

Episode 38

Jamie: Do we really want to say live because it's not really live.

Ryan: It's live-r. You're live. Nor...

Jamie: I am alive. I'm live

Ryan: Because

Charlie: Pre-recorded.

Ryan: Ben Did you say holy crap because you just realized who was on the line?

Ben: Yeah, yeah, it's just like listening to the podcast.

Announcer: Hello, and welcome to Science sort of.

Patrick: Hi, everybody, and welcome to Episode 38. The quiz show. I'm your host 38 special.

Ryan: It is special. It's not even an anniversary, but it's just special.

Patrick: That's 30 odd special.

Charlie: Ah man.

Ryan: No, there's, no there's a 38 Special.

Patrick: Oh, okay.

Ryan: It's a .30-06 and a 38 Special.

Patrick: Oh, okay. Wow, we really off, we really showing our intelligence early on?

Ryan: Did somebody did somebody ask about guns? Let me just answer that question.

Patrick: Yeah. We're, oh yeah, I'm your host Patrick and with me as always, and actually more than always are the other paleo pals, Charlie.

Charlie: Hey guys.

Patrick: Benjamin.

Ben: Hello.

Ryan: Whoa.

Patrick: And Ryan.

Ryan: Hey Ben. Hey everybody else. Ben, you just came through loud.

Ben: Oh, I'm tweaking the microphone. Well is it too loud? It's going down.

Ryan: That's better.

Ben: Sorry.

Ryan: Yeah right there.

Charlie: Canada just put up a new communication satellite.

Ryan: It's ah, they just us throw a cup with a wire really high in the air.

Ben: And run some tinfoil around a moose.

Patrick: Alright.

Jamie: It works every time.

Patrick: Just the antlers the rest of it doesn't broadcast.

Ben: Of course. Yeah.

Patrick: And joining us specially this week is the voice of Science sort of, Jamie.

Jamie: Hello. Welcome to Science sort of.

Charlie: Hey Jamie.

Ryan: Hey y'all.

Jamie: Hey y'all.

Ryan: The oft lamented intro to Trailer Trash Talk.

Patrick: So, yeah, so the format this week is going to be different. This is the quiz show, and Jamie's gonna be our quiz master and she's gonna ask all the things you've always wanted to know, but been afraid to ask up until now. So let's see, you want to start with some emails, Jamie.

Jamie: Yeah. And, ah...

Ryan: Should we explain how this thing's going to work?

Patrick: Okay, I don't know how, we don't know how this is gonna work, exactly. Jamie's gonna ask the question. We're gonna collaborate, collaboratively try to answer it using nothing but our own gray matter. And then if that fails, we'll go to the wilds of the internet's and we'll be graded somewhat on our ability to answer the question, creativity and humor. That sound fair?

Ryan: That sounds like a weird mix of stuff that stumps q i.

Charlie: q i, yeah. Well, I have a question for the quizmaster. What are you drinking?

Jamie: Yes. Exactly. I am drinking a champagne cocktail of sorts. It's champagne with chambord and...

Ryan: It's a champagne, it's a champagne cocktail sort of. Jamie.

Jamie: Sort of. It's a champagne cocktail sort of. And it has two raspberries in it floating the top, in case someone is mistaken for the level of luxury in my drink. It's a very elegant drink.

Charlie: Sounds what, sounds nice. There's no cham in that.

Jamie: Humor. Points, right?

Patrick: Yeah, Charlie's already trying to out...

Ryan: Ouch.

Jamie: Um, yeah. Does anyone else want to fess up to what they're drinking?

Ryan: Well, yesterday, I went to the strawberry Music Festival, which is out out near Yosemite, but not quite in Yosemite. And it was a lot of fun. It's like a, kind of a blue grassy Country Music Festival. And I picked up as local a brew as I could find, which was the Snow Shoe Brewing Company Grizzly Brown ale. So it's just a very, very standard but enjoyable brown ale that was pretty nice to sip out in the hot sun while I listened to some music and I had enough leftover to have one on the show.

Jamie: Delicious.

Charlie: Sounds good.

Patrick: I'm drinking ah, the margaritas that were leftover from that batch last night, Charlie.

Charlie: Oh, those are delicious.

Patrick: And you?

Charlie: Look at you. I'm, I'm working on a cocktail special for the quiz show. It's one shot espresso on three ice cubes with another shot of Amaretto Disaronno Originale. So it will, the espresso will stimulate my brain the amaretto will mellow me out, and the ice cubes will keep me cool.

Ryan: Well, the amaretto, so the, the amaretto will act against so the caffeine is a vasalconstrictor and the amaretto is a vasaldilutor. So hopefully the amaretto will overpower the constriction of your, of your veins and you'll be able to think more clearly with better oxygenated blood, but also maintain the stimulus of the caffeine.

5:07

Charlie: That's what I'm hoping.

Ryan: And then as soon as we get Ben back, he can tell us what he's drinking.

Patrick: So much for that moose.

Ryan: That stupid moose. They should have kept it on a leash. That's what I kept telling them. You can't trust a moose, but try telling that to a Canadian.

Patrick: We can try and guess what Ben's drinking. Since he...

Jamie: I like that.

Patrick: He wasn't really prepared. So I'm guessing he's probably going to be drinking orange juice.

Ryan: I'll go with moose milk.

Jamie: Charles? Thoughts?

Charlie: I'm going Jones soda.

Jamie: Jones Soda.

Patrick: You think he's got one just running around?

Charlie: Oh, yeah.

Patrick: Should we move forward and pick him up here in a minute?

Ryan: No, I think I'll be back in a second.

Patrick: Okay.

Ben: All right, I'm back.

Ryan: Ah, what are you drinking Ben?

Ben: Ah, well, water. I just got in.

Charlie: Oh, somebody called it?

Ryan: Nope. Yeah.

Patrick: Just called him on his cell.

Ryan: You just melted, melted some snow?

Ben: Yeah, well, it's, it's getting warm up here with the global warming so I just went to local glacier and ah...

Ryan: Patrick liked that one.

Jamie: Very smart, very sensible.

Patrick: Oh, he's just, Ben's so much more jovial than many of the Canadians that...

Ryan: How do you do it Ben?

Ben: What Canadians do you know that aren't jovial.

Jamie: I know, I was just thinking...

Ryan: Well, Patrick, what do you do to Canadians that make them so mad at you...

Patrick: I don't, this same sort of, this same sort of thing where I, we poke a little fun at Canada but it really it's because we're uncomfortable with our our status as Americans and, and we would be more comfortable living in Canada really. But they don't, they don't ever seem to pick that up but I think Ben, Ben knows.

Ryan: I just love that you just said Merica. Like total, you weren't even, you weren't even affecting an accent. You just really you, just let it slide through that one. I think it's cuz Jamie's here, you're talking like you should talk.

Jamie: No one wants to be underneath Canada.

Ryan: Canada's big, we can't hold the whole thing up. There's all kinds of stuff.

Jamie: Yeah.

Ben: Also we claim the North Pole. So technically everybody's underneath Canada. Don't feel bad though.

Jamie: That's what she said.

Ryan: Our benevolent leaders, the Canadians. Done terrible. Alright, ready for a question...

Jamie: Okay, we're gonna start this off.

Music

Jamie: Now there are a couple of things, a couple of points I'm going to award based on creativity and humor, and we'll add those up and award a prize to be announced at the end of the show. All right, let's get this started. So we have quite a few questions. We had a lot of participation in this, in this push show, so I was really actually impressed with the the caliber of questions coming out and we're going to start it off with a thought from Alan. He has asked, "Is there the possibility of true artificial intelligence? And if so, how does it make the conscious human valuations involving ideas such as beauty, justice, and meaning?" Just a thought.

