the first evidence of hafting, and the way we know that is because you look at the mastic, which is the glue used on the tool. Obviously, the wood has rotted away after 500,000 years, but there is residue of glue on the back of some of these tools that were found in Africa. And that indicates that they may have been glued into a handle of some kind.

Alie: [*incredulously*] What is the glue? Where are they getting the glue? They can't get that on Amazon.

Angelo: Yeah, you can't get it on Amazon for sure. They would make it. It's also called pine pitch. It's kind of a mixture of tree sap, beeswax, wood ash, and fat that would make this kind of black tar glue. And usually, you would glue it into a stick or a handle by carving a notch into the piece of wood or the bone, slotting the bi-face into that notch, putting the glue around, and then usually you tie it with some sort of cordage. If it's made out of animal sinew, which is really strong and useful because when it's wet it's really easy to work with but when it dries it actually has its own glue. It shrinks and hardens like a rock. You're able to tie something really tight, and then as it dries, it literally constricts around that piece and hardens rock-solid to make it a really, really tough point or a tough haft. So they usually tied it as well, but sometimes they would just glue it.

The Neanderthals came around 400,000 years ago and they started making smaller, more specialized tools. They had the Moustarian tool tradition and the Levallois [pronounced here Le-val-WAH] tools which I'm probably mispronouncing, it's a French term and I'm not great with my French.

Aside: Let's ask a computer: [c*omputerized girl's voice*: "*le-VAHL-u-wah"*] Le-VEL-uwah tools. Okay, so by the by, these are like the Acheulean axes, aka sharpened rocks, but they're more refined and they're smaller. They're more knife-like. They look much closer

to arrowheads and stone points. I guess they're evidence that our hairy ancestors were getting some real skills. Think of going from a flip phone to an iPhone. It's like, "Ooo!"

Angelo: The cool thing about these is that they're able to get really, really, precise, sharp flakes they could repeat over and over. And instead of making these big handaxes which were kind of unruly, they got better at making bi-faces on a smaller scale that would work better in hand tools.

Then we have the earliest spears we've ever found- the Schöningen [pronounced SHUN-ni-gan] spears. Now that's a German word that I'm sure I'm mispronouncing as well. The Shun… Shun-in-gen spears… I can't remember, you might have to look up the pronunciation of that.

Aside: [*computerized female voice*: *"The Skunignan Spears"*] That's not helpful.

Angelo: But the Schöningen spears, they were a collection of six- to seven-foot long wooden sticks that were excavated with a bunch of horse bones that are dated to about 380,000 years ago. Still before *Homo sapiens*. It's theorized that these spears were used as thrusting weapons, but there's a debate about whether or not they could have been throwing weapons as well.

Aside: Throwing spears, by the by, are for overhand chucking; and thrusting is like underhand, stabby times. So, look at us. We're archaeologists now.

Alie: The difference between a throwing and a thrusting weapon… Is that the crux of what an atlatl is?

Angelo: Yes. I like to use a mnemonic that atlatls are for throwing and spears are for thrusting. When we're talking archaeology and we're talking weapons study, if it is a spear that is being thrown without the aid of another tool, if it's just being thrown, that's a javelin. A spear by itself, just the word 'spear' indicates it's a thrusting weapon. If it's being thrown by another tool, like an atlatl, then it's called a dart, specifically if it has fletchings, which are the feathers in the back.

Aside: Okay, so Sticky McPointerson, a spear is just to stab, a javelin is tossed forward, and a dart is tossed forward but has fletchings, or those feather-like, little wings on the back. A 2019 University College of London study had some collegiate javelin competitors try to throw replicas of those heavy German spears to see, "Could these even be tossed? How far?"

Angelo: Here's the thing with experimental archaeology research. It tells you whether things *could be* possible but doesn't necessarily prove that that's what happened. So the result of their research is, "Okay, it is possible to throw the spears, but that doesn't mean that the Neanderthals *were* throwing the spears." Does that make sense?

They found that even with these collegiate, trained javelin throwers, that anything beyond fifteen meters, they weren't able to hit the target at all. After twenty meters the spear wouldn't even land point first, it would kind of fishtail in the air. This is for a couple of reasons. One, the body mechanics of throwing a spear like a javelin, with a flat trajectory, aiming for a target, isn't really conducive for the human body. Olympic javelin throwers are throwing at an extremely high arc to throw for distance and it works okay for that, but even those javelin throwers, if you asked them to hit a standing target twenty meters in front of them, they would have a lot of difficulty even reaching the target, even though they can throw 100 meters if they're throwing for distance. It's just that the mechanics of

throwing at that flat trajectory versus throwing at an extremely steep trajectory are completely different.

Aside: Angelo says it's pretty hard to toss a heavy spear on its own both far and accurately, so how are they getting from A to B?

Angelo: We know that Neanderthals would use hunting tactics where they would either drive animals off of a cliff, or corner animals in canyons or something like that to where they could be accessed with thrusting spears to finish off the animal. These spears are the oldest complete weapons that we have ever found, and they date to about 380,000 years ago.

Alie: I can't even fathom that!

Angelo: It's crazy! That's a time scale that's hard to process, because if you think about the entirety of recorded human history - history that we have written accounts of by people who had developed written language - really only go back a couple thousand years in the grand scheme of humanity. But we're talking almost 400,000 years old! And like I said, these spears were found in Germany. They were used by Neanderthals at that time.

That's another thing with archaeology, just because you've excavated the oldest example of something, it doesn't mean that's when that thing started. That's just the oldest one we've found.

Aside: Okay, so for hundreds of thousands of years, these bad boys were too heavy to hurl very far. But as time marched on, weapons got faster and lighter, and about 45,000 years ago, anthropologists think that spears emerged with a *little* extra help, which is a spear thrower you use in conjunction with it. It works to fling the shafted weapon a lot like the dog toy the Chuckit!, which hurls spitty tennis balls at the dog park. [*slow, low-pitched "A-woooof"*] In fact, Angelo says that the Chuckit! is a modern atlatl. What is it called? An 'at-latl?' 'Atl-atl?'

Alie: It's an 'at-latl', not an 'atl-latl', right?

Angelo: It's an 'at-latl'. Well, I say 'at-latl'. The reason I don't say 'atl-atl' is because in my mind you're pronouncing the middle 'l' twice, when it's actually just spelled A-T-L-A-T-L. The word atlatl is a Nahuatl word, which is the language spoken by the group of people in central Mexico that we now call the Aztecs, even though that's not what they called themselves. The Nahua people were a collection of people from Northern Mexico from about 2,000 years ago, who slowly, tribe by tribe, emigrated south toward the Valley of Mexico, where other civilizations like Teotihuacán had been flourishing in that time period.

Now, one of the first groups to come down was the Toltec group. They were a Nahuatl-speaking group that came after the fall of Teotihuacán and kind of established a small kingdom or empire in a city called Tula in central Mexico. The last Nahuatl-speaking tribes to immigrate from northern Mexico to central Mexico were the Mexica [phonetic: Meshika] tribe. They came in and probably were using bows and arrows at the time, but atlatls were really popular in that central Mexican valley. So they adopted the use of the atlatl, they started conquering these other city-states at the time, and they created a triple alliance between two other city-states. It was the Mexica tribe and their city-state of Tenochtitlan, and then two other tribes with their own city-states. They created the Aztec triple alliance.

So that's who we… When we say Aztec, we're actually referring to this triple alliance between these three cities, the main group of which was the Mexica tribe in the city of Tenochtitlan, which is what we now call Mexico City.

Alie: And how long ago was this?

Angelo: That was in the 1300s and 1400s CE, so not too long ago. Then the Spaniards came, conquered the Aztec, and then enslaved and killed them all with smallpox in one of the worst genocides in history. The Mexica themselves, it was part of their culture to *not* call themselves the Aztec. The word 'Aztec' means 'somebody from Aztlán'. Aztlán is what they called their Northern Mexico homeland. So they were 'the people from Aztlán'; the Spaniards were like, "Oh, we'll just call you Aztec." They called themselves the Mexica, which is where we get the word Mexico or México from. It all comes from that.

Aside: Folks in these regions, for years and years and years, have been amazing hunters. Why? A tool called an [*struggling to pronounce*] atlatlll... atl latl…

Angelo: In the original Nahuatl pronunciation, atlatl would probably sound something like 'atshatsh'. That -tl is called a 'voiceless lateral fricative' in linguistics, which means that the sound is not made from your vocal cords. If you made the 'tl' sound, your vocal cords wouldn't vibrate; you can put your finger to your vocal cords and you can kind of see which sounds make a vibration and which ones don't. A sound like a 't' or an 's' [*makes three 's' sounds*] doesn't vibrate your vocal cords, but something like an m [*makes an 'mmm' sound*] definitely does vibrate your vocal cords. That's the difference between voiceless and not voiceless.

