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[00:03:00.690]

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[00:03:25.860]

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[00:06:13.340]

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[00:06:21.620]

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[00:07:50.270]

One of the beautiful things about this program, folks, is that I get to choose who I think is who I want to have on the show based on what they're doing and. This man who I have on today, his name is Kermit Paddison, and he wrote a book called Fossil Men The Quest for the Oldest Skeleton and the Origins of Mankind.

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And it's about a skeleton they discovered in 1994 that is more than a million years older than Lucy, who is the oldest previous skeleton that they had found in the past.

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It's fascinating shit. It's all about the history of the human species. And I really enjoyed talking to him. The book is Fossil Man.

[00:08:30.920]

His name is Kermit Patison government podcast, The Joe Rogan Experience Train by Job podcast. My Night All Day.

[00:08:42.770]

Welcome. Thanks for doing this, man. I really appreciate it. I'm very, very fascinated by this subject.

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Well, thank you for having me. It's great to be here.

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So this is a this is a long journey for you to have written this book and to be involved in this project. Can you talk us through how you got involved in this?

[00:09:01.100]

Sure. It was completely unintentional. I had started off working on a different book on the evolution of human locomotion. And I mean, just as an aside, humans are weird primates and a lot of ways. But one way we're weird is just we were slow or weak, but we have this ability to walk and run long distances, which is kind of unique.

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So I thought, OK, I mean, I'm not certainly a lot of other people have noted that before, but as far as I was concerned, no one had really written the deep history of that. So I was going to go sort of investigate the anthropology of where this weird human capacity came from. And, you know, so I thought that the early human history like Ardi would be this, you know, a little sliver of background before I got to the interesting stuff.

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But anyway, I started reading the papers and they kind of undercut a lot of the things that I had the research community had taken for granted, or at least challenged them, let's say.

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And so anyway, I started talking to the people on the team and then they can tell me about how you found this thing. Oh, that sounds pretty interesting. And then so I thought, OK, well, maybe already it'll maybe it'll be a page. It's more than a little line then, you know, a little later, a little more. It's five pages. And actually this is a whole chapter now. This is three chapters. This is at some point after this agonizing time of reappraisal.

[00:10:34.010]

I said, you know, this is. Much better than the actual story I was working on. I mean, this is a discovery that has been announced to the world, but it hasn't really been described in detail. And it's interesting that a whole number of different levels I mean, there's the anatomy. It's just exploring the natural history of the human body literally from head to toe, because the skeleton was so remarkably complete. They had a skull, they had hands, they had feet and hands and feet were almost complete, which is unheard of.

[00:11:08.360]

I mean, you're lucky to find any skeleton at this age and to get something that's that complete is really unusual. And so many of their other parts of the skeleton, too. But so it sort of became a way to sort of tickle this interest I had and like the natural history of the human body and human biology. So that's the science of it. And then the discovery story, the sheer adventure story was just astounding to me when I started talking to the field crew in particular and hearing about how they, you know, all the challenges in the field.

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Oh, my God. I mean, this is like a collision of cultures and the Ethiopian desert indigenous Tafa people and the Highland Ethiopians and then the foreigner, the Americans, the Japanese coming in and all, you know, meeting and the initial meetings were not friendly, you know what I mean?

[00:11:57.650]

You got guys coming out after guys coming out with guns and saying, you know, get the hell out of here. And so that part is fascinating. And then the drama of discovery and as bullets flying overhead and there's this excitement of finding one little piece and another little piece of it.

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Anyway, to make a long story short, I kind of stumbled on this. And every time I turned over Iraq, there was something interesting. And then it got more interesting once this whole saga kind of moved into the lab because, you know, there's this old cliché in and in the science, and that is it's not so much what you find, it's what you find out. So in other words, when you find a skeleton or something like that, the truth that it contains, the scientific revelations aren't immediately evident.

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You look at the skeletons.

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Oh, that's that. I mean, these people spend years studying this thing, measuring, you know, thinking about it.

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So there was also this other detective story that sort of followed the field.

[00:12:58.860]

There's a lab detective story that sort of followed the field detective story that went along with it, and then, of course, when this thing finally was revealed to the world, there was again another clash, this time a clash in the world of science and academia about people taking issue with the interpretation or denying its importance or trying to try to bury the skeleton again, if you will, you know, with inattention and then denial.

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So, anyway, long story short, it just you know, I didn't set out to do this, but it just sort of dawned on me that this was like a huge scientific saga that was still mostly untold.

[00:13:42.000]

We should fill people in on exactly what we're talking about. So we're talking about a skeleton that was discovered that is one point two million years older than Lucy.

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So the skeleton is yeah, it's four point four million years old, the oldest known human relative. Well, it's the oldest known skeleton that actually this is an important distinction I should make. So like I said before, skeletons are rare. This is the oldest skeleton. There are three other members of the human family that are older. But the thing is, they're much more fragmentary. They're not anywhere near as complete. Like there's one another one from Ethiopia found by the same team that found the skeleton we're talking about that's, you know, some some teeth like a toe bone and a few other broken elements of the skeleton.

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There's another thing, another species called Aurora from Kenya, which is about six million years old. Again, much more fragmentary, some teeth. I think they got a couple thighbones, partial thighbones. And then there's a skull from Chad called Sal Anthropos. That's about six million, maybe seven years old, depending on who's dating, you believe. And that's that's a very nice skull, but it's a head without body. So, so, so anyway, so there are people sometimes get confused by that.

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So this is indeed the oldest skeleton. It's by far more complete than this other stuff. But there are some, you know, fragmentary things that are older and they all become part of the story, too.

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And what is what is the scientific controversy, do you think? It's. Is it based on real skepticism or is ego involved in this? You're laughing.

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It's unfortunate, man. These societies. Yeah. There's a lot of egos involved in science, unfortunately, right? Yeah, there's there's a lot of egos.

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There's a lot of disbelief because the the skeleton was so surprising and a lot of ways and so contrary to the predictions that many people in science had made, that it was a kind of like a, you know, a head explode for a lot of people.

[00:16:01.420]

So we thought we should break down those particular things that are different than what was expected. Right. First of all, it walked upright. Yeah.

[00:16:09.520]

So it it walked upright. So it's primitive. I mean, if you saw it, you know, if we could go back at a time machine and look at it, you know, this this thing that the species name is *Ardipithecus Ramadoss*, that's kind of a mouthful. But Ardi is the the individual skeleton that they found is that's the individual like like you're Joe, you're the individual and your species is *Homo sapiens*. So that's how you think about this Arctic politicus Ramadoss species already, the individual skeleton.

[00:16:37.960]

So so the interesting revelations with it is it has upright posture, so its standing upright, but it's still got the opposable toe. So this is a creature that was in the trees, you know, clearly climbing, but it also appears to be upright walking with this opposable toe. So it seem, you know, everyone knows

that sometimes deep in the human past there was some kind of a boreal ancestor, you know, some kind of ape. But the question has always been, what kind of shape does it look like a modern ape or does it look like, you know, something we've never seen before?

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And so the surprising thing about already is it's actually quite different than the living apes. So, yeah. So it's got this opposable toe walks upright are the proportions.

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Chimps have shorter legs and they have arms. Are these proportions similar to that already?

[00:17:40.000]

I mean, it's certainly more ape like than than than than any of us. But it's there's a couple of interesting things about it, its proportions. So all the other living apes have longer arms than they do legs. They spend a lot of time climbing, you know, long arms, long, and they have, you know, the different proportions, but they all have that in common.

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They got longer four limbs than Highland's already was a big surprise because it actually had longer legs than four limbs. I mean, you know, it definitely has bigger hands, eyes, longer arms than we do. But, you know, that was a surprise, at least to me. And I think to be some of the researchers and, you know, I was talking before about these kind of surprises that appear after the fact. Well, that that was one, because the bones are broken.

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You know, these guys on this research team, it's called the middle of a research project. They spent a lot of time, you know, reconstructing this and then estimating, you know, how well the lengths of the pieces that are not there and then run all kinds of regressions and a lot of calculations and stuff. But so that revelation was sort of a delayed, delayed bombshell, if you will, that it actually had these little. Tons of that were more like a biped.

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And so ours, our legs are longer, chimps have longer arms. So is this like does it have almost equal length arms and legs?

[00:19:10.530]

Like you actually just put a photo of it up here and I'm getting a chance to take a look at. Oh, it's fascinating. So it has long legs, almost like a person, but longer arms than we do.

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Yeah. Yeah.

[00:19:22.650]

Longer arms than we have for sure. I think I don't have the exact name, but I think the calculation they did it was that legs are. I think I think the arm. Yeah, I want to say it's like nine ninety something percent. So it's pretty close to one to one of length, but indeed the arms are a bit shorter.

[00:19:46.140]

So the surprising part was that it didn't walk at all on its knuckles, being that it was that old. Yeah. So so the. OK, so humans are we come from the African apes. That's pretty clear from genetics. That's been clear for a long time. There are two main groups of African apes. There's gorillas and there's chimps. Now within those chimps also includes this other species you might have heard of called bonobos. And within those, there's a debate about which we divide them into some subspecies and stuff.

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But I don't worry about that for now. But anyway, what they are common is they a walk. So they got

these long fingers. And when they walk, you know, I mean, they, you know, do this. I mean, if you look at a video sometime, you'll see it. And, you know, because our two closest cousins both do that, you know, there was a perfectly plausible theory that human ancestors did it well.

[00:20:44.940]

So we evolved from a knuckle walking ancestor. I mean, there was even a cover story in nature that at the time the headline was almost that, you know, humans evolved from a knuckle walking ancestor. So, yeah. So that was that was the theory. And then so here with already we have a creature that's, you know, it's not. The last common ancestor with the African apes, but it's certainly getting closer, it's getting a big step closer and the people anatomists who specialize in these things say that there's no hint of knuckle walking, not not only was it not knuckle walking to get around, but also it has no vestige of a knuckle walking ancestry.

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So in other words, there's no residual anatomy that would suggest that that it ever gets stuck. Yeah, so it was bipedal from the very early days. And very, very early days of the species evolution, well, it's by people all year I was at that at that for know, four point four million year old window.

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And that, you know, what comes before that is the speculation. Yeah. I mean, it's you know, these people that do this, you know, it's intelligent speculation, obviously, but you don't know what you haven't found. And so, you know, now the I mean, there's a debate about just how long ago the last common ancestor of humans and chimps lived. It's probably at least, you know, anywhere from one point five million years before already to, you know, some estimates put it even further back than that.

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So, yeah, there's another school of thought that's kind of emerged that says, well, it still could be a walking ancestor, you know, that gave rise to humans and Ardi. But it just all the stuff had disappeared by the time you got to. And that's that's kind of a counter that we can get more into that later on.

[00:22:48.870]

I want to get too esoteric on you, but but it seems so fascinating that it has these really long arms, but that there's no evidence whatsoever of not only knuckle walking in that species, but knuckle walking as an ancestry. Yeah, and that blew the mind of a lot of people, and there's there's a school of thought of critics out there sort of. OK, so this thing was announced in 2009.

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Know, surprised when I discovered. What was it discovered?

[00:23:19.660]

OK, it was discovered the skeleton itself was discovered in nineteen ninety four. And how did you discover it? Well I can short answer.

[00:23:29.710]

Or a long, long, long, long stretch that I like. I want to hear the whole thing.

[00:23:34.780]

All right. Well I'll take you back to the beginning of how like the whole detective story was. Sure. And that if you want me to speed up just.

[00:23:42.820]

Oh, no, no, no. This show's all about to say, I want you to have er. OK, so this group went to Ethiopia and they started doing this work in first went on an expedition, Ethiopia in nineteen eighty one specifically for this purpose of looking for ancient man.