Ryan: Do we have to buzz in, like... (makes buzzing sound).

Patrick: I don't think so. But you can.

Ryan: Yes. My answer is yes. Who's next?

Patrick: Oh, there will be...

Ryan: I think AI will happen.

Patrick: Well, Charlie's trying to, Charlie's working on it via espresso and amaretto.

Charlie: Yeah.

Ryan: You disagree Ben?

Ben: I disagree with artificial intelligence and justice and beauty. Here's why. Justice and beauty and all these concepts are always context based. And so some, you know, an artificial intelligence might be able to make decisions and stuff. But insofar as it's not something wandering around with, into society feeling bad about, you know, orphans and stuff, it's not going to have the context to have appropriate ideas when it comes to, you know, broader, abstract thoughts like...

Ryan: My rebuttal, Ben, is a little, a little man you might know called Mowgli, who was raised by wolves and still had the context.

Patrick: Also, not fictional.

Ben: Right but but but humans are context machines. All we know is also not fiction.

Ryan: Why can't we build it, why can't we build machines that understand context?

10:00

Ben: Well, I mean, like that's a, that's a tall order. Isn't it better to just build machines that can solve problems specifically...

Ryan: We're talking about the future, Ben?

Ben: I'm saying it's a waste of time to make a machine that doesn't solve a problem. You know, if you're just get to make a machine that feels bad about, like sad music, then why not just make a teenager?

Ryan: Ben would you, like...

Ben: It will take less time and it will be way more efficient.

Ryan: Would you rather go to court, would you rather go to court and deal with a human judge who's fallible and biased and may not be any good at his job? Or would you rather go to court and deal with a justice bot?

Patrick: We answer this in all kinds of sports right? I mean, we could have a machine that called balls and strikes but we stick with the umpire for some reason.

Ryan: But then we go with instant replay too, we, we...

Patrick: Yeah.

Ryan: We augment our umpires with artificial senses.

Patrick: Yeah. But in some sports they don't, they don't use instant replay...

Ryan: That's stupid. Sports.

Ben: Yeah, but I mean in ah, you know, you, in art and beauty and stuff, it's all, it's, to some degree, like in sports, there are specific rules, right? And so it's something that a machine can be pretty good at, you can say, did this Puck cross the line where the line is defined as this black line? 1.3 meters away from this end, right? And then the computers can say yes or no really, really accurately. Whereas in regular life, we ask it, is this painting nice? And it's like, well, what's your definition of nice? And so, it could probably say, yes, you would think that this painting was nice, but that's not the computer itself making some value judgment. It's just telling you whether the parameters that it uses to describe how your tastes fit, fit in with this painting.

Charlie: Maybe a mark of artificial intelligence is the ability to assess context on the fly. I mean, that's what we do as humans, our, our context ever, always changes. And so if a machine were to be invented, that it's context, it's only based context, is to reassess and constantly reassess context based on the situation that's presented. I think that would be a mark of artificial intelligence. And so a context, a you more universal context for beauty might be something like, for living things, evolutionary fitness, and that may be expressed in things like symmetry. And for things like art, it may be expressed in information content and complexity. But, so I think, yeah, a machine that can reassess context on the fly would be a mark of artificial intelligence.

Ryan: There's also something that we haven't, okay, there's also something we haven't mentioned yet called the Turing test. Which, have you guys heard of that?

Patrick: I've heard about

Charlie: Yes.

Ryan: Um, the Turing test is like considered by some roboticists and computer scientists, not all, it's not a universally accepted idea, to be the ultimate test of artificial intelligence. And basically, the idea is you're talking via like a text box, you know, like a Skype window or something like that. Back and forth with an entity and you don't know whether the entity is Artificial Intelligence or an actual person, and the Turing test is, is how well that works. So like if you can, if you can basically, stump, I mean, it's a good question to start with, our stump the idiots show is see if you can stump the computer and make it reveal itself to be a non human entity. And if it can't, if you never, if you never know whether or not you're not actually talking to a human, then it's passed the test. And the supply, the surprise reveal is that you've been listening to four computers the last 10 minutes.

Ryan: (In robotic voice) Ha ha. Ha ha. That was a good joke.

Charlie: I've never actually watched an episode of Star Trek, but there was an episode that had an artificial intelligent machine and the way they broke it. And so this is an example of the failure of the Turing test, I suppose is they told it that they

could not tell it to, tell a false sentence, or they couldn't, they could only tell true sentences and then they told the machine that this, this next sentence is false and the machine broke down.

Ryan: Nice. Logic.

Charlie: So if a machine is able to realize that you're taking the piss and that'd be a mark of intelligence too.

Ryan: So lying. We have to teach machines to lie.

Charlie: When do kids learn how to lie? Like three or four years old?

Ben: Like, infants now, like, like, two month olds can lie, didn't they find that?

Jamie: Yeah, they can lie, they can lie. Because they will cry, they really won't need you, you know, that sort of thing. They'll fall and like, really, but they really want attention. That's considered lying, right? No?

Ben: Yeah.

Charlie: Kind of, yeah.

Ben: And they'll like, they'll manipulate you so...

Jamie: The manipulation. Exactly.

Ryan: Like, they'll put on a bright, a bright orange sweater to make you think they're poisonous.

Jamie: Two month olds often do that, yes.

Ryan: I've seen it. You know, I've learned you can't eat a baby because you don't know if it's really poisonous or if it's just mimicry.

Jamie: Hmm, interesting. I'm gonna move us along to the next question. Yes, we're on question two now. This is an audio so I'm just gonna go ahead and play it. Um, if I can. Okay.

15:05

“Hello paleo pals. This is John from Texas. And I have a question for your sort of side of the podcast. Definitely not the science side, and I was wanting to get each of your opinions on who would win in a fight, Batman or Spider-Man. Thanks.”

Charlie: Oh, this one's for Ryan.

Ryan: Well, okay, so I didn't, I didn't know about this question ahead of time. That that would be John Lopez...

Patrick: Ironically, you've, you've been wondering about it for the past 13 years though.

Ryan: Have I?

Patrick: Preparing for this very moment.

Ryan: Yeah, I guess I kind of have. Um, well, I feel like, I feel like I should keep my mouth shut until you guys have a chance to toss out your opinions, because I feel like I have more information to bring to bear, so...

Patrick: All right, my answer is Spider-Man, because he actually has superpowers. And I think that will eventually win out.

Charlie: My answer is Christian Bale would beat up Tobey Maguire cuz he gets really angry.

Ryan: Oh, good for you with that I answer Charlie. Good for you for that.

Patrick: That's great creativity, that's gonna be points in the end.

Charlie: Good point.

Ben: Okay, I think Batman is gonna win because he has more information than Spider-Man because he has the bat computer and that means that he can always stay one step ahead of stupid Spider-Man. And then beat him.

Jamie: Beat him.

Charlie: All right, set us straight. Ryan.

Ryan: Okay, so, it, Ben will appreciate this. The, the answer is contextual. It depends on the context of the fight. Um, first off, the reason John is asking this question is that in the show the nerd list, John is a big Spider-Man fan and Shawn is co-host, as a big Batman fan. So I think they're asking us to set the record straight for them, which, I don't know that we'll be able to do but it's a very context specific fight. So they're both urban superheroes, they're both more than capable of functioning in the nighttime darkness city arena. But it kind of depends if Batman knew he had to fight Spider-Man or if he was just they bumped into each other and have a misunderstanding and fight, you know? Because Batman is the kind of superhero who benefits from time to prepare. And I think, I think Batman is obviously gonna have a better time fighting in Gotham than he is in New York. So it also depends on where they're fighting.