Lateral means that the air causing the sound is moving sideways around your tongue; instead of coming straight out, it's coming out sideways in the back of your tongue, kind of around your tongue. And then fricative means that the air is turbulating inside your mouth to make the noise. It's this very strange 'cklh cklh cklh' sound. I don't know how well it's coming up on the mic, but…

Alie: Yeah, I can hear it.

Angelo: So, the 'tl' is the hallmark of the Nahuatl language. You can see 'tl' in all sorts of Nahuatl words, like that salamander, the axolotl.

Aside: Personal side note, once I got called out of second grade class by this nice lady who asked me to answer a few really stupid questions, like, "What goes on a pizza?" Duh, ktheese. "Okay, what travels down the railroad?" Haha, easy. A kthu kthu train. Then, for several months, I had to report to a trailer near the playground to relearn these fricative lateral lisps. And yes, I know we need a speech pathology episode ASAP. I know. I'm on it. I feel better about my ch's [*pronounced with lisp*] now that I know that they're kind of like a sexy flourish in other languages. Also, buckle the frick up for a tale that is like *Drunk History,* only minus the hot tubs and barfing. Whoo! Damn! This is a journey. I love it. Boy, howdy.

Angelo: I want to give credit to one of my idols in the archaeology world: Zelia Nuttall. She is one of the most badass archaeologists of all time. I think she's amazing. She was a Mexican Irish American, born in San Francisco, to a Mexican American mom and an Irish dad. She went to school in Europe, met an anthropology student - I think he was a Dutch anthropology student. She would read his textbooks at night and taught herself anthropology. On a family trip, they went to Mexico. She was so knowledgeable, especially about Mexican archaeology, because of her mom who taught her some Nahuatl. She was

able to do some of these early translations and have a better understanding of the linguistic history of the Mexica people in Mexico. She became one of the first, if not *the* first, honorary professor at the National Museum of Anthropology in Mexico City, and that was in 1884, *waaayyyy* before any college was admitting women.

She was the pioneer. She did so well with her post at the National Museum of Anthropology that in 1886 she got hired by the Harvard University Peabody Museum of Archaeology and Ethnology as a contributor for Mesoamerican archaeology. While she was working with them, she moved to Europe again where she spent ten years in archives in libraries, and she found previously lost Aztec and Zapotec codices, or manuscripts or books, that were shipped by the Spaniards back to Europe, thrown into a crate in the bottom of a library, and forgotten about for 500 years.

Alie: [*in a pained voice*] Oh my god!

Angelo: And she found two of them. There are only a handful of these at all for any of the Mesoamerican cultures, and a large proportion of them were found by her alone. While she was studying all of these manuscripts in Europe, the "godfather of cultural anthropology," Edward Burnett Tylor, wrote this book called *Primitive Culture*. It established cultural anthropology. Now, it definitely was not great because it assumed that Western culture was the pinnacle of human society and everyone else was behind to some degree, which obviously is something that modern anthropologists and archaeologists completely reject as a model for human civilization. He has this quote:

> [*as if over an old-time radio, mixed with static*] *"The Aztec civilization is the highest known to have used the spear thrower, in reality, a weapon of savagery. We do not hear of the atlatl being in practical use at the conquest when it had apparently fallen out of disuse."*

Aside: Spear throwers, remember, are atlatls. What this crusty old man was doing was shit-talking atlatls and the people who used them. Like, how dare??? Zelia Nuttall was like, "Excuse me?"

Angelo: She read that quote, and he's basically saying that because the Aztecs used the atlatl, they were stupid savages because the rest of the world moved onto the bow and arrow, and they were the only ones left in the world using the atlatl; which isn't true, but at the time that's what he thought. She said, "You know what? I'm going to write the first book all about atlatls, [*DJ airhorn*] and I'm going to prove him wrong." In the opening paragraph, she calls him out directly and says, "This will be a response to anybody who thinks the Mexican people are stupid because we used atlatls. I'm going to show you how awesome they are." [*Alie laughs*]

And she wrote this crazy, amazing book in 1891, and it's basically the first ever academic study on the atlatls. She looks at it not from an experimental archaeology perspective; she didn't make an atlatl, she's never thrown an atlatl. She looked at artistic depictions in those books that she found and other books that were published, literary descriptions, and archaeological examples that were found. She realized that atlatls were actually really well adapted for aquatic hunting. She connected the word 'atlatl' to fishermen. Fishermen is 'atlacatl', [phonetic: acklha-cacklh] which literally means 'water man'. And 'tlaca' means to aim or throw, so if you put those together it's atlatl, which is literally water thrower.

That was her theory for where the word atlatl comes from; because it was used as a fishing weapon, it has this name associated with water. She also found descriptions of

Nahuatl people and people in the Aztec religion explaining that in their tradition there was a demigod named Opochtli who invented the atlatl for fishing and taught it to the Mexica people.

Aside: Angelo says that according to Indigenous culture, this weapon was considered to be handed down directly by the Mexica's god of war for some deity-approved ass-kicking, and that no other weapon in the Aztec armory is described with as much reverence as the atlatl. It's thought that only the upper tier of the military, and noblemen, and generals, and the elite - essentially royalty - were even allowed to use atlatls. And they let the commoners use the peasant weapon which was the bow and arrow. [*gasps in shock*] It's petty, and I love it. Also, history, y'all. It's just gossip that matters, and all it takes is someone who is willing to dish. Now, specifically about Zelia Nuttall…

Angelo: The story gets crazier. I think someone should make a movie about her and they should consult me - hint hint, wink wink. [*Alie laughs*] I just wanted to throw this out because it's important to highlight women of color in archaeology, especially this long ago. So few people know about her, even archaeology students, that I just can't pass an opportunity to tell her full story. After she wrote this thing about the atlatl, which became very popular because it made so much sense and she published a lot of pictures about it, she moved back to Mexico and she ran an excavation at the Isla de Sacrificios, or the Island of Sacrifices.

A male colleague tried to steal credit from her for the excavation, of course, so she quit her post with the National Museum of Anthropology, ["*M'kay, bye!"*] and published all of her notes and findings in an academic journal, which were so detailed - it was so painfully obvious that she was the actual person who had figured out the site and excavated it - that the other guy was fired in disgrace. [*Alie laughs*] She was like, "Oh, you're not gonna respect me? Then I'm just gonna quit and then disgrace you in an academic journal and show that you're a hack." And she did it!

So, then she got the attention of Phoebe Hearst, who was the mother of William Randolph Hearst, who ran the newspaper in New York - one of the richest people in that time period. She becomes Zelia Nuttall's patron, buying a house for her in Mexico City and funding all of her studies and excavations, with the agreement that some of the material that Zelia Nuttall would excavate would go back to the newly formed Phoebe Hearst Museum of Anthropology and Archaeology at UC Berkeley. [*quiet and dignified applause*] It all comes full circle back to San Francisco where Zelia Nuttall was born.

She ends up advocating for Indigenous rights in Mexico until she dies, and she convinces Mexico City to recognize March 12 as Aztec New Year - Indigenous New Year - where it is still celebrated to this day by the Nahuatl people who still live in Central and Northern Mexico, to this day. I think there are 1.2 million Nahuatl speakers still in Mexico. She got it formally recognized by the government and it was celebrated in Mexico City, the former site of Tenochtitlan, on March 12, 1928 for the first time since 1520 when the conquest happened.

Alie: Oh! I'm going to cry.

Angelo: It's crazy. To this day, Mexico is known out of all the Mesoamerican countries as a country that protects, from a government perspective, their archaeological sites really strictly. They're really good about protecting the sites, and doing good research, and having tourism. A lot of people credit her specifically for that because at the time, in the 1920s in

Mexico, there was a big push to ignore Indigenous rights, but specifically ignore Indigenous history of Mexico in favor of the Spanish history.