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I mean they were looking for fossils and they were actually, I mean they found this fossil but they found a lot of other stuff too. And like all up and down the timeline of human evolution. So stuff some stuff that's like recent and like in the order of hundreds of thousands of years ago, just stuff that's like getting near six million years ago, these fragments I was talking about earlier. So their research agenda is as broad. It's just like what can we find about human evolution?

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But anyway, one of the big burning research questions at the time was what came before Lucy? Now, you've probably heard about Lucy. Lucy was discovered in Ethiopia in nineteen seventy four. It was discovered by a guy named Don Johansson, American guy with his assistant, a guy named Tom Grey. They find this thing, it turns out to be a skeleton. It's three point two million years old. It's probably. I think probably the best it's fair to say it's the best known human ancestor, I mean, people who know nothing else about human origins will at least recognize the name Lucy.

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And there's a lot of reasons for that. You know, in terms of how it's publicized and and et cetera, et cetera. But I'm sorry to bother you.

[00:25:23.210]

Pause for a second. It wasn't Lucy also controversial? Yeah, it's any discovery in this field is controversial. So these are these are these are people all, you know, having the great the identity politics, the paleo identity politics of humanity. So there is no there is no easy consensus in this field. So anyway, so Lucy has discovered she's three point two million years old. I mean, this is a huge revelation at the time because she was, you know, like a skeleton and, you know, took, you know, the the oldest skeleton at that point was a Neanderthal, which was less than a million years old.

[00:26:10.050]

So this was like a big, big deal when they find something this old. So, you know, that thing have studied is popular books written about it, et cetera, et cetera, from like the nineteen seventies into the early 80s. That's the time that Lucy was sort of being intensely studied and revealed to the world. OK, so meanwhile, Ethiopia is going into this period of turmoil. So this this one of the big elements in this story is the difficulty of doing this kind of work in a place like Ethiopia.

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So right around the time that the Lucy was discovered, the ancient monarchy of Ethiopia headed by the last emperor, Haile Selassie. Well, it's like 20 year old monarchy, you know, it traces its roots to biblical times and claims to be the descendants of King Solomon and Queen Sheba. I mean, these ancient ancient monarchy, but hadn't really modernized. And then it was toppled by, you know, student activists, the military, this whole kind of coalition that wanted to modernize Ethiopia.

[00:27:17.050]

Well, what happens is, A, the power is seized by and the military becomes a Marxist dictatorship. Ethiopia, this longtime ally of the Americans in the Cold War, shifts to the Soviet bloc. And now it's like a frontier of the Cold War. Suddenly, like the Americans, the Europeans who were kind of welcomed as foreign researchers or now viewed with hostility, people are thinking, you know, a US CIA agent research kind of shuts down for a number of years because it just becomes too dangerous.

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Meanwhile, there's like this tribal warfare happening in the desert where they're doing this stuff. So it's but finally, in 1981, things have calmed down enough that this research team is able to go back and they go back and they have acquired a new project area. It's big. It's like the size of Rhode Island, you know, and in that product area, there's all kinds of like the layer cake of time, you know. I mean, some anthropology depends on geology.

[00:28:23.740]

OK, so there's like this layer cake time, you know, where you have you know, things are, you know, one million, two million years old. I mean, give me a really simple model here. And this project area is



really valuable because it's a sprawling area, but they have all these different time periods exposed. So in other words, as rocks from a million years old, there's rocks that are more than, you know, as old as six million all up and down the timeline of human evolution.

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So these guys go there and they see this place and they say, holy crap, this place is like it's it's it's it's a gold mine. It's a gold mine, like, spread out all over all this place. I mean, and we can we can learn so much about human evolution if we just spend all these years studying. So then unfortunately they spend one season here and just doing kind of reconnaissance to see what's there. Then Ethiopia shuts down again.

[00:29:16.180]

The government says basically puts a halt to research, says, you know, where they want to rewrite their antiquities laws so they can better control. These foreigners are coming to look at this stuff and they say, OK, well, hopefully we'll get you back next year anyway. It takes it takes nine years before they can resume research. So finally, this team goes back in nineteen ninety and they're starting to go find things and learn more about this area.

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You know that they have a project. And finally nineteen ninety two, they find a first tooth of what becomes the species of *Ardipithecus* at that point. At that point they're not, they're not expecting to find a skeleton because that's just like, that's like hoping you're going to win the lottery tomorrow. Right. You buy a ticket. Yeah. Right. Yeah I'm going to win the lottery. Yeah. Sure. Yeah. So they find it tooth and then they start finding these pieces and, you know, walking kilometers after kilometers, you know, day after day and then find a few more elements and anyway overcover a couple of years.

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They collect enough to realize that this is a new species, this is something different. But at this point it's just like a few teeth, you know, a few bone fragments and stuff. But then in nineteen ninety four they find the skeleton. And that's kind of an interesting piece too, because it's kind of against all odds. And I can tell you how that happened, if you're interested.

[00:30:47.050]

Yeah, I'd love to. Yeah. Yeah. So anyway, they're walking along and I should introduce some of the characters here.

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So the characters sound like a movie, by the way, the way everybody lays out.

[00:31:02.530]

Yeah, we haven't talked about the personality, but I'll mention some of them. OK, so one of the guys who starts in nineteen eighty one is a young player and the pilot is the name is Tim White. He's a anthropologist from the University of California at Berkeley. He's a guy from the American West. It's a very hard charging, strong willed guy. I mean, profane, encyclopedic knowledge. And everyone who works with him will tell you that he is probably the most intense fossil hunter who they've ever, ever met.

[00:31:40.870]

That's that's him. He would be the star of our movie. Well, he'd be the Harrison Ford character.

[00:31:47.350]

Yeah, he would. He would. He would. He would tell you that. Like, it's ridiculous to compare. To Harrison Ford, because that's complete bullshit, because he is a he is famously skeptical. He's he's a relentless killer of ideas. I mean, he's got this encyclopedic knowledge and he's got, you know, hair trigger bullshit detector. And that's why a lot of people are afraid of him anyway. But he's also a very, very exacting in the field.

[00:32:12.410]

And and so when they realize that they're in such a dense that they're starting to pick up fossils, you know, he organizes people to basically crawl hands and knees in these areas. He lays down like these Layne's in the fossil rich areas either, you know, carve, you know, lines in the sand with his little walking stick or he sometimes will put down ropes, you know, and it's like, you know, Joe, your job is to walk shoulder to shoulder next to, you know, whoever.

[00:32:46.820]

And all 10 of you are just going to crawl this space hands and knees and you're going to pick up every damn thing that you see. Even if you think it's a rock, put it in there, put it in the can, because we're not going to know for sure until we get back and look at it more closely. And and so so he's one guy. He you know, there's a team working on another character in this whole thing is one of Tim's former students, a guy named Brian Asfour, who's Ethiopian.

[00:33:15.500]

And he I mean, there's an interesting back story with with Brian. And he had been a student in the time of the revolution. And like a lot of other students, he was swept up in the whole political reform movement. And like a lot of other students, he was horrified to see what happened when the military dictatorship came in. He was arrested. He was put in jail. He was tortured. He was lucky to survive. He told me he went into prison on a chain gang with like seven other guys.

[00:33:48.260]

And when he was released two years or six months later, there's only two guys alive. This is a story of that generation and and the suffering that Ethiopia went through at that time is is is astounding. And most Americans would find it hard to believe. But anyway, he's he's a member of this group. There's a number of other Ethiopian guys. So part of the mission of this team has been obviously to find fossils, but they sort of made it a dual mission to train Africans.

[00:34:21.740]

We can talk more about that later. But, you know, if you look at a lot of the old. You know, documentaries about human origins. You see people I mean, oftentimes I like European people, you know, Americans and and, you know, the Africa is the country of human origins. But historically, at least for a long time, Africans were not they were hardly represented in the ranks of the scientists. But anyway, so this team had made it part of their mission to train Ethiopians not only to be field crew, but Ph.D. scientists.

[00:34:57.220]

And Bronnie is one of those people and another guy who actually found the first piece of art. His name is Johannes Haile Selassie. He came he was trained by Bronnie. And and so one of these days, he's out there with this group of people and they're crawling across and he finds a little bit of bone like little hand on second, I think was a second metacarpal. It's a bone right here in your hand and it's broken. And they say, great, you know, we got a piece.

[00:35:25.000]

And so, you know, and at first, you know, in this fossil, this damage, everything's broken in the. You know, the isolated truth here, the bone fragment there, you know, no one's expecting that if you find one piece like that is necessarily going to be anything else from that skeleton that you find because the stuff is just scattered and, you know, came from got eroded out of God knows where they went in a few days later.

[00:35:51.200]

They go back, they do the crime and they start finding more pieces and then more pieces and then, you know, they're sieving, which is basically like taking dirt and shaking it through a screen and then seeing what's there. And there's, of course, a lot of rocks and all kinds of crap, but they start finding some bones in there and then the light bulb goes on. Oh, there's multiple elements of a skeleton here or multiple elements of an individual.

[00:36:16.170]

OK, but still, it's kind of optimistic to think there may be a skeleton. But anyway, then they're finding piece after piece and then when you start finding multiple pieces, then it kind of suspicion grows that there may you may be close to the original spot where the skeleton came out of the ground. So anyway, then probably talking too long here. So no. No, you're not.

[00:36:40.220]

But can I stop you for a second? This is all I'm assuming this is all fossilized, right?

[00:36:44.900]

Yeah. So this is this. Yeah. This is fossil material. So basically what what a fossil is for people to know. It's basically a bone that has turned to stone. So when stuff sits in the ground for a long time, you know, minerals kind of come in and and displace the original biological material. So, you know, you could have fossil, you know, all kinds of stuff. I mean, usually there bones.

[00:37:08.500]

How long? Here's a question. How long do bones exist as bones before they become fossilized? I actually don't know that's a good question, and I my guess is that it probably varies a lot on the condition, you know, like just the geological condition. And so I I don't know. But my guess would be that that answer varies a lot, depending on that sort of the depositional environment. And so I can't give you a good answer. Fine, I'm sure.

[00:37:42.470]

But so another question is, when is it always that bones become fossilized or is it very specific conditions like do bones, for the most part just deteriorate and be eaten by, you know, parasites in the environment and bugs and whatnot? Yeah, yeah.

[00:38:02.070]

So it's it's pretty rare to be lucky enough to find something like this. And so in that part of Africa, there are a lot of predators, you know, I mean, now and then because they find like, you know, along with these fossils of things like already, they also find like ancient hyenas, ancient big cats, you know, all these things that were like, you know, eating our our ancestors.

[00:38:27.620]

Right. So, like, a lot of these fossils, you know, have like tooth marks in them and stuff. So something dies, a carcass lands on the ground, boom. And, you know, it's probably consumed by, you know, some big cat or whatever or I mean, one of the really ravaging things are hyenas. You know, they come in and packs and they have these really powerful jaws and they can actually chew bones down to splinters, you know?

[00:38:54.170]

And so now, you know, something dies. I mean, after a couple of days, there could just be like splinters left. It's not like they just clean off the skeleton for you. So anyway, they come in and then there's all this like this whole kind of like chain of other scavengers that move in. I mean, there's a lot of ancient pigs. And believe it or not, I mean, you may think of like, nice little pig is being, you know, this cute barnyard animal.

[00:39:18.860]

But actually, pigs are surprisingly annihilate of scavengers about the ruthless.

[00:39:24.740]

They're ruthless. We have an answer for you. Fossilise, preserve remains, become fossils if they reach an age of about 10000 years. OK, so it's 10000 years is not that long at all. It comes up, comes off the Internet. So we know it's we know it's true.