Patrick: I thought that was the same place.

Ryan: No...

Ben: Yeah.

Ryan: ...not in the DC Universe. Gotham in New York or separate cities. Gotham or New York, was nicknamed Gotham by Washington Irving, a guy who wrote a Legend of Sleepy Hollow. So that's where the name comes from. But it's not the same city in the Batman universe. So I think if Batman had even like a half hour to prepare to fight spider man, he would stand a pretty good chance against him, but I think in a surprise fight, Spider-Man's reflexes, like even though Spider-Man doesn't have the fighting skill the Batman has, I think he's gonna win out on strength and reflexes, and just like you said, he's got powers, he got the spider sense. So a lot of, a lot of the tricks Batman might try to pull are going to be thwarted by the spider sense and

especially if he doesn't know about spider sense. Like if Batman was unaware that Spider-Man had this slight pre-cognitive warning system, I think, I think Batman screwed.

Ben: Can I make an argument?

Ryan: Go for it, go for it.

Ben: Can I make another argument for Batman. So, Spider-Man uses webs to fight, right?

Ryan: Sometimes.

Ben: And so in part, he can take advantage of the physics involved when you take two free moving bodies and you attach them together. The, the physics changed slightly and he can take advantage of the fact that most of the people he fights, doesn't know about the little finicky changes in physics when you get attached to somebody with a string. But Batman also fights by tying people up with ropes and swinging them around. So Spider-Man won't have the advantage. One less advantage for Spider-Man. One more advantage for Batman.

Ryan: Batman...

Ben: Batman has those knives on his gloves you know the ones sticking out backwards. So if Spider-Man tries to like web him up Batman can just cut through the cut through the webbing really easy.

Ryan: Here's the thing Ben. Spider-Man is not dumb like, Bruce, okay, so Bruce Wayne is considered, in the DC universe to be the smartest man on earth. No, the second smartest. Lex Luthor is number one. Bruce Wayne is number two, Michael Holt, Mr. Terrific is number three. Um in the Marvel Universe. There are a lot of people smarter than Spider-Man but he's still really high in the intelligence scale. So, in front of Spider-Man, or probably Reed Richards, Hank Pym, Tony Stark, this one random dude named Amadeus Cho, that I don't really buy. But, like, spider man's in the top 10 for intelligence in the Marvel Universe among the superheroes.

Charlie: Wait, where does, who's, Doctor Manhattan, which universe is he...

Ryan: He's only in the Watchmen, Charlie, that's ah, so, Doctor Manhattan...

20:00

Charlie: It's a DC book though, right?

Ryan: Well, it's a DC book and Alan Moore originally, in the Watchmen, wanted to use these characters called the Charlton comics characters, which were a separate Comics universe that DC acquired. So it was a separate universe for awhile and in DC got the rights to it and Alan Moore wanted to use those characters for Watchmen. But because Watchman was such an adult story, they basically said he couldn't. So all of the characters in the Watchmen are analogs of these old Charlton characters. So Dr. Manhattan is an analogue for this character named Captain Adam who does exist in the DC Universe, but isn't as smart as Dr. Manhattan.

Charlie: Oh, okay. Who's gonna win the fight then?

Ryan: I'm probably gonna go with Spider-Man unless Batman knew he had to fight him and had time to prepare. I think Batman is all about preparation. I mean, obviously the dude spent years going around the world learning to fight and solve crimes. So if Batman had prep time, he'd win, but if not, Spider-Man, I think it's gonna take him.

Patrick: Well, there's one man's answer. The real answer is Spider-Man.

Ryan: All right, what do you got next for us, Jamie?

Jamie: Formspring question. Um, so I'm not really sure who asked these questions, Ryan, but...

Ryan: Yeah, Formspring is kind of anonymous.

Jamie: Excellent. Could we eat alien life? This is dealt with in the book *Old Man's War*. I know they might have some different, insane amino acids but they would make them... in some amino acids and would they even make proteins?

Patrick: But they would make proteins, would we have to evolve to eat them? Okay, so they're asking, you know, they're probably making some kind of amino acids might not be the same ones, but probably proteins, would we have to change our evolution to eat them? Um, I think the evolution, I think no. Not unless you're going to solely exist on, on alien based life. If you're just going to supplement a diet on alien-based life, no problem. But there are some essential amino acids that we don't make and if you're and if the alien life you're subsisting on, does not make those amino acids at all, then eventually you're gonna be screwed.

Ryan: This is not how I took this question.

Patrick: You're not even... okay.

Ryan: You said I'm not even what, I'm not even what?

Jamie: You're not supposed to have known about this question.

Patrick: Yeah, what do you mean? Just, just now that's not how you took the question.

Ryan: Yeah, that's what I'm saying. That's not how I understood the question. I thought it was asking more, wait, did it say if we could say if we could subsist or I thought it meant...

Jamie: Can I re-read the question.

Patrick: It says, can we eat them?

Ryan: Right? But I thought that meant from like, are they poisonous?

Jamie: Could we eat alien life in that they possibly are have different compositions.

Ryan: Right. But I mean, there's lots of foods that I eat that don't provide maybe the essential nutrients that I need. I just eat them because I like them. So...

Patrick: Right.

Ryan: I'm thinking of aliens is more of like a foie gras, you know, this is a delicacy that I'm going to enjoy. Is it going to kill me if I do it like fugu or something. Not necessarily could I subsist on a diet of only alien?

Jamie: Sure, sure.

Patrick: Well, that's one way to interpret it.

Ben: Yeah.

Ryan: Oh, okay.

Jamie: Have you read *Old Man's War*?

Ryan: I haven't.

Patrick: Yeah, has anybody read *Old Man's War*? I don't know what that book is.

Jamie: That might aid in our...

Patrick: I sense someone going to Wikipedia.

Ryan: No, no, that's the rules.

Patrick: My Spidey sense is tingling.

Ryan: Your wiki sense.

Patrick: Yeah.

Ben: Okay, so I've got a kind of an answer.

Ryan: Answer it.

Ben: Ah, and it has to do with like, organic chemistry.

Ryan: Of course.

Ben: Did you guys take organic chemistry?

Ryan: I loved it.

Patrick: Multiple times.

Ben: Right. So they're holicity to like, complicated molecules, right?

Ryan: Yes.

Ben: And some, there's some like...

Charlie: Wait, what's that mean?

Ben: That some are spiraled Left Handed, some are spiraled right handed.

Charlie: Chirality, that's how I learned it.

Ben: Ah, chirality, is that what it's called?

Ryan: Mmmhmmm.

Ben: It's called holicity in particle physics. Anyway...

Patrick: Thanks Canada.

Ben: No, physics, I haven't taken any, so chirality. Right, right so there are some, wasn't there a medicine in like the 1960s, that made a whole bunch of flipper, babies.

Ryan: Oh yes. What is that?

Ben: Because of the chirality?

Ryan: Oh man? It was ah, it was a morning, it was a morning sickness drug.

Patrick: Yeah.

Ben: That's right.

Ryan: Right, and the right handed version of the drug works just fine and the left handed causes awful deformities...

Ben: Right and so it's possible...

Ryan: ...the mercury preservative, that, man, this is gonna get a...

Ben: Thalidomide.

Ryan: Thalidomide. Yeah. Thalidomide babies?

Ben: Yeah, right.

Ryan: Big problem in Germany.

Ben: Right so, so there's like this issue with chirality and if, if their DNA makes their proteins the wrong chirality they'll be indigestible to us, right? Is there something like that?

25:00

Patrick: Well, some of these...

Charlie: ...newfangled, like nutritional supplements base themselves on chirality like I think it's olestra or olean is a fat that's right handed instead of left handed...