A lot of people were rejecting that they had any roots to Indigenous Mexico at this time because a lot of people in Mexico thought that the key to their acceptance on the global stage - as Mexico has independence and is becoming a country in a globalized world in the 1920s - they felt they would get further with Western countries if they rejected the Indigenous background and were like, "Yeah, we're Spaniard. We're European like you guys. We can play on the global stage." Because who did they have to look to for examples? The United States, which also ignored Indigenous rights and culture, and other places around the world that have done terrible things to Indigenous people. They were just following the lead of the world superpowers of the time, and she said:

> [*as if over an old-time radio*] *No, we should embrace our Indigenous heritage. We should uplift Indigenous voices. We should let Indigenous people celebrate the holidays and recognize those holidays because that's what makes us unique. And if anyone tells you that atlatls are what make Indigenous Mexicans stupid, just refer them to me because I want to set them straight.*

She's badass. She's my hero. I'm Mexican American. As a Mexican American archaeology student, she is such an idol to me. Plus, she's the first person to study atlatls. She's my hero.

Aside: I'm gonna cry. Are you gonna cry? Because I'm gonna cry. Also, by the way, if anyone needs to honor a badass with a great name for, say their daughter, may I suggest Zelia? I mean, come on. Also, let's finally talk details about this tool. Or is it a weapon? Okay, I looked this up. All weapons are tools, but not all tools are weapons. In this case, an atlatl is a tool of attack or defense: i.e. it's a weapon. Now that we have the rich, drippy backstory, WHAT is this thing?

Angelo: In terms of what is an atlatl? Okay. An atlatl is a stick, with a handle on one end, and a hook on the other end, that engages with the rear end of a dart, which is a long, thin, flexible, wooden spear-type thing that has a little dimple at the end behind the feathers. The spur of the atlatl - or the hook - engages with that knock and it propels the dart [*dart hitting a dart board*] further and harder than you could throwing it by hand. The atlatl refers to just the throwing stick part itself. The dart is the separate implement, so it's the atlatl and dart. Colloquially, we just call the entire system an atlatl.

The cool thing about atlatls is that they were used all over the world. If we go back to the earlier question of the progression of human technology, the earliest atlatls we have date to about 20,000 years ago. In fact, 17,500 years is the radiocarbon date. It was found in France. It was an atlatl made out of antler. That's after Neanderthals; that was all *Homo sapiens*. The thing is, is that atlatl use is theorized to go back as far as 45,000 BCE, so quite a long time before that. The way we know this is because when you throw atlatls, it puts quite a lot of strain on your elbow, and you develop an arthritis condition that bioarcheologists call 'atlatl elbow'. There is actually a skeleton from Australia that dates to 42,000 years ago called the Mungo Man.

Aside: Mungo Man is also referred to as LM3 and was found laid out in a somewhat extravagant ceremonial burial. And he was thought to have been about 50 years old, which is middle-aged for us now, but hecka old for back then. And he stood around six

foot five, which is unusually tall. What else is interesting about this amazing man's remains?

Angelo: And he has extreme atlatl elbow in his right elbow. And it's theorized that that's because he was throwing an atlatl. And that puts the atlatl to be about 45,000 BCE. The atlatl is the first two-part weapon system, potentially two-part tool system as well, complex tool system, ever invented by hominids. And to break that down, a compound tool is something that has two or more materials. Remember when I talked earlier about the hafting, where you take the stone and you glue it onto the stick? That's a compound tool. But then a complex tool is a tool that uses two separate implements that are not permanently attached. So a bow and arrow or an atlatl and dart, those are complex tools.

So the atlatl, or the spear-thrower, is potentially the oldest complex two-part weapon or tool system ever invented. It's also potentially the first weapon or tool system that was unique to the *Homo sapiens* species, because Neanderthals were using thrusting spears and, potentially, throwing spears. And the bow and arrow wouldn't be really invented for another 20,000, 30,000 years. So this was what *Homo sapiens*, the human species, brought to the stage.

Aside: Angelo said also that using tools allowed us to access more nutrition while expending fewer calories, and hunting with an atlatl uses way fewer calories than, like, chasing a deer for 10 miles until it's just like, "Fine, [*high-pitched*] go ahead and eat me." Now, those extra calories, and possibly the fatty stuff from brains and bone marrow, have enabled our ancestors to grow bigger brains, which allowed us to invent weapons, and reality TV, and finally, global warming and nuclear existential risk! But also puppy calendars and coffee creamer, which is good.

Angelo: Potentially it's the *Homo sapiens*' ability to develop these complex tools that allowed them to outlast and survive. And the atlatl is the first indication of this. So it is this really old, universal weapon. Everybody in humanity is connected by the use of atlatls because it was used by everybody. And we have found atlatl remains or atlatl evidence on every continent except for Africa and Antarctica. Now, again, that doesn't mean that they weren't used in Africa, it just means that we haven't found evidence of their use in Africa. But we have lots of evidence of their use in Asia and Europe and Australia and North America and South America.

Alie: And do you think that they developed all from the same source or do you think a lot of people on different continents thought, "Hey, what if I put a doohickey on the end of this sticky-stick and then I'm able to kill more stuff more efficiently from farther away?"

Angelo: That's the big question. That's really hard to tell. I'm not sure. There's no clear answer. It does seem like the use in North and South America is associated with the human migration across the Bering land bridge around 15,000 BCE. So it seems like atlatl use wasn't developed independently in North and South America, but it was brought by the people who migrated over the Bering land bridge. In terms of the rest of Europe and Asia and Australia, I am not sure. And I don't think that's really been answered, how it spread.

And let's say it was started in one area and then spread to other areas. There's two ways that could have happened. Either the people who developed it taught it to other people, and then those people took it to their areas and taught it to other people. Or the original group who developed the atlatl broke off and they migrated to other areas, bringing atlatl use with them. So it's the difference between teaching and migrating. We're not entirely

sure how it spread. And that kind of goes for the bow and arrow as well. Most estimates put the bow and arrow as being invented around 15,000 BCE, so that's a full 20,000 years after the atlatl was invented.

Alie: Yeah, that's surprising to me that there's such a gap.

Angelo: Such a huge gap! Now there is conflicting evidence that bows and arrows go back to 40,000 BCE as well, but that's fairly inconclusive evidence. So that's a little bit questionable as well. We're not entirely sure, but it seems like bows came significantly after atlatls. Now the thing about atlatls is that it's not just a stick that throws another stick. There's a lot of engineering that goes into it. Because you're extending your arm by having this handle, you are increasing your leverage and you're also increasing your angular momentum at the tip of the tool…

Aside: Y'all have been asking me for a physics episode, so here ya go.

Angelo: And that transfers a lot more energy into the dart. The other thing is that you're propelling the dart from behind the center of gravity, as opposed to throwing a javelin where you're holding the javelin at the center of gravity. That means that with the atlatl, you're able to put more energy into the entire dart system, which propels it further. So there's something about propelling something from behind the center of gravity that works a lot better. If you think about a bow and arrow, the bow string engages the rear of the arrow, propelling it from behind just like an atlatl. [*Alie aaahhs appreciatively*] And this is the number one thing that people get wrong when they try to make an atlatl, or when they try to understand atlatls.

Alie: This is the flimflam?

Angelo: Kind of flimflam, yeah. The most important part of the atlatl and dart system is the flexibility of the dart.

Alie: Really? So it's gotta go boioioioioing?

Angelo: It's gotta go boioioioing. And if you look at slow-motion video, not even slow-motion, if you just look at in-person, real-speed video, because the darts are so long, you can see the flex happen in real time. We're talking six to eight inches of flex while it's flying, which is a lot.

Aside: I've seen footage, and it *really* wobbles, and you're like "Shit is that okay?" And it is! By design.

Angelo: Without the flex, if you try to throw a stiff spear with an atlatl, the spear would fishtail in the air, because all the energy going into the rear of the dart needs to go somewhere. And the tip of the dart kind of resists motion because of Newton's laws. So all that energy needs to go somewhere and eventually the tip starts raising. And what happens is you flick the rear of the dart underneath the spear, which causes it to fishtail in the air. An atlatl dart, on the other hand, flexes while you're throwing. So right as you're about to throw, the dart flexes, storing that energy, keeping the point straight on target. And then that flex releases as you finish flicking the atlatl, which causes it to flex in the air but stay on target the whole way. [*Alie gasps*]

Atlatl darts are thicker in the front than they are in the rear, which means there's a taper, a very smooth taper, usually from about 1/2 inch diameter at the tip to 3/8 inch diameter at the feathers, at the fletchings. There's more flex happening on the feather end than

there is at the tip end, which means the tip stays on target and the rest of the dart flexes around the tip.

Alie: Oh my gosh. That is so much physics!

Angelo: It's so much physics. And you can imagine, if the dart is an even diameter across the whole thing, if there's not a taper, that means that the majority of the flex is going to be at the middle of the dart. It's going to flex up and down. But that means that both the tip and the feathers are going to flex six to eight inches around the target, and that could be the difference between a hit and a miss if you're trying to hunt.