[00:39:39.580]

But what is the National Geographic, Doug, I went to for that? So National Geographic is a good

source. Yeah. So it's it's a long time, but.

[00:39:49.020]

Yeah. So back to Wild Pigs. Yeah. Wild Pigs. Well, that was famously a scene in the movie Snatch. Right. You remember that movie that Brad Pitt movie? It's a great Guy Ritchie crime movie. The guy keeps pigs because pigs will eat everything, the bones eat everything. So when he gets rid of when he murders people, who throws them in the pen with the pigs and the pigs eat every part of the body.

[00:40:11.250]

Yeah, exactly. So there's pigs. And then there is, you know how like porcupines. It's like little little rodents to come in. Dung beetles. I mean, at the time it doesn't like going down through something. So by the time there's nothing left to eat, there's not much left of the skeleton. And so anyway, so that's that's just preserving the bones. Now, there's another thing that has to happen for this to you know, it has to like be in a depositional environment that will encourage the bone to fossilize and not just degrade.

[00:40:43.890]

And there's different places that are conducive to that. I mean, one is like a place where there's like a lake or something, you know, covering it with sediment. And this particular place, they think was probably an ancient floodplain. So somewhere near a river where there'd be like overbank flooding every now and then, it would like put on these layers of silt over time. And then this stuff would just be buried in the silt. Then it would fossilized.

[00:41:06.810]

But anyway, to answer your question, so, you know, you can have like a herd of antelope or whatever, you know, one hundred antelope and, you know, they'd all meet their ends in various ways, but none of them could actually be fossilized in the end, you know, so it's it's a pretty small minority of things that that have the courtesy to leave their bones for us. And then so that's that's one element that makes this thing so hard.

[00:41:33.120]

And then the other one is just, you know, you have to be if you are the fossil hunter, you know, the entomologist, you have to come along at the right time when that fossil is coming out of the ground, you know, so basically the stuff gets buried, you know, in our in our layer cake and many other layers stack up and it fossilized it. But then they come to the surface again, usually by geological faulting or erosion.

[00:42:03.120]

And once the stuff comes to the surface, some some fossils are like rock and roll last for a long, long, long, long time. But other stuff like this particular skeleton are actually really chalky. And I mean, Tim White, the the fellow who was sort of guiding us all this whole operation, says that it's, you know, it was really could come apart in your hands if you didn't handle it. Right. So they just haven't had the good fortune to kind of show up in this spot when it was coming out of the ground, just enough to be found.

[00:42:42.570]

But it hadn't been on the surface for long enough to sort of be degraded and stopped on by on by animals and blown around, because once this stuff came to the surface, it doesn't it's on a slope. Right. So that and they get these torrential it's a desert, so don't get a lot of rain. But when they do get rains, that can be torrential and then that just sends everything downstream and they just hit the Goldilocks zone, which just have happened to be there at the right time.

[00:43:10.890]

Yeah. And and, you know, some of that is luck, but it's also, you know, you make your own luck. It's it's it's putting yourself in the position to find things, you know, to spot them if they're on the ground and then to do the detective work to sort of find the original resting place like Tim White, this guy

mentioned. Is that the paleoanthropologist? He you know, when they when they found this scatter stuff on the ground, the question is where to come from?

[00:43:40.980]

Where is the original institute site, which is kind of what I left off when I was telling that story a minute ago, because they're finding all these things in the ground. So they're planting flags to mark where each one came from and they see a pattern, you know, converging, getting narrower and narrower on this this little hillock. And Tim compares it to, you know, what the gold miners did in California is from California, the forty Niners, where you're sort of like, see what the pattern is and then sort of follow it up slope to the source.

[00:44:10.980]

And that's what they did. And then they start they start to dig, dig in there. They found some bones that were still embedded in the original sediments. That tells you like, OK, now we found the you know, the original resting spot of this thing. And that's when they start digging. And that's, you know, I mean, it's very it's very. A slow process, and it doesn't happen nearly as fast, I mean, this stretches over days and weeks, but anyway, they start digging there and this is when they say, holy crap, this is like a skeleton.

[00:44:41.430]

So between finding the initial bone in ninety four to actually pulling it out of the ground and a skeleton form, how much time is this taking.

[00:44:51.690]

OK, so I think they found the first piece of the skeleton and I think was sometime in November ninety four. And then meanwhile there's all kinds of stuff going on. So they're doing surveys elsewhere that because as I mentioned before, this particular project, they've got stuff, sediments of all kinds of ages and it's huge. And so, you know, they've they've got a lot of places to look and you don't know. So they're not going to start.

[00:45:17.850]

If you're in this line of work, you don't start digging until you have a pretty good reason to believe there's something there, because otherwise you're just going to waste your time and you don't have much time in the field. You know, you've got to pay to sustain these expeditions in the desert. There's you know, there's people running around with guns. I mean, we haven't talked about this, but there's like this tribal like literally tribal warfare going on there.

[00:45:44.520]

And and so so, you know, you don't waste your time digging unless you have a pretty good reason to believe that there's something there. So anyway, they find this first piece in November and then I think, you know, they come back some days later and then start finding these other pieces that I mentioned.

[00:46:04.950]

And then then, you know, some weeks it was some weeks later before they started digging. Some of that was waiting until there was enough evidence to to really strongly indicate that there was something there. And some of that was just juggling the conflicting priorities in the field. And one of those conflicting priorities is actually they were searching for another what they hoped would be another skeleton quite close to this one, just maybe a couple hundred meters away, because they had found a nice arm bone there the year before and then dug this hole and dug and dug and dog and that dug for years there, but never found any more of that creature.

[00:46:47.730]

So that's that's kind of an example of, you know, what is not at all unusual experience. But you dig in and there's nothing there. But in this case, there was something there and it was a lot there. So, yeah.

[00:47:01.770]

Was there skepticism that it was all from the same individual? Yeah, well, that's that is, of course,

unclear when you're starting to dig, you know, but, you know, I think over the days and weeks, as they were, you know, slowly pulling pieces out of this excavation site, which is a very slow process. I mean I mean, literally working with, like, dental tools, you know, I mean, there's a lot of pictures of Tim there and, you know, chipping away at this and his students, you know, they're they're using, like brushes to brush because I don't want to go in there with a trial because you're going to, you know, destroy something.

[00:47:43.130]

So over the days and weeks, they discover there's no duplication of parts, which is a strong indication that it might be one individual. Now, can I stop you again?

[00:47:54.710]

Are they filming all this so that they can like so that if there are skeptics because with anthropologists and paleontologists, there aren't a lot of skeptics. Right. So are they preparing for this and filming every step of the way?

[00:48:09.130]

Not every step of the way. But Tim White is a relentless record keeper and he has this voluminous photo archive for one. He's also a relentless record keeper. And when the excavation started, they actually yeah, as you said, they did set up a video camera on a tripod and train it on the excavation area and just let it roll. And this is back in the days of actually had to take off his vest, like microstamping. But even so, they're filming all this stuff.

[00:48:44.420]

So by the time I come along, you know, many almost 20 years later, Tim lets me see all this stuff. And to me, this was like an absolute gold mine because I, you know, this thing that I would normally have to reconstruct, you know, after the fact, which I wouldn't be able to see the conversations that people told me what they said, I'd have to greet that with some skepticism because how reliable is this person's memory after 20 years?

[00:49:10.130]

I mean, I couldn't really be there in any way. But now they have this videotape I'm watching while these guys are digging up these little pieces I'm watching while Tim is, you know, exposing this smile of this ancient. You know, this Ancient's member of the human family and hours and hours of this stuff, so I can actually hear. You know, the excitement and then all the other kind of cross talk, the jokes, you know, the fact that they're playing the Grateful Dead in the background or Bob or listening to the BBC, you know, all the stuff, you know.

[00:49:48.150]

And so to me, you know, as a reporter, that was. That was like the equivalent of them finding the skeleton for me, having this trove of records was just just such an astounding jackpot for me because it let me be there.

[00:50:10.350]

Yeah, that's amazing. So how many teeth were intact? Did it have a full smile?

[00:50:16.710]

The teeth? Well, they were they were in the jawbone. I don't remember. I shouldn't give you a number because I don't remember. But they pretty much got most teeth of this creature. I don't know, maybe not on this one individual, but there are while this operation went on for years and over the years, they collected a lot of fragments from other individuals. So I'm sure they have pretty much all the teeth are pretty close to all the teeth.

[00:50:42.780]

I mean, the number of teeth they have is it's in the book somewhere.

[00:50:48.000]

I don't remember the number, but it's well over one hundred or so with already in the skeleton there. Is this is this the only example of this particular member of this this you know, this is this period in evolution or their other. Of the similar time frame that they found other individuals or other species, other individuals. Yeah, so there's a lot of individuals of the species. But again, they're just they're not they're not they're not completely I mean, you know, they find like a part of a jawbone of another individual, actually, that they found a nice jaw apart, part of a jaw just like a stone's throw away from where it was found.

[00:51:35.490]

They found like a foot bone of a bigger membered, or they kind of jokingly nicknamed nicknamed Bigfoot.

[00:51:43.930]

And they're aging because they're aging these creatures based on the biological material that's around it. Yeah, well, this is this is interesting and this this if you read the book, this becomes part of the sort of scientific detective story is all the techniques that are that are that are used. And for me as a reporter, this was actually part of the origins of this story, was getting to learn about all these component sciences that go into paleoanthropology. And there are a lot of them.

[00:52:11.110]

It's definitely a multidisciplinary field, but one of the most important. Discipline, subdisciplines within this is geology, and the reason is the geology gives you the timeline to answer the question that you just asked. And so there's different methods of dating. I mean, you can sort of if you're in the fields, you can begin to make estimates about the age of the sediments based on the other animals that are there. Like if, you know, if you find a certain type of pig that, you know, this particular species of pig between lived between this date and that date.

[00:52:47.600]

So that kind of narrows it down so that they call that bio chronology. So that's one. But the real specific method of dating is dating the volcanic ashes and lava. And I could I can give you like a one minute tutorial on that. OK, so as I meant so. So basically. You could think of geology is like a layer cake, right? So let's just say, like here, the ancient layers that were laid down, like I described, was to say this one is a million years old.

[00:53:18.280]

This one's two million. This one's three. This one's for. OK, so how do you know how old things are? Well, that the main method of dating is called radiometric dating. And so that basically means that they find volcanic ashes and lavas that are because this is on the edge of the Great Rift Valley. There's like tons of volcanoes all up and down eastern Africa. And every once in a while they erupt and they spew out ashes and lava and the stuff settles on the ground.

[00:53:46.840]

And in some cases, I mean, these ash layers are really thick. I mean, like several feet thick. And you think, oh, my God, what an apocalyptic eruption, eruption that must have been with that happened. But it's great for the geologists because they can take these ashes and they take them into the lab and then they can tell basically by the isotopic data. And so basically, it's just there's a change in the isotopes of of of potassium in particular, and argon, which are components here.

[00:54:19.540]

And the stuff decays at a constant rate, which is not affected by temperature or pressure if it's in the earth or whatever it is to concentrate. So this gives you a yardstick to measure how old something is. So if they can't figure out the age of the individual bones, but you can't figure out the layers of the ashes and labus that are above it and below it, and that gives you a bracket. And then there's like literally hundreds of ash and lava layers in this area.

[00:54:53.530]

And so in all, this thing's been dated over the years, that gives you a timeline. So this particular

skeleton, there's very conveniently an ash in the layer above it and another one below it. And when they did the dating, they both were calculated to be four point four million years old. So that means, you know, I mean, that that the area between them was deposited in a pretty short period of time. I mean, this method dating doesn't give you a down to like the year or even tens of years.