Ben: Yeah, that's right.

Charlie: ...or vice versa. And so it just makes you shit your pants because you can't absorb it at all.

Ben: Right.

Patrick: Um, well, in general all, all Earth life, while it's alive keeps its amino acids in the, I think it's amino acids, in the L, L position.

Ryan: Left handed.

Patrick: And then, yeah, well, I don't know. And then after they die, they convert to the, yeah, it is left handed. And then, after they die, they slowly, over time convert into the D position, you can actually use this to date organic matter to some degree.

Ryan: Hmm.

Ben: Whoa, science.

Patrick: And so, the L,D can evolve from L to D. And some people have cited this among other things as the idea that our universe actually has a left handedness or right handedness to it.

Ryan: I thought you're gonna say something about a creator being left handed. Like we have a polar, we should start worshipping a polar bear based god like they do in Canada.

Patrick: But in general, it the problems with us eating old meat are not that the amino acids have flipped chirality, it's that, it's...

Ryan: Yeah, I think the chirality has to do with whether it's biologically active, not whether it's...

Ben: Yes...

Ryan: ...it's digestable.

Ben: No, no...

Charlie: And so what does rotten really mean? Why do humans need a certain type of food before? Like, what do we do with our food? We oxidate right. And so we kind of need a food before other other animals have gotten to it first. Whereas other, other species are perfectly fine with rotten food, like dogs and bacteria and stuff.

Ryan: Mm hmm.

Charlie: But...

Ryan: So it really depends on...

Charlie: I think, I think it depends on the oxidative state of whatever you're eating.

Ryan: So how old is the alien? How long has it been drifting through space before we caught it and cooked it.

Patrick: No I don't, not so much that just we're trying to figure out if chirality makes a difference in terms of us being able to eat, an amino acid chirality makes a difference in terms of us being able to eat something or not.

Ben: Well like that, fat you know, with the, the one that makes you poop your pants?

Ryan: Olestra?

Patrick: Yeah.

Ben: Right, so right, so if, on an alien planet, all it matters, doesn't, the chirality itself doesn't matter it just matters that everything on the planet is consistent with that chirality, right, it's like driving on the left hand side, or the right hand side of the road. They don't mix. So, I mean, on another alien planet. They could have the opposite protein chirality from us, and I'll be happy eating each other but when we go to eat them, we'll poop our pants. Maybe.

Ryan: But I mean, I poop my pants when I eat normally that's not, that doesn't mean I can't. I really shouldn't have said that, that was dumb, oh boy.

Patrick: Points to Ryan.

Charlie: But this gets back, I have one comment that gets back to the artificial intelligence. Some, some people argue that the most common life in the universe if life exists elsewhere in the universe will be silicon based, not carbon based. Because it's much more resistive to all the harsh vagaries that are present in space, like radiation damage, and they don't need special atmospheric conditions to survive. And, I mean, we have silicon based things traveling through space right now all the time. They're orbiting Mars, orbiting Saturn, etc. They're different...

Ryan: But what if what if all life...

Charlie: ...instruments and so, so if life is going to spread it most likely will be spreading based on silicon based life, not carbon based life. And so, if it's silicon based life, we can't eat it, just the same way we can't eat our computer.

Patrick: Right.

Ben: Wow.

Ryan: What, what if all life has a single common ancestor like it does in the Star Trek universe that we mentioned earlier? So we all are somewhat related. And I mean, we've, we've been talking a lot about like whether or not we're gonna be able to adjust the proteins, but we haven't even touched on secondary chemicals that most plants have that make them poisonous and difficult for us to eat? So I mean, well, we can't, we can't, I mean, obviously, whatever we're eating doesn't want to be eaten because life in general, unless it's some weird parasite tends to not...

Charlie: Yeah, the whole, like evolutionary arms race, is gonna be totally different on a different planet.

Ryan: Right.

Patrick: Right. And so that's just a roll of the dice for us, right? Things haven't evolved to specifically take advantage of our biology and protect against it. So it'll just be, it'll just depend on whether what they've evolved to deal, to deal with the alien life affects us or not.

Ryan: Okay, well, here's what I'm thinking. There's some life on earth we can't eat. But there's some life on earth we can eat. So I think it would be pretty much the same for if you expanded the question from Earth to the universe. So there's probably gonna be some things out there that we could eat and get away with and most things we can't.

30:00

Ben: I'd say 10% of the stuff out there, we can't eat just based on chirality. And that argument about silica lifeforms.

Jamie: Chirality.

Patrick: That's correct. Ben does it again. Damn Canada.

Ben: I heard, I heard this argument in statistics that you can always come down to arguing that the 10% of any population is blah, right? So you can be like 10% of young men are homosexuals or 10% of people have eating disorders, or it always comes down to 10%. So that's a nice round medium number. What that?

Ryan: It means, there's five of us and, if you say 10% of people are homosexuals, one half of one of us should be homosexual.

Ben: I don't know if that statistic's made up or not. It's a popular statistic but I don't...

Ryan: It is a popular, a popular. I, ah, Ricky Gervais one time did, you know, back of the envelope calculations to find out how many people in China are gay and it's like bigger than our military. So, if all the gay people in China rose up against the United States, we, we could possibly lose.

Ben: What about all the people in China who are left handed?

Ryan: That's like one in the four right?

Patrick: And that's 10%.

Ben: Well see 10%.

Ryan: Huh. I'm left handed.

Patrick: You are?

Ryan: Yeah, that was what, and when you mentioned, and when we made the joke about the being left handed creator, most polar bears are left handed.

Patrick: And...

Ryan: Well in.

Ben: Wow.

Ryan: In most animals, it's a 50/50 split between handedness. There is handedness in the animal kingdom, but it's a even distribution of humans.

Charlie: So if you're in a fight with a polar bear, guard your right side.

Ryan: Pretty much, yeah.

Charlie: Get slapped.

Patrick: 90% of the time...

Ben: I hear fighting either fighting... claws are harder.

Ryan: Yeah. It's also it's hard, it's harder to hit on a left handed pitcher, but it's easier to hit if you're a left handed batter. Because if you're left handed batter in baseball, when you when you swing, your momentum is carrying you towards first base and not third base, so it's easier to get a good running start towards first.

Charlie: I forget which teams were playing but there's this famous instance in Major League Baseball, well there's a baseball story so everybody's gonna go to sleep, but there is a switch pitcher and a switch hitter and they just kept on switching back and forth.

Ryan: That's awesome.

Charlie: And the umpire had to look up the rules and, and it was determined that the pitcher has to pick a side and then the batter gets to choose.

Ryan: Nice. Well because also, if you're a left handed hitter going against a right handed pitcher, you see the ball coming around his body before a right handed hitter does. So basically being left handed in baseball is a huge advantage if everyone else's right handed which chances are, they are. Wow, we got way off topic.

Jamie: So, yeah.

Ben: There's got to be more left hand... in baseball than, then, then statistics would just randomly select, right?

Ryan: We pay them more.

Ben: Because that means that...

Charlie: Yeah.

Ben: No, no but it means that people who are left handed in like the minor leagues and little leagues and, are, are selectively chosen to go into higher leagues because they're slightly better than people. So, we should see, like, way more left handed people in baseball than we, in Major League Baseball, than we would expect.

Patrick: Because...

Charlie: Left handed batters are two steps closer to first base too.

Ryan: Yeah, that's, yeah, and just the way the momentum carries them. Well, I know I've heard that statistically speaking, though, right, right basemen, is that right, the right fielder right base, who's the guy standing to the right, third basemen, third baseman. Yeah.

Patrick: Wow.

Jamie: It's going to be a long show.

Ryan: That's a...