Alie: And then what is the arrow point? What?! What types of materials are at the tip?

Angelo: So definitely to get this specialized, you need to use one of those good stones that I talked about earlier. So flint, chert, or obsidian. That's basically it.

Aside: Obsidian, he told me, can get sharp. But how thin is this razor's edge?

Angelo: Obsidian does get to a sharpness on a molecular level that's unknown to any other technology that humans have created. It's like 10 times sharper than surgical steel, which is crazy to even think about. Now, the problem is obsidian is very brittle, so it's very sharp, but it breaks very quickly. Flint and chert are not as sharp, but they're much more durable. So there's a tradeoff between the two. And when you're using an obsidian point on a tool like an arrow or a spearhead or an atlatl point, that tool isn't necessarily that molecular sharp, because you would purposely effectively dull the edge to make it more durable. It's still very sharp, but it's not that molecular-level sharp. They would use molecular-level sharpness obsidian tools for other purposes, but not necessarily for projectile points because they're too weak.

Those tools, it's a process called flint knapping, and it's the process of making small chips or flakes out of a crystalline silica rock like flint, chert, or obsidian in order to make tools in a specific shape or pattern. Personally, with flint knapping, I can either get the tool really sharp, or I can get the tool in the right shape, but it's really hard to get it both sharp and in the right shape. [*Alie giggles*] So that's kind of what I'm working on right now. I've practiced flint knapping a lot. But that's generally what the tips would be made out of, those three materials. And even sometimes one group would use two or three different types of materials to make their points, depending on what they had access to.

Oh, I think it's important to note that atlatls were called different things by different people. Specifically, in Australia, they call them woomeras. Instead of being like a five- or six-foot atlatl dart, they would use seven- or nine-foot atlatl darts. They're really, really long and heavy, and they would use really long woomeras, which is what they called their atlatls. And the cool thing about Australian woomeras is that they're like a Swiss army knife. They would actually attach with glue, a knife, like an obsidian or flint knife, into the handle to use as a knife.

The atlatl itself is very differently shaped. Instead of being a stick it's more of this cup or bowl shape that's really, really big and rounded, so they could use that to collect berries. They would paint maps on the inside of their woomeras. And they would even put notches in the woomeras to make friction fire. So with one woomera and one dart you're basically set to go to survive the Australian Outback. It had everything you needed.

Alie: Oh my gosh. That is so genius.

Aside:10/10, would buy on impulse at REI.

Angelo: So genius. Atlatls are pretty terrifying. Because you're thinking, "Okay, hand-thrown spear compared to a bow and arrow, what's the damage difference here?" Well, an arrow is lighter and it travels faster. An atlatl dart is heavier, still travels fast, but doesn't travel as fast. So there's a tradeoff, but the impact force of an atlatl dart is big enough to take down a wooly mammoth because that's what they were used for in North America specifically. The Clovis culture was in Canada and in Northeastern United States about 13,000 years ago and they used atlatls to hunt mammoth. Modern tests with atlatls have found that atlatl darts can reach speeds around 80 miles per hour.

Alie: Oh my gosh.

Angelo: Yeah, crazy fast. The world record for an atlatl throw in terms of distance is 260 meters, which is 850 feet. So you're talking almost three full football fields.

Alie: Oh my gosh!

Angelo: But modern atlatl users, part of the World Atlatl Association - of which I'm on the board of directors - we host competitions and there are people who can nail a six- to eight-inch target at 20 meters, which is almost 70 feet, with like 95% accuracy.

Alie: Unbelievable. How much practice does that take? As someone who throws atlatls, how much practice does that take to get that kind of precision?

Angelo: I've been throwing atlatls for seven or eight years, but I've been studying atlatls for 10 or 11 years, and I'm still not at that accuracy level. I'm decent. When I competed in the youth division, I did pretty well, but now that I'm in the adult division, I do pretty terribly. But some of these guys have been throwing for 20, 30, 40 years. They're like ancient snipers. It's pretty incredible. They will literally nail the smallest of targets from impossible distances. Most people with a bow and arrow aren't able to have that level of accuracy.

Spaniards wrote that atlatl darts could go through chain mail, and modern tests have proven that atlatl darts will go through chain mail. So even these European conquistadors who had never seen an atlatl before because Europe stopped using an atlatl like 15,000 years prior, they're seeing tens of thousands of Mexica and Aztec soldiers throwing a raincloud of darts that are flying at 80 miles an hour with giant obsidian razor-sharp broadheads on them, coming from 100 to 200 feet away. It's terrifying! They were terrified of the atlatl more than almost any other weapon because even their archers weren't that powerful. I think that's really interesting that they just wrote about how terrified they were of atlatls. And I would be terrified as well if I was on the receiving end of one of these things. [*clip from the 30 Rock song Werewolf Bar Mitzvah: "Spooky; scary!"*]

Alie: Why do you think any type of culture stopped using them?

Angelo: Okay, great question. I totally forgot to bring that up. A couple things: Atlatls were developed during the Pleistocene, which is the ice age. They were, like I mentioned, really used to hunt big ice age megafauna: Giant ground sloths, wooly mammoths, stuff like that. During the Pleistocene, because it was so cold, a lot of the world, especially in a lot of the Northern hemisphere, was more of a tundra than it was a forest. So, the atlatl works well in this open environment because the swing, the throwing motion is what I like to call 'visually loud'. It doesn't make a noise, but it's a big motion, whereas with a bow and arrow, the motion to release an arrow is just releasing your fingers. It makes almost no movement at all.

So, as the ice age ended, animals got smaller and more skittish, like deer; *and* humans were hunting in more densely wooded areas, which makes swinging a big atlatl really difficult. Also, the throwing, the swinging motion of the atlatl, potentially could scare the deer before the atlatl could reach it.

That kind of begs the question: Okay, then why did atlatl use stay in North and South America as long as it did? For the Aztecs, it might be because of that religious reason. They stuck with it because they felt that a strong religious connection to it. But other areas didn't really develop the bow and arrow until a lot later, and they were still using… specifically in the American Southwest, which is where I am, were using our atlatls up until about 50 BCE. That's kind of when the bow starts being developed, maybe a little bit earlier than that but atlatls dominated in these desert environments because they were a little bit more open, kind of like how the tundra was open, and they would use them to hunt bighorn sheep.

Right near where I live in Las Vegas is a place called Valley of Fire State Park. There's a place called Atlatl Rock, and it's called Atlatl Rock because at the top of the cliff, there are pictographs and, I'm sorry, petroglyphs of atlatls [*Alie squees excitedly*] that are about 2,000-year-old petroglyphs. The cool thing is that the atlatls are so perfect. It's almost like they held up an atlatl and traced it into the rock. Like, they even show the darts with the feathers and everything.

Aside: So, this might even be up to 4,000 years old. I looked up photos, and in this red-rocked, southern Nevada landscape, up a steep, winding, steel staircase to the top of a deep ocher desert boulder formation is what looks to be graffiti etched in rock but it's this beautiful line art of antelopes, and targets, and a long dart, and BOOM! An atlatl. With two little finger holes. More on that in a minute.

Also, some absolute dickhole with the initials 'BBC' added to this art and I hope they burn their tongue on hot soup. I'm just… I'm sorry, I'm really mad. Also, at this point in making this episode, I wanted to just bail and blast Bon Jovi through the warm August air until I arrived in this desert in the Valley of Fire to stare at this rock, which is just proof positive that an Ologist can make you fall in love with an obscure tool you never knew existed. Now, in the Southwest and into Mexico, atlatls had some special features:

Angelo: They actually switched up the grip. Instead of holding the atlatl like a hammer, they would create these finger holes to put their fingers through, and kind of hold it with this upturned hand. Turns out that reduces the elbow strain that causes atlatl elbow. Because you can imagine, if you've got atlatl elbow and you can't hunt anymore, that's it. That's game over, you know?

They developed a different throwing style in order to prevent that atlatl elbow. They also developed compound darts that had detachable foreshafts. The idea behind these where that you have, like, a five-foot main shaft with the feathers, and then you have a one-foot foreshaft that has the obsidian point on it. The foreshaft goes into the main shaft. You throw that at a bighorn sheep. When it hits the bighorn sheep, the hope is that the main shaft pops out leaving the foreshaft in, because if the bighorn sheep ran with that big six-foot-long shaft still attached, it would hit a tree and break, then there goes all your hard work. [*from The Simpsons: Nelson Muntz, "Aww, man!"*] That allowed humans to go collect the main shaft, put on a new point, and throw it again. So, hunters only needed to carry one or two main shafts and then carry a small pouch of like five or six foreshafts. It was genius.