[00:55:25.490]

So no one knows just how long that period of time was.

[00:55:28.060]

But it's probably on the order of, you know, maybe a hundred years, something in the hundreds of years, not not long. And for something of this age that's actually really precise dating. So. So to answer your question, it's it's using volcanic ash isn't lavas above and below it to figure out the date of things and what is the the window of possibility like?

[00:55:49.300]

How tightly can they narrow that down? Within a million years. Like what? Well, I think it probably depends on. I'm not a geologist, so I don't want to speak on my layer of knowledge here, but with this one, they brought it down to four point four. So, you know, that's pretty that's pretty tight. And there's certainly there's certainly a margin of uncertainty, margin of error in there that they reported. And it's some low number with a lot of decimal points, which I don't remember.

[00:56:18.110]

But yeah, long story short, that four point four is a pretty it's a pretty good it's a pretty good date. And for for this stuff of this age, it's it's it's it's it's quite solid.

[00:56:29.560]

Now, when you have a being like this that's so unusual, it's not like anything they've encountered before with the longer legs and the thumbs on the feet and the whole deal when they're piecing this together, like, how do they know exactly where everything go? How are they absolutely sure how to put this together when they're putting it together and they're realizing this is so different than what they expected for something of this age? What how much of a freakout is happening here?

[00:56:58.690]

Well, OK, so it's different in some important parts. But but then again, if you're an expert on skeletons like these guys, all right, it's it's different what they've seen. But I mean, they know how skeletons go together.

[00:57:11.770]

And, you know, I mean, they can tell when turbulence and you don't get a fever confused with it with like, you know, something like that. So, you know, they look at this and I don't have this knowledge, but certainly those people do that they can pick up a tooth and they say, oh, yeah, this is upper right side of the mouth. I mean, the people that no skeletons can do all this mental rotation in their head and they can often do it from fragments of bone.

[00:57:42.280]

So it's not the whole truth, but like a fraction or a fraction of, you know, some football. And, you know, to me, that was actually one of the fascinating things about this is like how these people that know their skeletons can read the revelations in this, this and the skeletons.

[00:58:02.720]

You know, the story of giganto Pethick is how they discovered that, you know, it was an apothecary shop in China. There was an anthropologist who found I believe he found a tooth and he was like, what the hell is this? And he realized it was a primate tooth. It was much larger than anything they'd ever seen before. And then he asked them to, I think is I want to say 1920s and 1930s. And then they I mean, I don't think they've gotten anything more than some jaw bones and teeth.

[00:58:30.040]



And they realize it's a bipedal hominid that was somewhere in the neighborhood of eight feet tall. It wouldn't it wouldn't have been permitted if it was so, but at least the old meeting has changed. But I mean, it's like a member of the human family, which was basically after our split from the chimps. Now they call them homonyms with an eye. And at the end, so so what I believe is a Miocene ape. So it's an ape.

[00:58:58.500]

It's a primate. But you wouldn't consider it a member of the human family. It's just one of many weird things from this period.

[00:59:08.520]

They call the Miocene that the terminology.

[00:59:13.200]

But the point I was getting is that they believe we have just from looking at a jawbone, they can figure out what this thing was and how tall it was.

[00:59:22.470]

Is bonkers. Yeah, yeah, yeah, yeah.

[00:59:24.930]

Because the body proportions are I mean, they vary somewhat, but you can tell a lot from, you know, sometimes individual bone, you know, I mean, like, believe it or not, like the head of the femur is often used as kind of a, you know, the ball, the ball and socket on your on your on your thigh bone is often used, was used in order for that, in fact, to scale different parts.

[00:59:49.170]

So the they've got this complete skeleton. There's there's nothing missing from Ardi.

[00:59:55.650]

Well, there are some things missing out, small pieces. I mean, it's relatively I mean by the standards of paleoanthropology, it's remarkably complete. And actually the hands and the feet, which usually you don't get tempted by the paleoanthropologist, he calls them carnivore orders because, you know, you're lying. Your carcass is there. And like, you know, the pack of hyenas comes in and like, you know, here's a handout for the carnivore that you off your feet and whatever.

[01:00:20.530]

So so it's remarkably complete. But there are some pieces missing and there are some pieces that are just present but really damaged, like most of the spine is not there. And it sure would be nice to have the spine because you can tell a lot about the kind of the design of the creature, the organization, the creature, if you know how its spinal segments are divided, the pelvis they have a lot of, but it's pretty distorted by geology.

[01:00:48.030]

So anyway, there's a theories and some of the limb bones are fragmentary. So, for example, they don't have a knee joint, which we're sure would be nice to have because you could that's like an interesting bit of data just to figure out just how how this creature was a biped. So anyway, so there are there are certainly pieces missing. And I'm sure that, you know, science would love love to have them if they ever is already on display.

[01:01:19.200]

Is there or at least online, is there a place to to view it?

[01:01:25.500]

No. Well, there are some photographs of it that that have been published.

[01:01:32.520]

And you can see it there, lay it out on a table in the form that they think that it came in. Yeah. I mean, and the form that's to reconstruct the skeleton skeletal elements is is not terribly hard for these guys to do. I think in one case, there might have been a question about one of the hand bones. You know, like there was like a phalanx of one of the fingers. And there was a question, did it go in this finger or another finger?

[01:02:00.090]

But but for the most part, the it's easy for these experts to know where an element goes in in the skeleton. So there's pictures of the skeleton laid out, you know, not long after discovery, not not in the field, but in the lab. There's other parts took a long time, like a skull. I mean, that took more than ten years to put that together. Yeah. So the skull came in. Several fragments, obviously.

[01:02:30.070]

Yeah. So it looks some of the pictures were published of it, but like when it came out of ground, I think it had been like kind of like pounded down just by the force of ology. So as you know, like, like you took a piledriver, you know, and, you know, pounded the thing down and so. You know, that was quite fragmentary and so they had to reconstruct it was reconstructed by a scientist from Japan named against the Jamie put an image of it up on the screen right now.

[01:03:02.870]

We're taking a look at it right now. It's fascinating. So it shows like basically like half of it was intact or somewhere in the neighborhood of 40 percent of it up at the top of the left side of the head.

[01:03:16.240]

Yeah, that's amazing. Yeah.

[01:03:17.990]

I mean, it's really cool what you could do. So this guy, you reconstruct that his name is Gensen, where he's from the University of Tokyo Museum. And he's he's very exacting scientist. I haven't met him personally, but I've met a lot of people who work with him and he's very unassuming guy. But he kind of leaves all of his colleagues in awe because of his acumen. Anyway, he reconstructed that with his team. This is incredible.

[01:03:44.450]

So it's it's actually it's sort it the wrong way. I'm viewing the left side and it's actually the right side that was reconstructed. But the left side is the actual skull itself, which is a bunch of pieces. But the the teeth are remarkably intact. And that was the other part that was fascinating to me was that it doesn't have canines like a chimp. It has them more like a human being.

[01:04:06.860]

Yeah, actually, that was one of the big well, no, no one. That's one of the indicators, the strong indicators that tells us that this is something in somewhere in the human lineage, number one, because we have, as you mentioned, canines that are different than most other apes. You know, the other most other primates have these interlocking canines, you know, I mean, like chimps and gorillas, our two closest cousins, both to do big fangs.

[01:04:35.660]

Right. And they sharpen themselves, you know, like rubbing against the premo, the canine rubs against the premolar. So it's kind of like always keeping your knife sharp, right? Right. But humans are unique because we have these things that are not these guys like fangs. You know, they are diamond shaped zaharakis canines are certainly bigger than yours or mine or later members of the human family. But it shows that this what they call canine reduction, was already well underway by the time already lived.

[01:05:09.770]

And actually, this is an important point because the teeth, you know, the canines in particular, are kind of a diagnostic feature of these early members of the human family, because when you get back in

time, the things that the clues that that tell you that this is a member of the human family, they become much more subtle because these creatures get more and more apelike and less and less humanlike as you go back in time. So canines are a sort of reliable way or let's say a reliable indicator to tell you that you're you're looking at some.

[01:05:48.010]

Bit of early humanity here, does it tell us anything about Arty's diet because or is it a defensive thing? Because like when we're looking at gorillas, gorillas are they have canines, but they're vegetarians and the signs are for defense. Right? Right. Right.

[01:06:04.210]

I mean, this is interesting. So if you're a gorilla, I mean, you know, they spend a lot of time eating like leaves and stuff. And, you know, you don't eat these big canines to take out a leaf. So this is, you know, the sort of predominant interpretation is that this is a sign of interspecies aggression because, you know, with gorillas, for example, they they they their mating structure is that there is like a big alpha male called the silverback.

[01:06:37.930]

And he kind of lords over this harem of emails and tends to sire the kids, you know, and and, you know, these bachelor males that will sometimes challenge alpha male and try to take them out so they don't. So natural selection would, for the case of gorillas, would favor these big sharp canines. And then these big brute bodies, like male gorillas are quite big in some cases, like twice as big as this, the females.

[01:07:07.880]

And this is all interpreted as like inter interspecies aggression for mating now. Humans are interesting because we don't have these big canines. And actually this factors into the story because one of the main investigator is an evolutionary theorist who interpreted already was a fellow named Owen Lovejoy, and he's from Kent State University in the United States. And he has a theory that what you're looking at with canine reduction is a social revolution, that this is monogamy happening basically that that instead of, you know, some gorilla like mating structure where you have like this, you know, the gorilla instead of like the harem or a mating structure like chimps or bonobos, which are more promiscuous, but certainly not men are starting to have an argument.

[01:08:03.430]

But he thinks that that the canine reduction we see in the human lineage is because there was a pair bonding and that the reduction in canines is a sign of reduced aggression in our species. And this was, he believes, like one of the early human. Major adaptations that sent us on our own way.

[01:08:29.310]

That's got to be a very controversial theory, isn't it, because there's a lot of paleontologists that think that even with human beings, there's a lot of people that think that human beings weren't really monogamous until they figured out whose kids there were. Right.

[01:08:45.690]

Well, it's yeah, it's hugely controversial for a whole number of reasons. But one thing I should clarify is what what the biologists mean about monogamy. So it's wrong to kind of understand that and kind of like our modern moralistic way. This is not like the American Family Council talking here about monogamy. This is an pornography in the way that like so there's a lot of examples of creatures that do have that are monogamous, like birds, like mom and dad in the nest or, you know, I think coyotes are I mean, those are Gibbons is another another primate that are monogamous.

[01:09:21.420]

So this is not unusual in the world of of biology. Yeah.

[01:09:27.600]

So so anyway, so sometimes people say, oh, you know, that's you know, it's you know, that's kind of

like bringing into this moralistic it's not that it is it is a legitimate way to describe it made strategy that exists in many places in nature.

[01:09:47.130]

OK, so, yeah, there's and there's other theories that have ascribed human sexuality to something, you know, into something more like a chimp, you know, that it's probably promiscuous. And, you know, especially I mean, as the book mentions, that the this whole model of a chimp like ancestor has been prevalent in anthropology for for four decades. And, you know, and one subcategory there is mating strategy.

[01:10:20.070]

And, you know, there's you know, I mean, if everyone abuser's out read about just sort of theories about human mating strategies. I mean, there's all kinds of of of ways that people have explained. There are peculiarities and our. Yeah. Our sexuality and all that stuff.

[01:10:39.840]

Now we're we're looking at already we're talking about an animal that predates weapons, correct?