Patrick: I don't know how you made it through middle school Ryan.

Charlie: The starboard basemen.

Ryan: Well, here's the problem. I was in, I was in the outfield. So you know, you're playing, playing centerfield. So I would look at the bases and I would think left base, right base and center base. That's my excuse. But I've heard you like...

Ben: So, you're like the 10% of Americans who doesn't know anything about baseball, huh?

Ryan: No, I'm the 10% of Americans who are left handed, so, but I'm ambidextrous enough because of sports that I don't really know my left from my right.

Patrick: What, like, that's 10%. I mean, according to Ben it is, I guess.

Ryan: But I, like I say, like I don't like I don't intuitively, because I don't like favor one side all the time. Like I don't have a very, like it's not a flash instant left or right for me. Like, I'm still, I still...

Patrick: The more reason to call it third base.

Ryan: Yeah, or Yeah, you're right Patrick. I'm not arguing that I'm not stupid.

Jamie: Again, I'm reeling you in, because we're gonna we're gonna go to the next question.

Charlie: Okay.

Ben: All right.

Jamie: Yes. When did all of you guys decide to start the podcast?

Patrick: Is there more?

Jamie: And how did you guys meet?

Ryan: Where's this question from?

Jamie: This question is from Formspring.

Ryan: Oh, another anonymous one. Okay. Well, Patrick, I think you're probably the best one to tell that story.

Jamie: Oh.

Patrick: Um, I, when did it, I guess it started in July or August.

Ryan: Well, when did we meet is the, was the first...

35:01

Patrick: Oh, when did we when? I thought it said, all right. When did we meet?

Charlie: Munich, 1963.

Ryan: Actually, Charlie, you and I didn't meet until Nuremberg, so.

Charlie: Oh.

Patrick: Before we before we time traveled back to the island, we...

Ryan: There's this thing called the Darwin initiative. We decided to sign up....

Patrick: I guess well, Charlie and I met in 2004.

Charlie: Yeah. Started grad school.

Patrick: And Ryan, I don't know when I met you. Soon, a year or two after, so I don't know, 2005, 2006.

Ryan: Well 2005 was when I took dinosaurs with Kena, and it was fall of 2005 when I took her paleo with you as the main TA.

Patrick: Okay, so sometime in there.

Ryan: Yeah. So 2005.

Patrick: And then Ben is a, is a relatively recent addition. We've only met Ben since we started podcasting.

Ben: That's right.

Ryan: Yeah, so how did the show get started Patrick.

Patrick: Um, I'm not entirely clear about that. We fight about this to some degree right? Either you or I decided to start this, a podcast.

Ryan: I'm convinced it was you.

Jamie: Patrick's always wanted to start a podcast. I'm just going to throw that out there.

Ryan: That's what I'm saying. I distinctly remember we would have these. So I'm Patrick and Justin, for, you know, former...

Ryan: We're gonna say Justin is the once in future Paleo Pal. That's what I'm...

Patrick: Okay.

Charlie: Yeah.

Ryan: Cuz he'll be back in the future. Once and future Paleo Pal. Um.

Charlie: Prince of podcasts.

Ryan: Prince of podcasting and NPR's Golden...

Patrick: We'll go back and destroy the episode that he decided to quit on. And then he'll never quit.

Ryan: We just, the island. We just can't let Yeti off the island.

Patrick: Yeah.

Ryan: So basically, Patrick and Justin used to sit next to each other in their little opposing cubicle manlet situation. And I worked in their lab and we would just we would waste at least three or four hours a week, just, you know, BSing with each other and talking about whatever nonsense and watching movie trailers and videos on YouTube and all that. And I think it just got to the point where we either we need to find a different outlet for these long conversations, or we're just gonna not get any lab work done. And Patrick was like, well, we should just do a podcast and I said, okay.

Patrick: Something like that. Um, and, but you, you had already done a little bit of podcasting before that.

Ryan: Yes.

Patrick: Which was, which was the key, I think.

Ryan: But I think it was your drive to do a podcast that made me pull up the knowledge and make it happen.

Patrick: All right, fair enough. What was the rest of the question?

Jamie: Ah, how you met and how you got the podcast started. That was it? You guys have answered it beautifully.

Ryan: Wait, Where did Charlie come in all this?

Charlie: He had, um, well, you and me and Justin, were all sort of biologically, paleontologically oriented and we brought Charlie in specifically for a space show early on...

Ryan: Episode 6 I believe.

Jamie: Yes.

Patrick: And kept on, kept after him to join up so that we could be more diverse and less one sided.

Ryan: Right, because I originally, Patrick, I originally wanted to call this the Paleo Pal Show.

Patrick: Yeah.

Ryan: And you said no. And you said, why don't we call it Science... sort of? And I said that, well, I didn't, maybe I didn't say it, but I knew that ellipsis would give us trouble.

Patrick: Yeah, and it's, very little trouble in the end, I think. A little bit of trouble.

Ryan: And then the story how Ben got involved is actually pretty funny.

Patrick: That is kind of funny.

Ryan: So we were doing Episode 9 "Superman eating lions", which is where we interview the once and future Paleo Pal Justin about his research. The other story we were planning on talking about this week was this crazy story I saw where this dude had written a paper on the grand unified theory of Superman's powers. Um, so I was sitting at home kind of reading over all the papers and stuff we were supposed to go over that week, Justin's paper, the Superman paper. And I noticed that right at the top of the paper, Ben put his email address because he's just a ballsy dude like that. And I thought, you know, why not? And I opened up my email program and typed off a quick email to Ben that said something along the lines of, hey, Ben, my name is Ryan, I do this podcast Science sort of, we're getting ready to record in like, two hours, and we're gonna talk about your paper. So if you want to

come on and chat with us, that'd be cool. And then I didn't hear back and we were started recording that, that episode. And then while we were recording that episode, Ben emails me back and says, oh, yeah, sure, that sounds like fun, and I should, you know, and, and so we did like the quick get connected on Skype. And I told him like, okay, Ben, I'll bring you in in just a second. And then literally, Patrick, Charlie, and Justin were all in that episode. None of them knew that I'd made this happen with Ben at the last second. And I think I tried to make it sound like it was planned all along with this big surprise, but I basically said, Now we're going to talk about the Superman paper. And I've got a special guest and Ben just popped up on the Skype chat and the rest is history.

40:15

Ben: Yep.

Patrick: All right. Fair enough.

Charlie: Serendipity.

Patrick: Is there another, another email?

Ryan: Sure.

Patrick: Or do you want to do the, do that last Formspring question while we're here.

Jamie: Well, we'll finish off Formspring. So we have someone who is wondering who has voiced the recorded messages at the beginning and end of every show. It sounds like someone with freckles for some reason. So do you guys want to answer it?

Ryan: Well, you should probably answer it.

Jamie: It's me. Patrick's gorgeous wife.

Ryan: Do you have freckles? I don't think I've ever looked.

Patrick: Not very many.

Jamie: Not a lot, not naturally sort of like sun damage, more.

Patrick: More like cancer.

Jamie: I have cancer on my face. Um, yeah, so that's, yeah, no freckles really. More of a olive colored skin complexion.

Ryan: I know this is a question we've answered before but it's good for the quiz show.

Patrick: Yeah.

Ryan: Cuz it's one we can get right. And who's that, who's that in the background?

Patrick: That's our ticking time bomb.

Jamie: Yeah it is.

Ryan: That's, that's the, is that the Brachiolope I hear?

Patrick: Question relief.

Ryan: Sounds like a, sounds like a Brachiolope.

Patrick: Is it back to the emails or another audio one?