Alie: Aha! That *is* genius!

Aside: So, think of a fancy quill pen with a bunch of different nibs. Also, some anthropologists postulate that this was the first ever complex use of the phrase, "just the tip." That's not true.

Angelo: And we call that a Basketmaker style atlatl. It was very, very common about 1500 BCE in central and southern Nevada, northern Arizona, southern Colorado, and kind of that four corners area. The Basketmaker People would eventually become the ancestral Puebloan people, who eventually became what we now know as the Hopi and the Zuni Pueblo Indigenous people of the four corners area. So, it has this rich long history in this area. This Basketmaker-style actually shows up all over the Southwest. And because of the aridity of the desert here, we find more intact at atlatls in the American Southwest than we do anywhere else in the world. In fact, the most intact atlatl ever found is the Broken Roof Cave atlatl. It was found in the 1920s or 1930s in Arizona.

Aside: I looked this up and it's right near the Utah border, and it got this kicky name because rocks just literally would rain down on researchers as they excavated things like, oh, burial sites and human remains… but also, an atlatl with some darts. And despite being thousands of years old, it's beautifully preserved. It's made out of oak, with hide finger loops, and a nice, dainty, little curve to it.

Angelo: You can find pictures of it online, 'Broken Roof Cave atlatl.' It is absolutely gorgeous. It still has the leather finger loops intact, it has all the weights intact, the spur, it's carved beautifully. It's incredible. We find artifacts like that in the Southwest because it's so dry, things preserve a lot longer. The cool thing is that we find that throwing style with the finger loops as far South as the Yucatan Peninsula in Mexico. Whether it was spread by people, or whether it was developed independently, the longest users of atlatls developed this throwing style that prevented that atlatl elbow.

The last thing I want to mention before I get to Patreon questions… I know I'm so sorry…

Alie: No, I love it!

Aside: Obsession is contagious! So lay it on me, I'm ready.

Angelo: This is a crazy thing. It was an experimental archaeology project I got to be a part of involving at atlatls and it involves the Moche civilization of Peru. The Moche civilization was around between about 100 and 700 CE, before the Incan empire. Like, well before the Incan empire, and they used atlatls a lot. There's this guy, Christopher Donnan, he's an archaeology professor at UCLA. He has been *the* expert on the Moche civilization for like 30 years. He studied them more than anyone else.

He found a bunch of these pots that have paintings of people throwing atlatls at some aerial target. He didn't really understand what it was. And the atlatls look weird, they have these weird wooden cross pegs, and he didn't understand it. So, he took it to the World Atlatl Association, and he said, "Hey, what do you guys think this is?" And we spent the next year redeveloping the Moche Toss game.

Basically what it is, is there's a giant turkey feather shuttlecock, that's attached to an atlatl dart. You throw that into the air, and it flies like 50 feet in the air; because it's a big turkey feather shuttlecock it floats in the air. Everyone else has atlatl darts that have these wooden cross pegs on it that we throw at the shuttlecock as it's falling. The cross pegs

engage with a string that's on the shuttlecock. It tangles the string and pulls it down. It's like 2000-year-old trap shooting without atlatls. It's incredible!

Alie: Oh my gosh. How do you make sure you don't bone each other in the face with that?!

Angelo: Oh, well yeah. We have all these safety protocols. Everyone lines up and throws in the same direction, so there's nobody down range. But, if you look up 'Moche Toss' on YouTube, there's actually a video of the World Atlatl Association doing the Moche Toss experiment side by side with the paintings from the Moche Civilization. It's a really cool video because it's like experimental archaeology in action. We have this picture of this ritual we don't understand, "Well, let's try to figure it out." We try to figure it out and it seems to have worked.

Aside: I looked up video of this and it involves one atlatl dart with a bouquet of stripey brown feathers on the end and a long string wound around the shaft. Then once it's launched, a row of, like, 10 other atlatl darts go boingyoingyoingyoing after it to see who can snag the string. How bananas that this was all the rage, then was buried under millennia waiting to be reenacted?

Angelo: And now the Moche Toss is an atlatl competition that's part of almost every major atlatl tournament as one of the four main events of atlatl tournaments when the WAA hosts them.

Alie: Oh my God. It's like the closest thing to having a time machine, pretty much.

Angelo: Yeah. Basically. I mean, it felt so cool to be able to be part of this process of figuring out how this worked out. And again, I didn't even… When I was doing the experiment, I didn't really fully appreciate it until I saw the video after, and it had those side-by-side comparisons. It was like, "Oh my gosh, we nailed it. We totally nailed it." [*clip from Parks and Rec: Andy, "Nailed it!"*]

Aside: So now it's time for Angelo, your favorite experimental archaeologist, to nail a few Patreon questions that y'all threw and thrusted at him. But, before we get to them, a word from Ward-approved sponsors of the show who make it possible for us to donate to a cause of the Ologist's choosing.

This week it's an incredible mutual aid fund called the Black Trowel, which is a collective of archaeologists, from PhD students to faculty members, committed to the active support of archaeology students from working-class and historically looted communities who require economic support.

Black Trowel provides hookups to mentors and journal articles, as well as microgrants from $5 to $300 – no questions asked – to archaeology graduate and undergraduate students who need it, with students of color and those without parental/family support, or who lack access to other forms of financial aid by virtue of being undocumented, to the front, they say. I *dig* them, very much, and Angelo's an angel for letting us know about them. For more on this check the link in the show notes or go to BlackTrowelCollective.wordpress.com.

That was made possible by sponsors of the show, who you may hear about now.

[*Ad Break*]

Okay, let's get to a few Patreon questions in this whirlwind exploration of ancient tools.

Alie: First question. This was asked by Riley McInnis, Joshua Reid, Brittany Panos, and Sarah Kulig. Essentially, they want to know, they need to know: Do you play Dungeons & Dragons? What class would an atlatl play as? What would be its cost in gold pieces?

Do you play D&D? Yay or nay?

Angelo: I don't play D&D. However, I stalked Patreon questions ahead of time and I prepared an answer for this question because I knew it's the only one I wouldn't be able to answer off the top of my head.

Alie: Oh my gosh, and I picked it first! I'm such a dick! [*laughs*]

Angelo: I don't know all the classes and stuff, but I will give what I think the stats for an atlatl would be in comparison to a spear, a javelin, and a bow, because there are scientific studies comparing the four weapons. If we refer to a 1986 study by Anan Raymond about the effect of atlatl weights and force comparisons between bows and atlatls, and spears and javelins, he found that the range for an atlatl would be in between a hand-thrown spear/javelin and a bow. He also found that atlatl darts are slower than bows and arrows but have double the kinetic energy of self bows and longbows.

So, bows aren't better across the board, but they're faster and require less body movement, so they wouldn't scare prey as much. I'm sure bows and javelins are used in D&D, I'm not sure. But if they are, you're going to look for something that has a range between a javelin and a bow but double the impact force and damage potential of a bow and arrow.

Alie: Nice. Okay. D&Ders now have an answer for that. Perfect. How many gold pieces? Let's just say five. I don't play D&D.

Angelo: Um. Sure. Five, five is fine. Yeah.

Alie: Five? Five. Jen Woods, first-time question-asker, asks: If I wanted to make one of these, how would I go about it? And is that a good idea or a terrible one?

Side note: Jen has done throwing knives, and axes, and archery, so maybe those skills would overlap?

And then Vidie Pong wants to know: If I was marooned on an island that had game animals and trees, how reasonable would it be for me to attempt to fashion myself an atlatl and hunt with it before starving to death?

Angelo: Great questions! Atlatls are *way* easier to make than bows and arrows. If I was stranded on a desert island, I would make myself in an atlatl. Bows, you have to make a bow string, you have to find the right wood, and you have to shape the wood correctly. There's so much... Bows are way more complicated. If you're in a survival situation, you don't have the time to make a bow. Atlatls are a lot easier to make.

Now, it doesn't mean that atlatls are *easy* to make, they're just drastically easier to make, and more reliable in that situation. Making an atlatl - great idea, regardless of survival situation. Everyone should make an atlatl. It's a lot of fun. They're pretty easy to make, especially if you're not going to do a traditional method or make it out of stone tools. Just buy stuff at Home Depot. No big deal.