[01:10:45.870]

Yeah. As far as we know. So the first stone tools do not appear until well, certainly by around two and a half, two point six million years ago, the stone tools, there's some things that have been found in Kenya that are older, that are like three point two or three point three. That that one is a little controversial. So we'll see how that all shakes out. But anyway, but in either case, it's at least the stone tools are way after already, way after Lucy.

[01:11:18.030]

So it's possible to use weapons sticks and things along those lines. Yeah. So that's that's the part we may never know, because if you see something like a stick that biodegrades, then, you know, who knows or throwing a rock. Right. You know, you could. You could. You could. How do we know that the idea would be that they're not hunting with weapons? Most likely, no.

[01:11:46.110]

And actually, surprisingly, weapons are. Arrive pretty late and. I put the figures in the book and I don't want to say it now because I don't remember what it is offhand, but the early tools are things like choppers and then hand axes.

[01:12:03.810]

But those are tools for. Processing food, you know, they're not I mean, the weapons come late, it's kind of interesting that you notice the things that are identifiable weapons are like Spears atlatl.

[01:12:18.330]

Yeah. Or like or particularly like lisick things, you know, that leave to leave a you know that they're stone that are preserved. Those those those come pretty late. Interesting question about just why weapons were developed and why, why we started using them.

[01:12:36.800]

So do we know, do we have speculation as to what Arties diet was like was already a herbivore. Yes, so they can they can make some determinations based on a couple of lines of evidence. One is the Microsoft microscopic striations in the teeth, because when you eat something, you're whatever you eat leaves kind of like a scratches on the surface of the dental material so they can make some inferences there. Another one is using it gets kind of complicated, but they can make some inferences about what kind of plant foods they ate based on.

[01:13:19.420]

There's there's just two kinds of plants like C three or C4. And this refers to two different forms of photosynthesis. C for plants tend to be more like open sunny sort of things. C, three plants tend to be more shady things. I mean, this is not an absolute difference, but it's important anyway. So they can

make some inferences there that Ari's diet was mostly like c three things, which tends to be things that are in more kind of wooded areas, not the open.

[01:13:54.010]

You know, through of the grasslands and that sort of thing, I mean, it did have some see for this diet, but it's mostly C3, but so mostly vegetables.

[01:14:03.130]

Is this what's believed or is it inferred that it's omnivorous? Yeah, they think it's probably omnivorous.

[01:14:09.590]

I've heard some speculation that maybe if they are maybe eating some bugs and stuff like that. I mean, the interesting thing is, like, you can you can get to see three or four signature from eating the plant, which directly. But you can also get it if you eat another animal that's been eating one of those two things. So this kind of moves up through the food chain.

[01:14:29.860]

Is there speculation as to what natural selection benefit there would be for it to stand up? Look for it to be upright, yeah, so that this actually gets back to that monogamy theory I was telling you about, which is admittedly quite controversial, but so what Lovejoy theorizes, and this was presented when with the the announcement, the series of papers, when Artie was finally revealed to the world in 2009, Owen's theory is that monogamy is a mating strategy and and that basically.

[01:15:10.750]

Just go back to your question, so your instant like what they expect, like speculating or answering the question, why? Why is this creature erect? Is that what you're OK? Yeah. So Owen's interesting take on the whole question. So this is, of course, you know, why did humans stand upright as the million dollar question of human origins? I mean, Darwin tried to answer know and many, many people trying to answer. And there's more serious than you can shake a stick at.

[01:15:40.640]

I mean, Darwin said, OK, enough people stood up because they were using tools, you know, to free the hands. And other people have said, no, it's because they were trying to minimize sun exposure because they're standing up in a hot place. You're getting less of than if you're you know that. I mean, people have said it's phallic display, but I mean, all kinds of stuff, you know, picking fruit, take over tall grass.

[01:16:03.170]

I mean, you name it. Right. But the interesting thing is that most of these theories look for like a direct benefit for standing up to some direct, you know, evolutionary benefit. Owen's theory is a little different because he doesn't think. There is a direct benefit, he thinks it's sort of a secondary thing. So just to tell you a little bit more about him, he's kind of an interesting guy, has an interesting history, but he in earlier in his career, he specialized in biomechanics.

[01:16:34.310]

And actually he was the main. Biomechanical analyst on the Lucy team and 20 years before Arty came along anyway, his early career, he worked with scientists who designed artificial joints. And so he grew up, you know, grew up as a scientist with a pretty keen awareness of how biomechanics worked and also what could go wrong with the skeleton. And Owen would tell you that like that bipedality is a really stupid thing to do from an evolutionary perspective because it makes you slow.

[01:17:13.290]

I mean, you know, it's slow. And, you know, if you want to be a fast runner, you probably should stay on all fours, you know? You know, it's an invitation for disaster, you know, because, you know, I mean, why do we have artificial choices? Because people blow out these or blow out hips and standing upright also causes of these vulnerabilities in your back, you know, for because of the way the spine is kind of contorted in with humans.

[01:17:40.380]

So why on earth would this species do this stupid thing, you know, and why are there eight billion of us here now, you know?

[01:17:48.560]

You know, if we did the stupid thing to our own theory is that it was actually a a a sacrifice in locomotion. But what it did do is it gave us this big payoff in reproduction.

[01:18:02.970]

So he thinks standing erect was to free the hands that within the context of these monogamous relationships, I was telling you before, so that the males, you know, guys like you and me became provisionals. So they basically became the males became partners in the child rearing and this increased survivorship. So interesting things like other apes are not very not very involved as they become. Did I call them deadbeat dads? You know, they were OK. And so but humans are and usually we have these monogamous relationships.

[01:18:38.770]

So anyway, oh, its theory is that the bipedality was just a means to an end. It allowed the males to provision and that the females would be able to spend more time nurturing children. And this was a demographic revolution. And so and then the reduction in canines as part of that theory and that this was like a reduction in aggression. So we're not fighting over who's the alpha male. We're in these monogamous pairs within a group of primates.

[01:19:13.140]

And that explains why, you know, bipedality appears pretty early in human evolution and why they reduce canines also appears. So, anyway, I'm sorry, this is I integrated. It's it's quite controversial. And, you know, it's without finding things that even if you were able to find, you know, skeletons. Right. You know, all of the Ngati, it would still be controversial. But anyway, that's that's the theory.

[01:19:37.020]

Is there a compelling competing theory? There are lots of competing theories, probably too many to mention here, but I mentioned some standing ups, the fireworks display, that's pretty much about that one anymore.

[01:19:54.610]

But I want to introduce shortly after the sexual revolution that appeared at. That's hilarious, so we don't know basically we don't know and that I mean, some of the stuff I mean, to be honest, I mean, from my point of view, it is may ultimately be unknowable.

[01:20:17.040]

You know, does the fact that already was basically intact, despite being around predators and scavengers and all these different things and the fact that already was walking on hind legs, despite the fact that walking on hind legs makes you more vulnerable, does does this signify that it was in some sort of a protected environment where it wasn't at such risk of predation?

[01:20:45.090]

Well, remember, these things can go, you know, in terms of escaping predators, trees. You could. Yeah, I mean, it can go up a tree. And I'm not, you know, between you and me, I don't have a disposable toe. But if I were out on, you know, out in some dangerous place in Africa and the sun is going down and, you know, the hyenas were coming out, I would be probably heading up a tree to what I would recommend you do the same.

[01:21:08.070]

Yeah, that's you. Of course, you still have to worry about the big cats. But anyway, so it did have the ability to to go into the trees. But how did these things survive? That's an interesting question.

[01:21:20.370]

You know, I mean, there are other animals that, you know, monkeys that live there that have the same you know, the same challenge today. But actually, I'll tell you just a little interesting aside here and sort of the field work part of the detective story. So the fact that they found the skeleton that was remarkably complete was all the more miraculous because of the condition of all the other stuff they were finding until that point. So, Tim, why the main paleoanthropologist on the team, he you know, he's he's very experienced and has been working in Africa for a long time.

[01:21:54.720]

And when he looked at the fossil assemblage, the word that he used, it was ravaged and this was visible to him, you know, from you know, from their first days on the site because they're finding all these fragments of things that have really been chewed apart. And instead of finding teeth, they're finding pieces of teeth and bones that are chewed to splinters.

[01:22:18.450]

In some cases, they actually found things that are etched by digestive acid.

[01:22:25.410]

Wow. So basically what that means is that it was eaten by some carnivore pass through the digestive tract and shit out left in some pile, know that then degrades, but the tooth is still there. But they can see they like the surface has this kind of altered texture to it that tells these people that, yeah, that's digestive acid at work on the Thomas thing. So, you know, because that was like the signature of all this fossil samples that they were seeing.

[01:22:57.300]

You know, if you're just getting like teeth in, like, you know, things that have been passed through detector track record and splinters, you know, you're not going to you're not hoping for a skeleton. You're not going to find a skeleton here. But somehow by you know, just by great luck, they did that. For some reason, this carcass wound up on the ground was not, you know, now demolished by all these predators and had a chance to fossilized.

[01:23:25.680]

So that that is just remarkably good fortune.

[01:23:30.060]

Was that one of the reasons why it was treated with so much skepticism? Because, well, I mean, no one doubts the existence of the skeleton, at least no one like we should do since.

[01:23:45.560]

Well, they doubt I'm sorry, but there's so many things that are so specific, like the carbon dating of the the upper and lower layers. The fact that you have so many bones, the fact that they're not repeating the fact that it's clearly some sort of a primate and that you put all the stuff together and reconstruct the skull.

[01:24:05.570]

And I mean, what is the controversy, the controversy? Well, there's a couple of things. I mean, you could talk for a long time about this, but I guess one point of controversy is, is it indeed a member of the human family? And, you know, as I said before, you get. Further back in time, and the things that tell you it's a member of the human family become more subtle, like these canine teeth, for example, the bipedality is another one.

[01:24:38.260]

But, you know, there's a great deal of skepticism in the field about people who I talked to who tell you who doubt that any of these early species that have been identified as hominids or ineffably members of the human family, they doubt that any of them really are or that's just unknowable. So this kind of like this, this is almost in some people this this almost like nihilistic view that you can really ever know that that's one.

[01:25:12.730]

But I but I but I do think that as the the the validation of already as a member of the human family, the human lineage is I think there is a growing number of people who are accepting it. And there's some people with a lot of outside people who have basically endorsed. What the research team has had said, you know, whether it's a direct ancestor or like one of your extinct alchol, whether it maybe is not your grandfather, maybe it's like your and I'll go, you know, that we may never know that, but.

[01:25:52.960]

So anyway, that's one point of controversy. Is it is it in our human lineage? Another one is the arguments that the discovery team has made about what it reveals about the last common ancestor of humans and apes. And like, for example, we were talking before about. About this model of a chimp like common ancestor of humans and and African apes and the team which spent 15 years studying this thing before they announced it to the world, they. I believe and strenuously argued that this skeleton shows you that the common ancestor of humans and the African apes was in fact not like a chimp, not nowhere near as chimp like as everyone thought, because there's no vestige of knuckle walking.

[01:26:49.390]

I mean, there's a whole bunch of things that gets into sort of, I guess, some anatomical, very esoteric anatomical stuff that if you read the book because it gets into to do all that. But so anyway, so that's part of the controversy. So so there is a sort of subset of the critics who have come to accept already as indeed a member of the human family. So they say, yeah, they're right. They placed it correctly in the in the human family tree, but they are not yet convinced that it it that it falsifies this idea of a chimp like ancestor.

[01:27:30.700]

Their argument would be, well, sure. In the ways that are already may have still descended from this chimp like ancestor. But, you know, it evolved these new adaptations that sort of erased those from its anatomy. So that's one element of controversy. I mean, there's there's the great thing about the skeleton, actually, because it because it is so complete and because it. It was released with this huge package, obviously a whole series of paper about the hand, the foot and the pelvis and the skull, there was a lot of fodder there for debate and disagreement.