Jamie: Yeah, yeah, we're back on the emails. Okay, so the next question is from Dennis Murphy. And he is asking what affect does the mass of oceans have on the topography of Earth's surface? And is it going to be significant? Now he did some back of the envelope calculations and got the mass of the oceans to be roughly one seventh of the mass of the oceanic crust. So he thinks that's going to have some effect on the thickness and density, if not on plate formation. Hmm. He also has included the details of his math. If you are so interested in how he came up with his 1/7th.

Charlie: All right, what's the thickness of the oceanic crust? 10 kilometers?

Patrick: Let's see if he includes...

Charlie: 6 kilometers?

Patrick: Yeah, I think 6 kilometers might be about right. Maybe 10. I'm not, yeah, on order of magnitude, 10 kilometers.

Charlie: And then density is $3,000 \text{ kg/m}^3$

Jamie: Yeah.

Patrick: Yeah.

Charlie: All right. So a meter column, a meter, 1x1 meter column of oceanic crust will weigh $10 \times 3,000$ or $10,000 \times 30,000$.

Patrick: Okay, but, but...

Charlie: $10,000 \times 3,000$. So it'd be $10^3 \times 3 \times 10^3$...

Jamie: Break out your calculators Paleo Pals.

Ryan: Is that allowed?

Patrick: I don't even know why, I'm not even sure it's necessary.

Ryan: Isn't the question about...

Charlie: So, so, a meter, meter column, a 1x1 meter section of oceanic crust would be $3 \times 10^7 \text{ kg}$. And then how deep is the water?

Ryan: Wait, why, I'm confused why we're going through all this.

Patrick: I think less than, cause Charlie's trying to compare the density of rock to the density of water.

Ryan: But the question's about erosion, right? Like what's the topography...

Patrick: No, it's not about...

Jamie: The mass of the oceans on the topography. Not really

Patrick: Yeah, but he's curious. This is like the ocean water weighing down the oceanic crust to the point that it's, it's lower. And the continental crust is higher.

Ryan: Okay.

Patrick: Which I think is really no.

Charlie: Yeah.

Patrick: Like continental crust is so much lighter than oceanic crust anyways, that...

Charlie: Yeah, I'm gonna say it's one, it's 1/10th, the mass, the column mass of water is one 10th of the column mass of rock.

Ryan: Well, Charlie, did you know that Greenland is rising?

Ryan: Yes, I did know that.

Ryan: Considering you told me.

Charlie: There's no ocean on top of Greenland.

Ryan: Considering you told me that that's, ah, yeah, I'm not surprised you know that.

Charlie: Yeah, so but that's an, that's an excellent point, Ryan because if the amount of water or ice on top of Greenland changes, then the topography of Greenland changes and ice has the same density, basically, as water. And so that

means most definitely, water does affect the height or topography of the crust.

Patrick: Charlie, I think you're right. The, like the absolute topography will change. Like the oceans as a whole would rise up a little bit. But relative topography under the ocean is probably not going to change, right.

45:02

So mountains will, will in the ocean, will rise whatever, 10 meters as well the valleys, right? So relative topography should mean the same.

Charlie: Well, if there's no water there, at least near the, near the continents, the topography would change because a lot of ocean floors, relatively smooth knew the continents because of all the, all the sediment that's running off the continent. So if you look at like, the Louisiana Delta, it's, it's smooth out there until you get to the deep ocean. And that's just because you have this constant deposition of sediments being washed off the continents. But so if there wasn't water there, you might have more like alluvia fan like surfaces rather than delta like surfaces, but...

Ben: I've got a question. So does like ocean currents, put torques on ah, on continental plates? Like, you know what I'm saying?

Ryan: Torque?

Ben: Yeah, that kind of moves around with like Coriolis forces and...

Charlie: That's a good question.

Ben: Does the Horn of Africa feel like a torque?

Ryan: Hmm.

Patrick: I don't know. That's a good question. You know, um, I don't... maybe you know, the, I have no idea. The only thing I know is that like the Pacific plate, the currents, where the Pacific plate and the North American plate contact right along

the San Andreas Fault, like that is, the current right there are going the same direction the fault is, right. Is that right? No, that's not true. They're going the opposite.

Charlie: Yeah, it isn't true, cuz it's...

Patrick: Yeah. So probably not Ben. Because of, like South, South, Southern California is moving towards San Francisco. And the currents are going the other direction. But so it's possible that it has some kind of affect, but it must be negligible compared to what the plates want to do. Anyways. Yeah, I don't know anything about this...

Charlie: Good answer. What it actually is moving, the plates, it's, it's this forces and torques from the...

Patrick: Yeah...

Charlie: Overturning and convection of the mantle and lithosphere something...

Patrick: Yeah, well, partially...

Charlie: ...centers that create pressure and push plates in different directions.

Patrick: Right and then a lot of, it's thought that a lot of cool when the plates right underneath, say, the oceanic plate or whatever just got subducted underneath continental crust...

Charlie: Oh yeah, temperatures...

Patrick: ...that cools off, it pulls, it pulls everything down and...

Charlie: And makes them more dense so then they're heavier...

Patrick: ...so that's, so once you get that started that, that might control a lot of it. But basically, it's really similar to convection in a boiling pot of water. A lot of people think.

Charlie: I think maybe a very loose hand wavy general answer to this question is that the density of rock is three times the density of water. So yes, water will sink the topography of the crust a little bit but not that much. Yes, water may push on continents but not nearly as much as the rock is pushing on the continents just because rock is heavier, denser. But yeah, I'm stumped.

Jamie: Stumped again.

Patrick: Somebody has been typing.

Jamie: Yeah.

Patrick: I think, I think it's Ryan.

Ryan: No, I just, I...

Jamie: He was checking his email.

Ryan: I gave it everything I had with my Greenland joke. I have nothing left. That's all

Jamie: All right. Well, we can go to the next question. I calculated my scoring, my points on that one anyways. So the next question actually is pointed towards, just, it's a generic question. Or rather, it's not really I guess it doesn't really it's just going to be a yes or no really. "My dad is a big Radiolab fan. And I was wondering if I got special paleo points or something if I managed to convert him to Science sort of.

Ryan: Hark, a Brachiolope!

Jamie: Exes-non is the one who asked this question and they said they sent this to Ryan specifically because he thought he'd see the humor in it more than the other Paleo Pals.

Ryan: What was the question? I was listening to the Brachiolope.

Jamie: Does his big, does he get points if he converts his dad to Science sort of?

Charlie: From Radiolab.

Ryan: Oh.

Jamie: Correct.

Ryan: Hmm...

Charlie: Well, luckily, podcasting, listening to podcasts isn't a zero sum game. You can listen to two podcasts. And also Radiolab may have higher production value but we have several more podcasts. We put one out once a week.

Ryan: We also are actually scientists. Which I always thought...

Ben: What, who are the radio people?

Ryan: They're they're radio, they're, they're science reporters and radio people. Like, they're not science...

Ben: Oh.

Ryan: They're science, they're radio people with an interest in science whereas we are science people with an interest in podcasting.

Ben: Oh, we're way better than that, right? Cuz like radio people, can't, journalists can't shoot from the hip when they get asked weird science questions. Where a scientist can. And so it's more fun and better.

50:06

Patrick: We're proving our worth. Yeah. But you know, like, like we were saying, you don't have to convert your dad, you just have to get him to listen. He doesn't have to stop listening to Radiolab. He just has to start listening to Science sort of.

Ryan: And if you're worried about points, yeah, I'll send you a prize pack. No problem. Prize pack, if you, if you, I'll send you two prize packs, one for you and one for your dad. That's, if a prize pack is what it takes to convince your dad, yeah, sure,

prizes. No problem.

Ben: Surprise packs are sweet.

Patrick: Yeah, yeah.