The atlatl itself is the easy part. You could effectively just use a wooden 2x4, that you can hold comfortably, with a nail in it or some sort of wooden peg as the hook. That's all you need for the atlatl. The dart is the hard part. You need to have a dart that's flexible enough.

When I made my first atlatl, I was maybe 11 or 12 years old, so I was a lot smaller and what I would use was four-foot wooden dowels that were quarter-inch diameter. I would make my own duct tape fletchings for the feathers. I would tie a bunch of duct tape to the tip to make it front-heavy, to give it enough weight. I wasn't going to put an actual metal tip on there. My parents were crazy enough to let an 11-year-old make ancient weapons in the garage, but not crazy enough for me to let me put real tips on them - which is good on their part, to be honest - so, that's what I did. Those quarter-inch dowels are definitely flexible enough. They work pretty well.

If you're going to make them out of a stick, you're going to want to dry the stick out, peel away all the bark, and heat the stick over a fire. When you heat something wood over the fire, you can actually bend it. It's really pliable. You'd be surprised how pliable wood is when it gets hot. That's how you would straighten it. Both in ancient times and now you straighten wood the same way.

So you heat your stick over a dowel and just slowly press and bend it against whatever bend it has in it, straighten it out, and you just want to make sure that it's thin and flexible. Now, there's kind of a hack. It doesn't have to be as thin if it's really long. For example, if I have like a quarter-inch steel bar… yeah, that's not going to be flexible. But if that quarter-inch steel bar was a mile long, it's definitely gonna be flexible. So any material at a certain length becomes flexible, no matter the thickness. So if you're like, "Well, I don't really have any thin sticks or thin branches or whatever," well, just make a really thick dart, or make a thick dart that's maybe like an inch in diameter, but make it seven- or nine-feet long instead of five- or six-feet long.

Alie: Okay. Gosh, that's smart.

Aside: If you are, right now, plotting to make ancient weapons in your driveway, feel free to do a tiny, imperceptible butt dance in solidarity and in celebration. Also, just a little DadWard advice and a legal disclaimer, please do not accidentally kill each other with these things. Thank you. But with some of Angelo's advice, you're just gonna be a chip off the old block. Oh, I mean, speaking of that:

Alie: Clara Law is a first-time question-asker, and a future archaeologist who had great questions, one of them was: What is the best type of rock, or your favorite rock, to make weapons or tools out of?

Angelo: So, my favorite type is obsidian, because… Because it's so brittle, it's easier to flake and flint knap. Also, obsidian comes in a wide variety of colors and shades that makes it really pretty. There's, mahogany obsidian, which is brown, black, and red speckled. There's snowflake obsidian, which has white speckles. There's rainbow obsidian, there's green obsidian, even translucent, banded obsidian, all of which I've made stone tools out of at some point. And yeah, that's definitely my favorite because I think it looks the nicest. It's also one of the easier stones to make tools out of because it's so brittle, it breaks pretty easy.

That also means, however, that it potentially could break in half while you're working on it, which isn't great. I'm not sure there's an answer to the best type of rock, because they each have their drawbacks. Like I mentioned, obsidian is really sharp, but it's fragile and brittle. Chert and flint are not as sharp, but they're much more durable. So it's just a tradeoff, it's whatever you're looking for, whatever works best for your situation.

Alie: Related, Kimberly McCall had asked: What's the best stone for edged weapons and why is it obsidian? So I believe that you've just answered that to a point? [*laughs*]

Angelo: Yeah, to a point. It's not necessarily obsidian. While obsidian is very good for edged weapons, it's not necessarily the best for edged weapons. You'll notice a lot of archaeologists and anthropologists don't like to make determinations of 'best' or 'quality' because then you get into those issues where you're calling some other culture or peoples 'less than' or 'primitive' or 'not as advanced' when that's not necessarily true! Like Zelia Nuttall proved with atlatls, just because something is older, it doesn't necessarily mean it's a less-than or inferior weapon. There's no such thing as 'the best weapon' or 'best tool', it's whatever works for that environment. Bows aren't automatically better than atlatls and atlatls aren't automatically better than bows. They're both better than each other at specific tasks.

Alie: And actually, on the topic of Zelia, Nikki DeMarco and Jenna Mace wanted to know if there were weapons made for women, and if there's anything you've discovered on the history of female hunting or weapon use?

Angelo: Really good question. It's been theorized that atlatls are the most egalitarian weapon, which means that because it uses a mechanical advantage over your arm, it doesn't matter how strong you are. It's more of a finesse weapon than a strength weapon, which means that children and women potentially could have used them and used them to hunt as well. However, there's not necessarily evidence of that. It's just, again, something that's possible. So, I'm not sure whether there's evidence of female hunters, but definitely with an atlatl, compared to most other weapons, it's possible that women hunted.

Aside: Ladies, carve those atlatls. Now on that note, patron Richard asked: Have archaeologists found any kid-sized weapons? Either doll-sized or training, like mini-atlatls or bows?

Alie: So, if this is more of a finesse weapon rather than a strength weapon, could little kiddos be having little baby atlatls and trying to get little tiny baby targets?

Angelo: Yes. In fact, recently we found child-sized atlatls in Oregon. And this was excavated by the University of Alberta, and they found that the biggest atlatl was 166% larger than the smallest atlatl, which is greater than the range of hand sizes for adult humans. So they figured, "Okay, well it might've been children that used the atlatls." I have personally taught children as young as second grade, which I'm not sure, how old is that? Six or seven years old?

Alie: I think so.

Angelo: There's an elementary school here in Las Vegas. And every year for, like, three years, they've had me come do an atlatl throwing workshop with their second graders. You can find pictures of this on my Instagram. It's adorable. [*Alie: Awwww!*] What I did was, we made atlatl darts with Nerf foam tips. I built a giant 10x10 mammoth target for them to throw at, and we built tiny, little, child-sized atlatls out of paint stir sticks from Home Depot. And the class, part of their social studies unit is learning about Ice Age humans. So I come in, I do a little 45-minute lecture where I pass around some arrowheads, some atlatl points, I pass around some vegetable cordage that I made- it's rope made out of yucca fibers. I talk to them about what ancient life, specifically around hunting, was like for Ice Age humans.

And we go outside, I teach them how to process their own plant fibers to make rope, and then I teach them how to twist their own rope. Usually parents have to help because seven-year-olds don't have the greatest dexterity. [*clip from Game of Thrones: Cersei, "Tiny little hands and feet."*] And then we walk over to the atlatl target and I let them all throw. They have like an hour to throw atlatls.

It's crazy how instinctive atlatl throwing can be. Some of them have a really hard time with it, but then every single year there's like three or four of these seven-year-olds who start throwing like they've been throwing for a decade. [*Alie laughs*] They start throwing as good as I am, and I've been throwing for a decade. So sometimes it just clicks with some people. It doesn't matter whether it's a boy or a girl. I've had girls throw amazingly well and boys throw amazingly well. It has literally nothing to do with that, which is another point towards it being an egalitarian weapon, it's a finesse weapon. But yeah, these kids can sometimes throw incredibly well and incredible distances even though they're using small atlatls.

And a cool thing about the child atlatls that were found in Oregon is that they were made out of whale bones. So the children-sized ones were made out of whale bones, but the adult-sized ones were made out of wood. So, not really entirely sure what that's about, but it seems like we have a lot of the child-sized ones because the bone doesn't deteriorate as much or as fast as the wood does. So we find more of these children's-sized atlatls.

Alie: Yeah, I wonder if they were also passed down, you know, from child to child as they outgrew them or something.

Angelo: Perhaps. And the cool thing is the ones in Oregon, they were that split finger style that reduces the strain on the elbow that we more typically associate with groups that used atlatls farther south, like in Arizona or Texas or northern Mexico. But it's the style that we actually see as far north as Oregon as well.

At the Harvard Peabody Museum of Archaeology and Ethnology in Boston, Massachusetts, there is a display of artifacts from the Northwest coast. And these artifacts are both prehistoric artifacts that were excavated and historic artifacts that were [*sighs*] probably stolen from Indigenous people in that area, as depressing as that is. One of these artifacts is a canoe action figure with two or three people sitting in it, and one of the little action figure people sitting in the canoe is holding an atlatl and using it to hunt, like, a seal or a whale. And it's the most adorable thing!

Alie: Is that hard to do? Is that hard to do sitting down?

Angelo: It's *so* hard to do sitting down. So one of my closest friends in the atlatl community is named, I'm pretty sure he has a PhD, Dr. Richard VanderHoek.

Aside: He does indeed. I checked.