[01:28:13.190]

And that's what's been happening for the last 10 years now when they talk about a chimp ancestor, a chimp like an ancestor. Is this just because chimps are around?

[01:28:24.260]

We know genetically that we're at least closely related to chimps. So it's just presumed. And is it possible that there was that all the way back, like from the beginning, that our ancestors were bipedal? Well, I don't think many people would say, well, ancestors of the human lineage, right.

[01:28:46.950]

When you look at already already is the oldest known full skeleton that we have of our ancestors. If we go back, if we somehow or another found something that was 12 million years old. What if that thing was bipedal? OK, well, OK.

[01:29:01.800]

So one problem is that the split between humans and chimps, it's probably not that old. So if you're a 12 million, you're probably somewhere before the huge Jim split. I mean, there's a lot of like squished time in this. So, you know, actually, I think actually, as it happens, I think some of the the estimates that are kind of furthest out are, in fact, 12 million. But, you know, somewhere between six and 12 million where where humans and chimps split, it's kind of what it is.

[01:29:27.930]

But that I do think that once upon a time there was a split between humans and chimps. So if you go



back far enough, you'll find a chimp or something like a chimp.

[01:29:37.200]

Well, you'll find an ancestor of it. And the big, big question, as it does it look like a modern chimp, right. Or does it look like something you've never seen before? Or does it look like something that's sort of a more primitive version of *Ardipithecus*? I mean, this is the great unknown. I mean, this is like, of course, another quest, you know, for it for science.

[01:29:58.390]

So the discovery of the *Ardipithecus* was really a monkey wrench into this whole idea of what we.

[01:30:04.140]

Yeah, yeah. So that that was what what was one of the things that was quite controversial about it. And, you know, we haven't talked much about the discovery team that put this together, but they are you know, they're they're very good scholars. They're very good at what they do. But they're also quite provocative and which would be, of course, made them great material. But, you know, they don't present the skeleton and say, you know, here's a physical description of the skeleton.

[01:30:39.660]

Go ahead and make up your own minds. They presented it and it said, here is a skeleton and this is why you're wrong and you're wrong and you're on your own. So there it was. It was a provocative it was a provocative series of papers with some stunning revelations. But a lot of some people in the research community did not take kindly to the mode of presentation. But let's say because, you know, at one point, you know, there's a there's this huge research community that study chimpanzees, you know, either it studied them in the field doing observational studies or tied them in the lab to try to find clues about the origin of human locomotion or anything.

[01:31:23.670]

I mean, chimps are kind of became this all purpose model. And so when the team came along and told them they're all kind of barking up the wrong tree, there was there was a lot of consternation about that.

[01:31:36.860]

It's so fascinating to me that there was a time where this thing didn't exist.

[01:31:42.090]

We didn't know it existed and that it was only 1994 and that our understanding of where the human species came from relies on these perfect conditions to happen and then someone to come across this thing at just the right time and that this person has to be a skilled researcher that knows how to handle it and put like our understanding of where we came from as much as we know about, you know, the Internet and space travel, the galaxy.

[01:32:14.670]

It's so crazy to me that we need to piece together our understanding of the history of the human species based on these, like, perfect scenarios.

[01:32:26.280]

Yeah, well, that there's a reason why these skeletons are so rare. I mean, they're hard to find. I mean, you need the right geological conditions. I mean, let's just start with where you find these things there. We're we're pretty certain that early human origins was in Africa. OK, I mean, that's pretty clear at this point. And humans were humans were confined to Africa, as far as we know, until about two million years ago.

[01:32:56.040]

And some of these primitive species start to go out. So, you know, the early stories in Africa. Now, you often hear people say, well, the Great Rift Valley is the cradle of humanity or South Africa is the cradle of humanity or the Eden or whatever, and. These places were not necessarily the only places that

human ancestors dwell. The reason we know about these things is just because these are the countries where the geological conditions favor the preservation of fossils.

[01:33:26.920]

So, you know, so and so. And so there's this whole mythology. You know, it's sort of about like this place of that place is like the Eden of humanity or whatever. I mean, a lot of that is just self promotion, tourist board stuff. Sometimes scientists self promoting again, you know, they should what they should be saying is we're not the. They were the the birthplace of humanity where they were the graveyard, but that doesn't have the same PR appeal where the graveyard.

[01:33:55.230]

But but if you look at where fossils are found, like look at a map of Africa, it's a tiny portion of the African continent is has a fossil record. And there's like Ethiopia we've talked about, there's Kenya, there's South Africa has the different geological conditions there that explain, you know, but South Africa, things tend to be preserved in caves, tend to be a little not quite as old as the oldest things from the Rift Valley. But there are a few scattered bits of things elsewhere, like in Chad and some other countries.

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But most of Africa is totally unknown, the fossil record. And so there could be a large part of the human story of just evolutionary biology in general that are just just gone, or at least not yet discovered.

[01:34:47.760]

So we are windows into the past are like these little pinholes, you know, and the places where you find those things, like in this fight, oppression of Ethiopia that I'm talking about are pretty rare. So you need to have those rare places. And then you also need to have this skill. And this is this is not an easy I mean, I've spent a couple of going out to the field with this particular group a couple of times. And this is not easy work to do at all.

[01:35:17.520]

It's not easy to find the stuff, to have the eyes, to see it and then to spot it on the ground. And it's also not easy to do just logistically. I mean, right now, for example, I mean, the work in Ethiopia has kind of come to a standstill because their country is, again having, you know, some political turmoil. There's fear that that might be heading into civil war. And so that means it's to you know, a lot of these teams are probably reluctant to go to the field because, you know, because of the the danger.

[01:35:53.010]

And so we're kind of back to a situation like what I was describing earlier, where it's just too dicey to go into the into the field. So anyway, so so why are there so it gets back to question. Why are there so few skeletons? Well, the places where you find it are rare. The logistical challenges are severe. And also the skill level that it takes to find something, even if it does exist, is is that takes a it takes a lot of skill.

[01:36:25.990]

I was quite impressed when I went there to see how people could find things, because I know people would find things that I, as a layperson walking just could not see.

[01:36:36.660]

You know, it just makes you wonder how much we've missed and how much people have stumbled upon where they didn't have that skill or they didn't know what they were looking out of. They weren't trained, they weren't educated, and they just found some piece of something that probably could have changed the way we look at our history. Oh, yeah, yeah, yeah.

[01:36:53.760]

No, it's just it's just like. Yeah, amazing. Yeah. I mean there could be, you know, I mean there's, I mean somewhere under the surface in Africa, there's all kinds of skeletons and fossils that could answer all

kinds of questions for us.

[01:37:06.750]

But we can't if it is if it's just buried that far underneath the surface and you know, some you know, some surveyor comes along and walks over it, you know, there's nothing eroding to the surface yet.

[01:37:17.280]

You know, it's it's invisible. Right. And so much space. There are something I wrote. Yeah. Yeah. And so it's it's it's. Yeah. You only know you know what you can find.

[01:37:32.820]

Now, since the time of the initial discovery in nineteen ninety four, there's been a lot of different versions of the human being that have also been discovered. How many different humans have they discovered now I know it was what it called. Dennis Sylvan's is the name of them, is that right. Yeah.

[01:37:53.760]

So that that is some fragments of bone that are from a cave up in Siberia. And actually that that was kind of interesting because they were able to get some ancient DNA out of it. So stuff like Artie and Lucy are too old to get DNA out of all the biological biological material is gone. But in some of the newer stuff. Yeah. Or younger stuff, they're the they can get what they call ancient DNA out of them. So, I mean, just as an example that about ten years ago some researchers were able to extract some DNA from some old Neanderthal bones.

[01:38:39.660]

And there's been this interesting question for decades about whether Neanderthals, Neanderthals, our course of the. Famous, you know, fossil species known from from Europe and from Asia, and for a long time there had been this debate about whether Neanderthals evolved into modern humans. That's one school of thought that that they did. And then another school who thought they called the country out of out of Africa, group who believe that another species of Homo sapiens thus arose in Africa and then moved into Europe and Asia and displaced, you know, the Neanderthals and basically either outcompeted them or killed them or whatever.

[01:39:24.480]

Somehow we showed up, they disappeared. And so, you know, and in some of the early DNA studies, kind of supported that out of Africa deal that that sort of displacement thing. But anyway, about 10 years ago, the people that study ancient DNA were able to start extracting ancient DNA from some Neanderthal bones that had not completely fossilized. So there was like a little bit of biological material there where they could start to knit together, you know, these ancient genomes.

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And that science has advanced a lot. I mean, it's astounding what what they're doing now. And I don't I shouldn't say too much about it, because that's you know, that's not my focus. So, so many hard questions about that. But but anyway, so one of the things that that they have discovered was that, in fact, there was some interbreeding between, you know, these modern Homo sapiens who came out of Africa and went to Europe and Asia.

[01:40:22.620]

And there's some portions of the Neanderthal genome that are still alive or still exist in the genomes of people who are of what they call non African descent. So basically, the people who left Africa, you know, interbred at least to a limited degree with Neanderthals. And so that a little Neanderthal in a lot of us.

[01:40:45.850]

So that that that's like a huge, huge revelation. And then there's been many other revelations with ancient DNA mean this dinosaur bones is another one. So it appears that anyway, you asked about all these ancient species and I don't know how many there are now. There's probably a couple of dozen members, really.

[01:41:06.240]

A couple does he really does that many.

[01:41:08.380]

Yeah, well, that her name I mean, and this is this is a controversial thing, too, because it's like. You get if you are a scientist, you find, let's say, a fossil, and if you name it something new, there's great and there's great intent to name something new because, you know, new species headlines, you know, and it's interesting. Let's say you find another something that is a species that's already known. You know, maybe it's just like a variation of that or a slightly older, slightly younger or slightly like, you know, physically different.

[01:41:46.780]

I mean, you know, you know, ho hum, who cares about that stuff.

[01:41:51.640]

Just doesn't get the same amount of attention. So so there is a professional bias, I think, toward naming new species. Now, some of this stuff, I mean. There's no question it's a new species, you know. You know, I mean, *Ardipithecus* is one. There's many other things that have been discovered. But, you know, I think the thing that's difficult here is that the whole idea of of species is people say, oh, something is a species, but that what does that mean?

[01:42:22.510]

And in modern humans, for all we like to talk about our diversity or actually at least genetically pretty homogenous compared to other primates. And so I think in the ancient past, there's probably there's probably a lot of variation, at least in some species that's greater than what we see in ourselves now. So. And in any way and then so that's that's part of the problem that creates this debate about whether something is a new species or just another example of something that we already know about when the other thing is that.

[01:42:59.890]

Yeah, yeah, go ahead.

[01:43:00.610]

I was going see that little guy that they found on the island of Flores, *Homo floresiensis*. Is that what you say? Yeah.

[01:43:08.290]

Yeah. This little dwarf like thing. Yeah. Was that considered a human.

[01:43:12.890]

Yeah, well, that's a big that's, again, another point of debate, I mean, everyone I haven't heard anyone doubt that it's a member of the human family, but it's really weird because it has like this. Yeah, it's kind of. Yeah, people there's a phenomenon called island dwarfism, where sometimes things like that, like like let's say it goes island as sea levels change, things get smaller or something.

[01:43:36.610]

Is that big like reptiles.

[01:43:38.840]

Yeah. Are bigger on islands. Right. Yeah. Like Komodo dragons or whatever.