Ryan: Yeah. That's right. Ben got a prize pack.

Jamie: Really?

Ryan: Yeah.

Ben: That's right.

Ryan: What did you do to get a prize pack? I don't remember. Something awesome.

Jamie: You're very allusive.

Patrick: We've got to step up the prize packs.

Ben: I wrote a journal, I wrote a review on some kind of Podcast Alley. Right?

Ryan: Good job you.

Ben: Yeah. You're gonna have to go back to the Museum of Creation to get more of those prize packs.

Ryan: Don't give away the mystery.

Patrick: Just take it on faith. We'll send you a prize pack.

Ryan: And it's an awesome prize pack.

Jamie: An awesome price pack.

Ryan: And I agree, I agree wholeheartedly with Charlie, um, there's no time slot. You know, we're not competing for the 9pm Monday slot with Radiolab. You know, you want to listen to radio, and I go through moods where I want to listen to a certain type of podcast. You know, sometimes when I listen to a podcast about comics, sometimes science, it's not consistent, it's not super regular, but you know, I just listen to what I'm in the mood for at that moment and Radiolab and our show is very similar, but the differences are profound enough that I think we can fill different niches in your father's podcast listening to lifestyle.

Ben: Do they drink beer on Radiolab...

Ryan: Never.

Ben: While they talk about how good the beer is or is it one of these public radio things where they're not allowed to drink awesome alcohol on the radio.

Ryan: Well, because it's public radio, they're probably allowed to drink like a Pinot Grigio or Chardonnay.

Ben: Yeah but then they have to spit it out or something.

Ryan: Right, like into a spittoon thing.

Jamie: They just spit it out.

Patrick: Exactly.

Ryan: Because it's not good enough. It's probably where Justin is now sippin' on some some kind of Pino situation with Robert Krulwich.

Jamie: Yeah. Well put Ryan. Alright. Well, I guess we are going to go to the next question, which is actually my favorite question. And it is from a couple of guys that are from India. And they wanted to know, this is really specifically actually aimed at Patrick. They want to know, if somehow magically, if all of the Paleo Posse needed liver transplants, except for you, Patrick, and you had two livers who would you give

the second liver to? Basically, if you had to pick, who would you say. By the way, you can never drink again if you give away your spare liver, so you have the option to not give the liver...

Ryan: Wait...

Jamie: ...because drinking is so important to you. Yes, Ryan, this question has been asked in two different methods.

Ryan: No, no, no I have a point to make, a scientific point to try and score some...

Jamie: Oh, science points, got it go.

Ryan: Patrick could...

Patrick: Give a piece of my liver away, chop it up and give it...

Ryan: A liver can...

Ben: And then it would grow back....

Ryan: Exactly.

Charlie: Yeah, yeah.

Ryan: A liver, a liver is like an earthworm, it can regrow from a single piece. Do I get Ryan's points for scoop, scooping him?

Ryan: No Ben, you lose points for being a jerk.

Patrick: Didn't we, we both scooped him at the same time.

Ben: It's true...

Patrick: Clearly Ryan doesn't think he's in line for the whole liver.

Ryan: I'm just saying, I don't need much, Patrick. I just need enough to regenerate a new liver. Are you and I even compatible? I don't know. I might not be, what's your blood type? It's like O double negative?

Jamie: No.

Patrick: Mine is O positive.

Ryan: Because you're so negative Patrick.

Jamie: He's not, oh, wow.

Ryan: Well, he's...

Patrick: Alright, well, we're down, we're down to two.

Ryan: You, you, double negative, I'm not gonna deal with you bullying me for a...

Patrick: For for hypothetical liver.

Laughter

Jamie: Who knows, maybe he does have two.

Patrick: Mmm hmm, huh, well, I do from a scientific perspective, I guess it'd be important to save one of the physicists, I suppose.

Ben: Right.

Patrick: Although Ryan and I, Ryan and I were the original two Paleo Pals.

Jamie: So to save the show.

Patrick: Yeah, to save, and Ryan does a lot of the, I think you'd have to go to Ryan just, in order for Science sort of to continue.

Charlie: I agree with that. I would, I would refuse. I'd lay myself down for the sake of the show.

Ryan: Wow, Charlie, you would die to keep the show going. You know, Charlie in the...

Patrick: He would die not to have to edit the show on a weekly basis.

Charlie: Yeah, exactly.

Laughter

Ryan: We would send you to that um...

Charlie: There's actually no altruism there, it's purely selfishly motivated.

Ryan: Well, you know what, you know, we'd do, Charlie for you, is we would send your body to beer from bad, to be preserved in alcohol in a giant beer pool. That place, that place in Austria.

55:00

Charlie: Do like, with people, give a discount? Well you get the four, four dudes can get a discount, right? So without...

Ryan: You get, you get the discount if you, no, you don't get, the get a discount...

Charlie: Oh, it's not discounted, it's like a deluxe package.

Ryan: You pay a little extra for the meat spread.

Charlie: Would they have to pay a little extra to get to have me dead in the, in the beer pool?

Ryan: If we claim you had healing properties?

Charlie: I do.

Ryan: Oh, well then yeah, for sure.

Charlie: All right, I'll my...

Ryan: Wait, is Ben willing to die for the show? Is Ben's liver being put on the line here? Is Ben's liver...

Ben: I live...

Patrick: Ben doesn't drink, his liver is fine.

Ben: My liver's healthy.

Ryan: So you're saying...

Patrick: He's got Canadian medicine.

Ryan: That's true. Free livers for everyone.

Ben: I would just be taking Patrick's liver as like a pet and keep it on my desk.

Ryan: I see...

Jamie: A souvenir.

Ryan: Yeah, Ben goes and is like...

Ben: That's right.

Patrick: I need an American liver.

Jamie: There's America liver right there.

Ryan: I see Ben going into the hospital and being like, I need new liver and why don't you do the kidneys while you're at it? They're feeling a little bit sluggish. I'm not peeing as often.

Jamie: So we have a great question from Sean from Missouri. He wanted to just ask about how you guys had talked about invisibility by bending light, which got him thinking that if eventually this light bends in the visible spectrum, then wouldn't it be the perfect defense against the lightsaber since a lightsaber is supposedly just light?

Patrick: Ah, I, if you, I mean, if you had a suit that would bend light, I guess it would work.

Ryan: So he's asking about invisibility? Say it again.

Patrick: Well, see, he was asking, you know, we did that, we did that story where people are bending light around objects so that they appear invisible.

Ryan: Yeah.

Patrick: And right now it's only happening in non visible light spectrums. But this guy says, well if it, if we ever get it working in visible light spectrums, wouldn't it defend you from a lightsaber?

Ryan: I mean, wouldn't a mirror...?

Ben: Okay, no...

Ryan: Wouldn't a mirror defend you from a lightsaber. It's just light.

Ben: Yeah, right. But it doesn't, right? I mean they cut through metal all the time. So in the first cup, I mean in the fourth, I don't, what order are you supposed to say it...

Ryan: You say...

Ben: The one with like...

Ryan: Bad trilogy and the real trilogy.

Ben: So in the first one of the bad trilogy...

Ryan: *The Dark Times*.

Ben: They're cutting through metal things the time, right?

Ryan: Yes.

Ben: And metal's pretty reflective. It doesn't really, but, I mean, they, it goes through like a hot poker in butter. So it's obviously hot as well as being very bright. All this light and stuff, some kind of plasma...

Ryan: It's probably a plasma, right Ben?

Ben: Well, I mean, yeah, so...

Patrick: Okay... continue... no, I think...