Angelo: He is the state archaeologist of Alaska, and he specializes in Arctic Circle atlatls. He studied Arctic Circle atlatls more than anybody else, all these different throwing board styles that are only found in the Arctic Circle. And he has this public demonstration he does where he has this kind of fake canoe frame and then he uses a pie tin spray-painted brown to be like a seal head. And he has participants try to sit and throw an atlatl sitting.

When you're aiming at something like a seal head, instead of throwing at a standing target, like a mammoth, where you're standing and the target's standing, so you're kind of able to conceptualize that frame of reference when you're aiming… When you're throwing

at something that's swimming, you're above the water and you're trying to arc something to hit effectively the "ground." Water's not the ground, but it's that plane of the ground. It's a *completely* different aiming system because you're not trying to hit a standing target, you're trying to arc something to hit a seal that's under the water that's out in front of you. Crazy different, really difficult.

So he brought that setup to the Valley of Fire atlatl tournament that is hosted here in Las Vegas every year for the past thirty years. And he brought that setup last year for people to try to throw sitting down. And we're talking… we have world champion atlatl throwers who have 95+% accuracy at any distance under 25 meters, and they were having so much difficulty throwing sitting. You just change that and suddenly people who have been throwing for decades have trouble. But child atlatls, child atlatl action figures, somehow more prevalent in the Northwest coast. We haven't really found evidence of that elsewhere, but definitely found evidence of that in the Northwest coast.

Alie: Anna Vallery wants to know: If I find an arrowhead on a walk, am I required to leave it or turn it in to a museum? I collected a bunch on our property as a kid and now I'm wondering if that was super illegal? What're the ethics? What's the protocol there?

Angelo: Okay, so, definitely leave it, unless you are in very specific circumstances. In general, all archaeological remains are protected in the United States. If it is on public land and you disturb it, it is… I think it's a felony. There's a fine associated with it, and there's different amounts of fines for different types of artifacts. If you are on private property, it's technically not illegal. And also, there are some states that allow arrowhead or artifact collecting on public property if it's part of an erosion.

So, like, on a riverbank, where those remains probably aren't the original context anyway, they were probably moved by the river, so you can pick them up. But that's a state-by-state basis. In general, leave them alone. The reason is because in archaeology we get data not from the artifact itself, but from what's around the artifact where it was found. That's called the archaeological context. The context gives you vastly more data than the tool itself.

For example, let's say you find an arrowhead. You pick it up and you bring it to a museum. Well, you probably didn't take GPS coordinates of exactly where you picked it up. And if I look at the arrowhead, I'm like, "Okay, well, it's an arrowhead." But if that arrowhead was still left where it was and I was able - I or another archaeologist - was able to go see it in its context, we might be able to look at the site and say, "Okay, this arrowhead was found next to bones of this type of animal. It was found next to a fire hearth. So maybe this was where a hunt happened, they processed the animal right here and there, built a fire, cooked it, and ate it and left. And they left the arrowhead behind." So now I have waaaay more information about what that arrowhead was used for based on what was found around the arrowhead, and very little information from the arrowhead itself, besides the fact that it's an arrowhead.

That's why places like rivers, where artifacts have already been moved out of their context are legal to pick up in some states because they recognize that leaving it be doesn't really do anything anyway, because it's already been disturbed by the river, so might as well just pick it up. But again, that's a state-by-state basis, and I would rather just leave them behind.

Alie: Yeah. Is it helpful at all to take a picture and drop a pin at all? Or no?

Angelo: You could notify your local anthropology department or your local natural history museum. Or, every single state, required by law, has to have a state historic preservation office with a state historic preservation officer who is in charge of all historic and archaeological remains and sites for that state. So you could always let that person know, because that's literally their job to keep track of which archaeological sites are which and where in your state.

There's a chance they probably already know about that site, especially if you're on, like, a well-trodden path or hiking trail. But there's a chance if you're, like, out in the back country somewhere and you find something, leave it be, try to drop a GPS pin if you can, and let somebody at the state historic preservation office know, and they can send out an archaeologist to see if it's a site or not. But it's definitely something you can do, you can notify.

Alie: Cool. Ayshia wants to know: How much do you love *Forged in Fire*? And Christine Hottinger wants to know: Relatedly, what do you hate about *Forged in Fire*? Also, my question: What is *Forged in Fire*? [*laughs*]

Angelo: So, *Forged in Fire* is a TV show where blacksmiths have competitions to see who can make the best/strongest sword, or knife, or etc., etc., etc. [*clip from Forged in Fire: contestant, "I'm gonna make a seven-layer bar. I always make a seven-layer bar for the center of my swords because… I'm a warrior."*] They're not necessarily making historic recreations. I don't watch the show, I just know what the show is. I think I've seen maybe one episode, but I have no thoughts about it. Blacksmithing and metallurgy or metalwork is definitely not my specialty. I know cursory information about Bronze Age, Iron Age, or even medieval weaponry and stuff like that, but it's not my specialty. It's not what I've studied on an academic level. It's kind of just a hobby.

Alie: Have you ever seen an atlatl in a movie or TV show? Have there been any movies about them? Like, what's the deal?

Angelo: Okay. So, I am so excited. There is a movie about atlatls that comes out August 14th. I don't know when this episode is going to air, so it's probably… yeah, August 14th. It's called *The Silencing.* It stars Nikolaj Coster-Waldau, who is the actor from *Game of Thrones* who played one of the Lannisters. In real life Nikolaj Coster-Waldau is an atlatl user. He posts videos of himself using atlatls on his property on Instagram. If you go on Instagram, you can find his atlatl posts. I don't know whether he started using the atlatl after filming this movie, or somebody decided to write this movie for him because he uses atlatls, I don't know. [*Alie laughs*] But the movie is about a guy who kidnaps people and sets them loose in the forest and hunts them with an atlatl. Nikolaj Coster-Waldau plays the good guy who's trying to hunt the hunter.

Alie: Oh my gosh!

Aside: Of course I looked this up, and the trailer already has well over a million views. And one of the top comments reads, "Producers: How many times can you cut the word 'atlatl' into the trailer? Trailer guy: Yes."

Angelo: Seriously, if you watch the trailer, they say the word 'atlatl' like ten times. It's insane! Like, atlatl is a main character of the movie. Even… I was showing my parents this and they were like, "Okay, when you said there was a movie about atlatls, we thought you were over-exaggerating. We thought that there was a movie that had one scene with an atlatl. We didn't think…" [*Alie laughs*] The trailer depicts this whole scene where the police have

to go to an experimental archaeologist to ask what an atlatl is. [*clip from The Silencing trailer: Police officer, "What do you think he used?" Man, "It's called an atlatl, and it ain't no toy. It's designed to kill."*]

And the experimental archaeologist explains - and this is in the trailer - he's explaining and demonstrating atlatl use and how powerful it is. He throws it against, like, a pig carcass or something just to show us how powerful it is. And half the movie is them figuring out what an atlatl is, because they find these wounds on these bodies and they're like, "What the hell? What kind of tool made this wound?" Nobody knows what it is. And it turns out it's a guy in a full ghillie suit, [*Alie snorts*] hiding, camouflaged in the woods, hunting people with atlatls. The whole movie is about atlatls! It's crazy, it's crazy! So it comes out August 14th on all streaming platforms. I believe it's already out if you have DirecTV. I could be wrong.

Alie: How are you gonna celebrate? Are you gonna wear a ghillie suit? What are you gonna do?!

Angelo: I'm gonna have a watch party at my house, and I am so excited because this is the atlatl representation in media that I've been waiting for. And the fact that they seem to be pronouncing it correctly, the representation of the atlatl seems accurate. I actually know the guy who made the atlatls for the movie. [*Alie gasps*]

And that's another thing. If anyone wants to buy an atlatl, there's a few pretty good vendors. The only thing you have to look out for is making sure that the dart is flexible enough. Whenever I buy somebody else's atlatl darts, I'll usually taper them myself to make them a little bit better. But anyway, this company named Atlatl Madness is the one who supplied the atlatls for the movie. And they look great, the movie looks great, it looks accurate. It's great, it's phenomenal.

Alie: Dude, I'm so pumped for you. I'm so pumped for you. I'm also excited to watch this. [*laughs*]

Angelo: Yeah, the trailer alone is wild. I can't even imagine how crazy the movie is going to be, because the trailer gave me goosebumps from an atlatl perspective already.

Alie: I'm so excited! Okay. This is going to be a hard question: What sucks about an atlatl? Does anything? What is irksome about your job?