[01:43:42.510]

But but in this case, you know, this thing got small and so there's a big debate about what it evolved from. And, you know, are there more of these things?

[01:43:53.370]

I mean, that's that's kind of as recently as how I mean, it wasn't that long ago, right? Wasn't it like 15000 years ago or something crazy?

[01:44:01.980]

I don't remember. But yeah, it is. It is it is recent. I don't remember the exact number, but it's not kind of remarkable.

[01:44:08.250]

Frequently recent. Yeah. Yeah. And certainly certainly the life that the lifetime of our species. Yeah.

[01:44:16.560]

Well it's something where cryptozoology, which is always a weird thing. Right. But there's people that believe I think it's called orang pandak. There's a sort of legendary animal in the jungle of Vietnam that is very much like this Homo floresiensis, a very small person, very small, hairy little person that lives in the I think it's Vietnam, I'm pretty sure. And they they think now that, well, hey, they might be really talking about something that did exist thousands of years ago.

[01:44:51.760]

What is this, a fossil species? I'm not a legend.

[01:44:54.730]

I think it's probably a lot of it is horseshit, but it's when when they found this Homo floresiensis, I think a lot of the people that were proponents of this orang pandak thing, they were like, well, hey, that's what we're talking about. Like, this is this is the actual creature, a little small, hairy person.

[01:45:15.790]

OK, is this like the Bigfoot of Vietnam kind of thing? But it's a little foot. It's a little tiny. Little bit. Yeah. Yeah.

[01:45:22.600]

But the speculation is, you know, that this thing used to be they just thought it was just one of those crazy legends. But now they think, hey, you know, they might have been talking about something that existed in human history like this Homo floresiensis did.

[01:45:38.530]

Yeah. Yeah. Well, maybe maybe it's a mutant from, I don't know, Agent Orange or something that I think they're talking.

[01:45:45.100]

I think it's a pretty old story. I it's predates Vietnam. Yeah.

[01:45:49.810]

Well, anyway, just just a final note on the species. Just a little food for thought. So, you know, people bandy around this term species like people request in the category.

[01:45:58.990]

And so the weird thing about species is we know, OK, so let's make a lot of definitions in biology.

[01:46:09.520]

One of them is the classic definition, a biological species definition.

[01:46:14.260]

And this dates from the 1940s, a guy named Ernst Baros, a prominent biologist, a very important historical figure. Anyway, he defined the species as. The group, the population that could breed with each other. OK, so you can make babies, you have the opportunity to make babies, you're a species. So it's this big inclusive thing. Right. And but, of course, you know, with a lot of the fossil species, you know, we don't know who could breed with who.

[01:46:43.680]

We just know what they look like. Right. What's physically different. And so, you know, for a long time, I mean, so take humans and Neanderthals has been this big debate, you know, what's the relation between them? Did they interbreed? And so a Neanderthal is something that looks sufficiently different from Homo sapiens that it's put in a different category so that one of the big wows of ancient DNA is you have two things that look physically different enough to be undone, categorize a different species.

[01:47:19.470]

But now the genetics tell us that they they they were able to they they did interbreed. So now there's like this big problem with like, what is a species like what do you you know, and I don't think biology has has these I mean, I'm sure others have different opinions about this and some avoid the question altogether. But that was one thing I wrestled with in this book. You know, it's like people that we have we're using like language to describe biology.

[01:47:48.900]

But those are two different mediums. And sometimes the biology defies the categories of language and the categories of pacification. And this is this is like a constant theme through well, at least in human origins, science is that, you know, would people build these categories and these narratives to construct to to sort of hold the facts of what little we know. But then, you know, the body of knowledge expands and suddenly, you know, you're old categories are leaking all over the place.

[01:48:18.240]

Right.

[01:48:18.570]

And that's that's therein lies the limitations of calling these things humans.

[01:48:24.630]

What you can't humans, you could call them species. I don't I don't know the the answer to to that, except that we should be clearly you need language to have, you know, for precision, you know, for science. I mean that's absolutely necessary. But it can't be too dogmatic about your categories because nature is not dogmatic. Nature is far more fluid and dynamic than that.

[01:48:57.540]

And we don't have a complete picture of the exact process from ancient ape to human being in the current form. We don't have a know.

[01:49:08.460]

We have a series of snapshots. Yeah, snapshots that we have been lucky enough to capture. And Ardipithecus is one, you know, Lucy was one Homo erectus, you know, Homo nullity. You know, this this Denisova, that little florans thing. I mean, those are all these snapshots. But, you know, it's not like we have anything. Like a complete picture, I mean, you can certainly see some trends, some through lines from the more primitive things to a lot of things, you know, the more advanced bipeds, the limb proportions, changing the brain.

[01:49:47.600]

Of course, growing. That's a huge storyline in human evolution. But there are a lot of yeah, all we have these snapshots that we're lucky enough to to get because of just the happenstance of geology and discovery. One of the thing about species that I found quite interesting in this whole thing. So you've probably heard about like the Tree of Life and the human family tree. And, you know, and I mean, this is an old metaphore and and but but like, the tree is kind of having a little trouble right now.

[01:50:26.640]

Not not that we should get rid of it, but it's so when you have this idea of a tree where everything is splitting into dead ends, you know, it it leaves these questions what people say, like humans and

Neanderthal, which one led to modern humans. And it becomes like this either or thing. Right. So when you have all these species that look different, I'm trying to center my hand in the frame here. Here we go.

[01:50:48.950]

That I think it is sometimes led science into false choices where we say, OK, well, you know, the ancestor has to either be this one or that one because, look, there's a split here, you know, and they went their separate ways because that's kind of what the tree metaphor depicts. Right. But actually, what ancient DNA is showing you is that things that are actually looking different are actually able you're getting some crossover there.

[01:51:14.270]

And so now your tree is looking a lot of a lot less like a tree. It's looking more like a web or a lattice sometimes. I mean, people are using these searching with these other metaphors to kind of convey the complexity of what biology is showing. But it's you know, it's a lot more complex than the simple trees of the species. And and anyway, I just want to insert that little word of caution about the tree. I mean, the tree is a really powerful metaphor for the diversity of life.

[01:51:45.530]

But when creatures that have recently split, you know, those branches don't necessarily remain isolated from each other, they can have some crossover in some interbreeding or hybridization, whatever you want to call it, that makes it kind of hard to give you. Nice, neat through lines from right, this issues to that speech. This is what I was going to get to with all these various species of human or thing, all different types of humans that we know of now since 1994.

[01:52:13.860]

Is it possible that there were that there were multiple different types of creatures like Ardipithecus? Like there's multiple different types of what we call a human being, and that they're simultaneously evolving in these different parts of the world in a similar timeline and creating the Denisovich genes and the Homo floresiensis and Homo sapiens and Neanderthals.

[01:52:43.860]

And it's all just kind of happening at the same time, but not along the exact same timeline with the exact same ancestor.

[01:52:54.420]

OK, well, OK, so let's take Ardipithecus, because at that point, Ardipithecus is only known at this point as far as as far as I know, from Ethiopia. And one is the middle awash, the place where he came from that I was describing earlier. And then they've also found some other Ardipithecus at a place called Goda, which is basically another project area that's adjacent to the middle awash. They're basically neighbors. So, you know, this is in this one part of Ethiopia.

[01:53:23.480]

But so how widespread was Ardipithecus in Africa? How you did it range through the entire continent or was it a regional. Species, I don't I guess the answer is is unknown and, you know, for the reasons I had mentioned earlier, that there's just so little of Africa that that gives you the windows into the past. But anyway, so but there is another Ardipithecus skeleton that's been in the last couple of years from from Kona. And that one is interesting.

[01:53:58.120]

So it is it has to Ardipithecus the original already had this opposable toe and walked when it was upright. It apparently walked with the toe kind of splayed off to the side, you know, kind of like an outrigger, you know, at this this goanna creature, they have something that they're calling a skeleton. I haven't actually seen it. I don't think it's actually been they published. It revealed its existence, but I haven't seen a picture of it, and I don't think they revealed that, but I was talking to the scientists, there is a fellow named Scott Simpson from Case Western Reserve University, and he's a very competent paleoanthropologist.

[01:54:47.660]

And he says that their creature has this toe. It's like Ardi. I mean, you know, there's no doubt they belong to the same species.

[01:54:54.120]

But this one has its toe more more in line with the foot. So it's more kind of human like. So, you know, it's still grasping. It's about the same age as already. So around it's like four point four, four point five. So anyway, so so the point here is that there is, you know, just as there is in modern species like baboons or whatever, there's different populations or subspecies that sometimes develop different adaptations for whatever reason, and they're quite similar.

[01:55:31.140]

But you get these variations, you know, for whatever reason of a local adaptation so far apart.

[01:55:42.360]

Are they from the original already? It's a I'm not sure it's not. It's like maybe 50 miles or with it or within that. It's it's it's just down the river that runs through there was called the river. And gonad is the trajectory that's immediately downstream of the middle outlash where Ardi was found.

[01:56:03.340]

Is it so speculation that they were living in the same specific type of environment? Do they know that?

[01:56:11.360]

Yeah, well, there's some difference in environmental interpretation, but between the two. But there's there's similar.

[01:56:19.680]

The reason why I ask the reason why I ask, have you ever seen images of indigenous people in the Amazon that walk around barefoot and their feet literally start to look like hands? They splay out in a very bizarre way.

[01:56:33.870]

I haven't seen those particular pictures, but I do know that people that walk around unshowered, you know, so others without shoes tend to develop its toes that are more divergent, not not opposable like a primate, but for whatever reason about being a gunshot. It just gives you you know, you look at the toe and it's like it's it's like visibly separated. Yes.

[01:56:56.430]

Are looking for the picture of it right now on the screen. Yeah, yeah. Yeah.

[01:56:59.940]

And it's very strange where it's it's almost like they're gripping the ground with their toes and the toes are very thick and strong because they're they're constantly walking around barefoot and they use their toes in the toe muscles in a way that we don't use them anymore because we're essentially we're in casts with our shoes.

[01:57:18.850]

Yes. Yeah.

[01:57:19.950]

Well, you know what's really interesting about me and we look at like modern adaptation adaptations of modern humans and all these different pockets of the world or a particular way look into all these ancient species, which are even weirder is really there's nothing about our form that's like an end destination. There's nothing about our form that is like we have arrived at this was, you know, we're primates. We're going the whole time. It's you know, if you want to talk about who are the weird ones, it's not all these other things.



[01:57:50.910]

It's like the modern humans are weird. We've got these big heads. We got this funny way of walking.

[01:57:54.660]

We're bald, you know, and we vary so much. Yeah. And we were very and then, you know, there's all these kind of myths about why I mean, God, there's so many myths in the field of human origins. But one of them is you probably heard about like the divine proportions or the golden ratio that humans were constructed, you know, according to these ratios of the so-called golden ratio. I mean, this is just storytelling, you know, I mean, there's nothing about our proportions or proportions are just a function of adaptation.

[01:58:26.340]

They're a function of evolutionary biology. And, you know, when certain chemicals are released in the developmental process that governs how long your limbs grow or your digits or whatever, but there's that. You know, we just all variations of. Primate, you know, we're just we're just one of them and so. Yeah, so so sometimes you see. Literature are people positing that somehow. There was something like and we reached some sort of end state or and I'll tell you, we're not Reginette state, we're just a variation of.

[01:59:08.380]

You know, creatures that have. And adapt, you know, they take these common elements and adapt them for a different breed, you know, for different uses and modern humans, though, we do vary size wise much more than ancient apes that we find, though, correct?

[01:59:26.520]

Like we don't fight, like, for instance, like, you know, mountain from the Game of Thrones, that enormous giant human being. That's a human being.

[01:59:34.230]

I don't I should confess, I am sort of illiterate when it comes to pop culture.

[01:59:43.380]

Oh, OK. I get like kids, but now I need to turn to them.

[01:59:46.440]

You know, I'm kind of like he's literally one of the world's strongest man. He's like seven foot plus tall, 300 plus enormous. But my point was that like that he exists as a human being. Also, Chris Rock is a human being and he's a very thin, very small man, but they're both human beings. We don't find that when you're looking at things like Neanderthal or were you looking at you find much more uniformity, is that correct?

[02:00:17.520]

Well, no, not necessarily, actually. Actually, in some cases, there's there's a lot of variation. And I'll give you one good example. So, Lucy, you know, there's this famous fossil, Lucy was the species is called Australopithecus afarensis, named Afarensis after the AFAS. You know, this part of the world that I was describing, the depression, she was discovered in nineteen seventy four. She's very petite, probably a female. And I forget how tall she is, but it's like three foot something and already is a female to correct as a female artist.

[02:00:50.040]

Taller Arty's, you know, head taller than, than Lucy. But anyway, so with Lucy, you know, when her skeleton was found, this was the only skeleton of that species. They had a lot of other pieces of things, but no skeletons. But there was this assumption that that species was small and or at least that female. And now, thanks to some other work that's done in Ethiopia at a place go to war on some HeLa, a few years ago, a team announced discovery of another skeleton of Lucy's species.

[02:01:26.610]

It's a male. It's a lot bigger than Lucy. They call it Kadanuumuu, which is a F.R. word for big guy. But it's the same species as Lucy. But it's a big guy, you know, substantially taller. So it's sort of falsifies this idea that all Lucy's species was was petite. So interesting. And why is that? Is that because it's there's a so-called sexual dysmorphia. Some of males are bigger than females, or is it just a different population or is that just, you know, just a difference in and, you know, the normal range within a population, you know, like short people and tall people and are, you know, in any population, I don't know.

[02:02:09.210]

But they're mature specimens.

[02:02:11.710]

Yeah. Yeah.

[02:02:12.570]

And they are both attributed to the same species. So anyway, just just to give you an example of a paleo species where there is actually a substantial variation, how much difference is it between Lucy and this other one?

[02:02:26.100]

It's I don't know. I wish I had looked this up before we talk because I I'd love to give you a number, but it it the big guy is substantially taller and bigger than Lucy.

[02:02:36.930]

But but the skeletons they have, you know, the anatomy is similar enough so that they are attributed to the same species and are similar age like Kadanuumuu I think is like three point six million years old and Lucy's I think three point two.

[02:02:56.790]

So when we look at humans like the Denisova and we consider that to be a different human than homosapien or than Neanderthal do, do we have any idea how that came about? Well, so first of all, I should say, I don't know much about Denisovich. My understanding is there's not too much skeletal will be preserved of it. I mean, they have enough bones.

[02:03:22.180]

They've obviously been able to take a fairly recent discovery, right? Yes. Within the last, I don't know, 10 years or something. So it's a question like, why do they look so different? Is that.

[02:03:32.840]

Yeah. What where they come from. Yeah. I don't know. And I don't think a lot is. Known about that, about that, right, maybe the scientists first I got to know more than they published, but I don't know much about it. But anyway, just the general idea of why do these things look so different? So there is this concept in science that helps explain this. And this is, you know, some people call it these are all it's speciation.

[02:04:05.860]

It's just like an adaptive radiation of all these things going out and turning into these different species. And that's kind of one way to look at it. But the way I prefer to look at it is. What the scientist is, what the scientists call isolation by distance, which sounds like horribly boring, I know you like what the hell does that mean? But basically what it means is that things, you know, spread out, and particularly when humans got the technology know humans got the technology to basically live in all these different parts of the world.

[02:04:36.990]

They were isolated and then could adapt. You know, make these local adaptations, which, you know, make them look, make the Neanderthals look different than the sub-Saharan Africans, for example,

who are their contemporaries, but yet they're still closely enough related. So when they do come back in contact, as they sometimes do, they can still potentially interbreed.

[02:05:03.760]

So so what the isolation by distance means, it just means that these things spread out enough so that they get.

[02:05:11.850]

Local adaptations, you know, like like your example from the Amazon or like, you know, people from the Inuit, from the northern areas or where it's such a fascinating field of study because you just you see how they're piecing together this puzzle slowly but surely.

[02:05:34.320]

And it just it's for someone who's impatient, like there's not going to get the answers to this very quickly.

[02:05:42.510]

But yeah, but yeah.

[02:05:44.190]

It's so amazing, though. Yeah.

[02:05:46.680]

But the truth is always so much more interesting than than than the fiction. And then I think I mean, I'm just a journalist, right. So I'm not a scientist, so I should just remind people of that. But if I were a scientist in this field, you know, you just have this lifetime of material. Ahead of you, and you just know that the revelations are going to be so fantastic, like there's, you know, like genomic science, I mean, I know my book is about fossils and that's mostly what I know about.

[02:06:17.400]

But, you know, genomics, that genetics in ancient DNA, it's an important, you know, cutting edge right now. But anyway, there's a guy, one of a prominent geneticist at Harvard named David Wright. He says we're just we're like kindergartners in our knowledge of this stuff at this point. I mean, as advanced as the science is and as as amazing as the breakthroughs have been, there's still only just beginning to understand, like how, you know, that that genetic code really translates into biology.

[02:06:49.990]

For example, you know, the code has been transcribed. We now have, you know, the three billion, you know, places in the human genome, you know, transcribed. But what does that mean? What does the code say? And how does that code turn into Ardipithecus and Denisov ends? And you and me, I mean, it's that's that's the there's so many questions waiting to be answered. And, yeah, if you're if you're if you're an impatient person, you won't get the big answers maybe in our lifetime, you know, for the big questions.

[02:07:23.730]

But, God, there's so many fascinating questions that are within reach that are being answered.

[02:07:30.820]

It's it's, you know, endlessly fascinating as a journalist when you're writing a book about this and you have to take a deep dive into all the science behind it and the just the history of it. What is that experience like for you? I mean, it seems like it would be all consuming because it's such a deep field of study.

[02:07:52.050]

It was all consuming for me. I mean, this book took me a lot longer than I ever intended.

[02:07:57.600]

Which kind of people would keep? You know, people would ask. I mean, I had numerous conversations that went like this. I was talking to some scientist some have been talking to realizing, oh, yeah, what's your what's your timeline anyway? And I'd say I'll probably be done this time next year. I mean, I would say that in like 2012, you know, the book is being published this this week. So so part of that I mean, and this kind of gets to the richness of the story that I was telling you about.

[02:08:27.390]

I mean, so I was you know, there was this interesting story about this fossil, the oldest skeleton ever found in the human family. So I wanted to understand, like the full lifecycle of that discovery, like how that the hunt, the research question was framed in the beginning and then, you know, how it was found interpreted, announced the world and then all the debate that followed. You know, I want to follow the life cycle of this whole thing through, because to me, that's a really interesting story.

[02:08:53.610]

And there are all these interesting components along the way, like geology and economics and developmental biology and the anatomy of all these different parts. So so anyway, that oblige me to sort of learn all of these. Topics, and so that was just a lot of reading, a lot of talking to people, I mean, I'm so indebted to to a lot of scientists who guided me through the geology, through the fieldwork, through the interpretation of this skeleton.

[02:09:27.880]

They I mean, they provided a service to me personally, but they also, more importantly, provided the as a service to. Public understanding and, you know, I can't say enough how grateful I am to those people. Where do you go from here?

[02:09:44.300]

I mean, when you spend eight years working on a book about an ancient ancestor to human beings and then you take a big, deep breath, you do all the publicity work, where do you go from here?

[02:09:55.220]

Well, that's a good that's a good question. I would go back into a cave, probably sit down to write another book. You know, it'll be a different topic for sure. I mean, I like, you know, stories that have narrative and I like stories that have depth. And, you know, this one was quite rewarding. It's quite challenging. I can't spend that long and every book because I'll be dead before, you know, before you know, before I get anywhere, but.

[02:10:25.140]

So anyway, I'm looking at a topic now, it'll be sort of deep history of science, I have to do a lot of legwork to see if it'll pan out the way it is. I mean, I yeah, I tend to keep things under wraps until I know that it's going to be worthwhile to do so. That would keep under wraps. But something like that, something a big a big a big story with characters and with depth and narrative.

[02:10:51.210]

And you just choose them based on your curiosity, like what's intriguing to you. Yeah, well, like with *Ardipithecus*, I didn't really choose it in the sense that, like, I sort of sat down eight years ago and said, OK, well, what am I going to do? I mean, as I said, I started off on this other road and then it just over time, this story just sort of appeared in front of me and sort of told me that I had this.

[02:11:17.900]

There's another road here that actually might be more rewarding. And then, you know, as I kind of went along, I kept having to stop and learn about. You know, the geology and all these component sciences or about Ethiopia, we haven't talked much about that, but the backdrop of Ethiopia while this was going on is an important part of the story at multiple levels. I mean, there's the turmoil in the country that makes it difficult to work there.

[02:11:43.860]

There is the this sort of ascendance of indigenous African scientists from Ethiopia entering the

science and sort of claiming a place at the table in science that has. You know, some colonialist roots, there's all you know, all these component pieces that took me. We're not visible at the outset, but I just sort of had to had to delve into them as I waded through this topic. And believe me, there was a lot of pain and suffering that went into this book.

[02:12:18.760]

I mean, I know it.

[02:12:19.510]

I know parts of it are are, you know, you know, sometimes strike people as maybe hard science. But believe me, that there was like I could have written and did write in some cases what you might see and like a couple of sentences that I tossed off about this or that, there may have been a 10 page. Draft of that topic, a five page or whatever that I needed to write to be able to understand it and then to reduce it, reduce it, reduce it, and then sort of reduce it down to just one brick that I could just sort of put in the wall of this story.

[02:12:56.520]

But, yeah, there was a lot of that that accounts for why it was such a drawn out process.

[02:13:02.250]

Well, congratulations on the completion and thank you very much for spending some time with me today. I really appreciate it, man. I really enjoyed. It's it's it's it's a great pleasure.

[02:13:12.240]

You have a great show. It's eclectic. And I'm still, you know, scratching my head and trying to think of where I fit in with, you know, Britney and Kanye and all these other guys.

[02:13:20.790]

But I pay you for that. I'm interested in what you do. You fit in because it's a fascinating subject to me. All right.

[02:13:29.130]

Well well, thank you for Hi5 with the high things. And it's been a pleasure. So you hold up a copy of the book behind you.

[02:13:37.110]

It's right over your shoulder so people can get an image of it.

[02:13:41.840]

Yeah. So the book is Fossil Men. It's published by Harper Collins, William Morrow in print. And it is kind of it's released November 10th. All right. And this is this is Artie's hand right here. I think November 10th is today.

[02:13:57.930]

Right? Isn't it today.

[02:14:01.500]

Tomorrow. Yeah. Well, the day come today is the night that we're filming this. It'll come out tomorrow on the 10th. All right. Beautiful. Thank you. Appreciate it. Thank you. You guys did a great job. Thank you. Thank you. Take care. Bye bye. Thank you, friends, for tuning in to the show. And thank you to policy genius. If you need life insurance, head to policy genius Dotcom. Right now to get started, you could say 50 percent or more by comparing quotes policy genius when it comes to insurance.

[02:14:28.900]

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[02:15:00.090]

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[02:15:38.040]

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[02:16:07.500]

Thank you, friends. Thanks to the much. Loved you all my.