Angelo: I think it goes back to flimflam. Whenever I see a "caveman" in a movie, throwing a spear that would've been a thrusting spear, and they throw it. And because of movie special effects, it goes 70 feet at 60 miles per hour, perfectly straight, and zips through the air and kills a mammoth or something like that. I cringe. Spears are for thrusting; atlatls are for throwing. It's not possible. There's no experiment that shows that you can throw a hand-thrown spear, especially like the ones they show in movies, any more than 20 meters. And even at 20 meters, accuracy is low, impact velocity is low, the damage is not that great. And if you're hunting a mammoth, you're not throwing a spear like that, you're definitely using an atlatl.

So, whenever I see flimflam, that stuff kind of irks me. And the other thing is, I mean, atlatls are… because atlatl is a Nahuatl word in academia, it's not really used to describe the tool itself because it was used by so many different cultures. It's called a 'spear thrower' in academia, and because atlatls throw darts, not spears, I kind of cringe at that term as well.

Aside: So, spears can be used for stabbing, which atlatl darts are too flexy for. Darts have fletching or feathers on the ass-end . So fancy. Although, it's a pretty broad term, a dart.

Angelo: If I told people that I throw darts, they'd think that I am in a pub somewhere in the UK and throwing darts at a dartboard.

Alie: [*laughs*] Eating bangers and mash.

Angelo: Yeah. The reason the darts that we throw at dartboards are even called darts is because it comes from a Roman thing called a *plumbata*, which is basically a giant lawn dart that they would throw underhand. It would go up into the air with a big lead weight and feathers in the back, and then, like a lawn dart, it would just drop straight down over shield walls. If you look at a *plumbata*, it looks exactly like a big version of a throwing dart, but the dart part comes from the fact that it has fletchings, because a spear or a javelin doesn't have fletchings, but darts do have fletchings.

So anyway, I kind of cringe at those two things: calling it a spear thrower, even though I have to because that's the correct academic term for it; and whenever I see a movie where somebody throws a spear, a bajillion miles an hour, I'm like, "Nope, that's not how that works at all."

Alie: [*laughs*] A difficult question; you know what it is. What's your favorite thing about atlatls? How are you going to pick?!

Angelo: [*frazzled*] Yeah. The last two hours of this interview is my favorite part about atlatls. There's nothing… There's no bad… It's the craziest, coolest thing that very few people are aware of or have heard of.

Aside: That's correct, we recorded a two-hour interview and then we chatted another 45 minutes afterward. And yes, this was very hard to cut down because this dude has so much knowledge in his brain bowl.

Angelo: You know what? I have an answer. My favorite thing, not about atlatls, but about what I do with atlatls and what my role is as a board member for the World Atlatl Association. The education outreach that I get to do is my favorite part about archaeology. I am most comfortable teaching people about things that I'm passionate about, and there's nothing I'm more passionate about than atlatls, and I love teaching people about atlatls.

I have done atlatl throwing workshops for elementary schools, middle schools, high schools, university groups, museums, the Bureau of Land Management, State Parks Service, the State Historic Preservation Office. Anytime I can tell a group of people about atlatls and teach them how to throw it, especially when it's little kids whose eyes just light up when they learn about a weapon they've never heard about. They have the ability to throw a small little spear, a small little dart, like 50, 60, 70 feet with this atlatl tool and their eyes just light up. That's the best part. Teaching people, having the public interaction is the best part. Science without communication, science without education is pointless. The reason we do science is in order to create a better society, in order to educate the public and science communication is my favorite part of what I do.

Alie: I'm sure it's also great when you're going out there, you're in the desert, you're just getting out of the car, you've got a bunch of darts, and you're just ready to practice. That's gotta be so fun.

Angelo: It's so much fun. I always get so many weird looks when I roll up to places. There was probably like a 12-month period where I had an atlatl and three darts in my car, perpetually, just stretched over the entirety of my sedan. Anywhere I'd go, people were like, "*What* is in your car?!" And I was like, "Oh, they're 30,000-year-old throwing spears, but don't worry about it."

Aside: Let's hear a little bit more about this sedan. The *atlatl ve-hickle.*

Angelo: So, my license plate says 'ATLATL'. It was a gift from my sister. You can catch me driving around Las Vegas with the atlatl car wearing my atlatl t-shirts. The funny thing is, I actually had a friend who called me once and said, "You wouldn't believe. I was just at the mall, and I saw a car with atlatl license plates. That means that there's somebody else in Las Vegas, besides you, who throws atlatls!" And I said, "Why would that be your first conclusion? Why would you not just assume that that was my car?" [*Alie laughs*] I was like, "You went to the extremely unlikely scenario that there's somebody else as atlatl-obsessed as me who got atlatl license plates, instead of just assuming that it was *me* who was driving that car and it, and it was me."

Alie: Ahh, that's the best. So, if you're ever in Southern Nevada and you see an atlatl sedan, just *beep beep, hi, hi!*

Angelo: Yup. I've definitely gotten weird looks. A lot of people think that I'm an Atlanta Falcons or Atlanta Braves fan because ATLATL, but nope. It's atlatls, it's ancient throwing weapons.

Alie: Well, you won't be alone. I think after this episode, there's going to be a lot of people who are gonna be pumped about atlatls, myself included.

Angelo: I hope so. If anybody is making or throwing atlatls, and they have questions, they want to talk to me about atlatls more, there's nothing more I love than talk about atlatls. So, I am available. My DM's are open for any and all atlatl related questions.

Alie: [*laughs*] That's great. Watch out. You're going to get a barrage.

Angelo: Oh, that's okay. I also do axe throwing and knife throwing, and I throw slings and I make my own slings as well. I do a little bit of everything.

Alie: I think one thing that's really admirable about you too, is that you really do put yourself out there in a way that lets these opportunities kind of open up to you. That's really infectious. I think that's such a good lesson.

Angelo: Well thank you. I like to pride myself that my passion for things is my favorite part about myself. I just dive deep and I just want to share that with as many people as possible.

Alie: You do a very good job. I'm so excited to watch this atlatl movie now. This atlatl movie's going to be so good. [*laughs*]

So, ask smart people stupid questions about their obsessions, and before you know it, you're carving stuff in the backyard and watching horror flicks involving a man in a moss-covered onesie.

For more knapped obsidian, and elegantly chucked weaponry follow Angelo on Twitter and Instagram he's *@IDigIt1st*. You can check out the World Atlatl Association at WorldAtlatl.org. You can also check out Angelo's podcast, which is not at all about atlatls but rather about this other passion, which is samples in pop music. It's called *Sample Excavator* and that's *@SampleExcavator* on Twitter and Instagram. It's wonderful. That movie is *The Silencing*, and it's out August 14. We make zero dollars off of talking about it, just thought it was interesting. For more links to all of this,

you can see AlieWard.com/Ologies/ExperimentalArcheology, and there's going to be a link to that in the show notes as well as to the Black Trowel Collective.

We are @*Ologies* on Twitter and Instagram and I'm @AlieWard on both. *Ologies* Merch is at OlogiesMerch.com, and we have all manner of ways to show your *Ologies* love. Thank you to Shannon Feltus and Boni Dutch, two sisters who host the comedy podcast *You Are That* for managing our merch. Thank you, Erin Talbert, for adminning the *Ologies* Podcast Facebook group. Thank you to Emily White and all the *Ologies* Podcast transcribers, and Caleb Patton who bleeps the episodes. Transcripts and kid-safe bleeped episodes are up for free at AlieWard.com/Ologies-Extras and there's a link to that in the show notes too.

Thank you, Noel Dilworth, who gets all the interviews scheduled, and more. And to assistant editor, Mr. Jarrett Sleeper, who hosts the mental health podcast *My Good Bad Brain,* and who absolutely wants to go to the desert and fling these things. To the fletchings on our darts, Steven Ray Morris, who is the lead editor, who also hosts the podcast *The Purrrcast* about kitties and *See Jurassic Right* about dinosaurs. Nick Thorburn wrote and performed the theme music.

If you stick around until the end of the episode you know I tell you a secret, and this week's secret is that if you can hear any bumping upstairs… that's my parents. We are getting ready to go to the doctor to take my dad to get his staples out, and they are waiting for me, and I have about two minutes to get up there and out into the car. Okay. [*laughs*] Next week. See you then. Yeah, okay, berbye.

Transcribed by:

Aska Djikia

Emily Hillard

Ashley Thurber

Hannah Dent

Brixton Moss

Emily Staufer

Victoria Desjardins

Wendy Fick

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For comments and inquiries on this or other transcripts, please contact OlogiteEmily@gmail.com