Ben: Right, so I mean, if it was, if it was just metal, they wouldn't have all that much luck. Just shining a light on it so it's also really hot. So no, it would, it would melt any optical properties. I mean, it's, it would just, it would burn you as well as cutting you with awesome photons. Somehow. I should, I usually have more prep for these weird physics sci fi questions.

Ryan: The whole point of the show, Ben, is that you have no prep.

Ben: It would cut you in half instead of going around you, because it's not a laser it's a light sword that is really hot. So if they can cut into a metal thing, then they can cut through you.

Ryan: Not if I'm wearing a mirror.

Ben: It would cut through a mirror, that's what I'm saying.

Ryan: No, it wouldn't.

Ben: Well, why don't they have like a mirror shield? Like why don't these Star Wars people have, like, mirror colored armor?

Ryan: Oh, I have a really good answer for that. George Lucas is a terrible writer. How about that?

Charlie: Yeah. Some total logical inconsistencies with...

Ryan: Yeah, how about we can't trust George Lucas with technology and/or dialogue that supposedly coming from humans.

Ben: I'm just saying you should trust him insofar as he didn't give everybody mirror shields to deal with lightsabers and also lasers.

Ryan: Because...

Patrick: This is a long time ago. I don't remember any mirrors in the movies.

Ryan: Because the Jedi, well, it's because every mirror is a green screen. Stupid, now I'm just now just mad.

Ben: There must have been a mirror.

Ryan: Now I'm thinking about...

Ben: Yeah, also, C3P... or, yeah, C3PO's really shiny. He should...

Ryan: He doesn't get ever get attacked with the light saber.

Charlie: Who asked the question?

Jamie: It was Shawn from Missouri.

Charlie: Yeah, so didn't Shawn put in the email. If the lightsaber is simply made out of light, then wouldn't this deflector block the lightsaber...

Jamie: Since a lightsaber is supposedly just light.

Charlie: Yeah, so I agree with Shawn. If it is supposedly made out of light, then, then some sort of suit that could bend light around it would be a perfect shape.

Ryan: Maybe that's what happened to Obi Wan. Maybe he never died. He just turned on some sort of light diverging technology. So he appeared both invisible and dead.

1:00:01

Jamie: Hmmm.

Patrick: He's really just invisible.

Ryan: Right? But he would appear invisible and the lightsaber wouldn't actually damage him. Maybe that's why, maybe that's why Obi Wan did the force disappearance and Qui-Gon got stabbed in the gut. Because that's one of the, that's one of the biggest inconsistencies. Is the first time we see somebody killed by a lightsaber. Their entire body just disappeared and they become a force ghost. But Qui-Gon gets stabbed straight through the thing, and then Obi Wan cradles him as he dies.

Ben: They explain that. Well, I mean, Qui-Gon teaches, well the ghost of Qui-Gon teaches Obi-Wan how to do it, right? And then Obi-Wan doesn't have to get hit cuz he's magic instantly.

Patrick: Hmmm.

Ben: That makes it, okay, but here, hold on, hold on. I've got a physics answer. Supposedly...

Jamie: Oh. Extra points.

Ryan: Wait, did you look something up Ben?

Ben: No, I used my head. Come on. Alright, so...

Jamie: He looked something up in his brain.

Ben: Yeah, well, okay. So, so supposing that all your light, somehow, is in a straight beam back and forth. Before you, oh, wait, I think the orders of magnitude are all messed up. Anyway, I'll just say this because it sounds like it makes sense. And nobody's actually going to do the math so I can stand by it. Okay, so since in your, in your, in your lightsaber, all the photons are essentially lined up in a straight line, all the heat in it is going back and forth between the two ends of it instead of diffusing out and dispersing. And then if you hit someone with it, and this person is wearing some kind of light cloak, suddenly, all the photons in your laser sword, even though it's made of light, get really, really dispersed. So you're increasing the entropy of these photons. So there's some kind of heat interaction between you and the photons, which means that either you're gonna get cold or you're gonna get melted by all these photons that are bouncing off of you in this weird way. So because there's some kind of heat transfer a you'll still get affected even though, you know, you're just made a mirrors.

Ryan: I gotta say, that's actually a really good answer.

Ben: Haha, it won't work.

Jamie: Canada once again.

Charlie: Why wouldn't it be diffusing heat? When it's just, when it's just in a straight line? Why wouldn't it be diffusing heat?

Ben: Oh, I don't know weird alien engineering. So it's not diffusing heat because of some kind of engineering that keeps the ...

Charlie: I mean the elements in your toaster's in a straight line and it diffuses heat perfectly fine.

Ben: Yeah, but the elements in your toaster is diffusing heat because it's supposed to, right? So, somehow...

Ryan: Plus, some lightsabers have a crystal in them Charlie.

Ben: Lightsabers are somehow really hot without...

Ryan: Crystals...

Ben: ...you know, burning everything that comes near it, but doesn't touch it.

Ryan: Crystals.

Ben: Right. You don't see people's hands getting melted when they're holding the laser sword. It's only when they put their hand in the laser sword that their thing gets melted. So that talks about some kind of weird going on inside the laser sword and you're going to disrupt that when you hit somebody with it.

Ryan: Well, that's something I always wondered about with the lightsaber. It must be really difficult as a weapon, because the only thing that would have mass would be the handle of the lightsaber itself. So it must be pretty. I mean, it must actually be pretty difficult to use. I don't, you know, not that it's impossible to learn how to use it, but it would be very unintuitive because the blade itself would be massless. Unless it's, unless it's a plasma.

Charlie: It does what it does, because it's designed to do what it does.

Ben: Probably massless, but it still has some weird inertia.

Ryan: You think? Does light, I mean, do photons have enough inertia to matter?

Ben: Yeah, but it's not. It's really,

Ryan: I didn't mean to do that. That's just the quality of the show.

Jamie: Right.

Ben: I'm done answering this question.

Ryan: Okay.

Jamie: I'm really excited about this next question.

Ryan: Lay it on us quizmaster.

Jamie: Okay so this is from Jacqueline F. The effects of coastal sea level rise are a concern for many scientists, particularly in the New York City area. The Museum of Modern Art in New York City has an exhibit called rising currents where they suggest the use of soft infrastructure vegetate, vegetation to prevent the flooding of New York in the event of a storm as opposed to storm surge barriers. Would vegetation really help in the event of a flood? Do you think that is the best option?

Patrick: I don't see how that's gonna help.

Patrick: You're gonna have saltwater intrusion as well, which is going to kill majority of your vegetation. Unless you specifically choose hailefidic plants and I still don't really see how that's gonna do much for you.

Charlie: Yeah, when I think of vegetation, used as a means of flood prevention, it's mainly used on land and off of, land, land runoff. So, like, do you use it to stabilise slopes and it enhances and evapo transpiration and it diminishes runoff and erosion.

1:05:09

But as far as blocking the ocean, I don't think it could do much. It might block waves and storm surge things. I mean, mangroves do that. But as far as like just total sea level rise versus location of city streets in New York City, I don't think it's gonna help. So I mean, in, in Oregon, we have huge problems with, with logging because then there's no more vegetation on the steep coastal mountain slopes. And so then these roots aren't stabilizing the slope anymore, so then all the sediment gets washed down when the rains hit, and then you get these big mud slurries that can flood towns. Whereas, if the trees were there, yeah, if the trees were there, that wouldn't happen. So vegetation does very important things with flood prevention on land. I don't know if it does things for coastal shorelines.

Ryan: Cuz, I mean, that mud slurry. It's not just like a tidal wave. It's got, it's got its own physical properties that are really kind of strange, counterintuitive and deadly.

Charlie: Yeah, it's got, like cars and houses all part of it.

Ryan: It's a big, I mean, it's a problem in West Virginia too, because of the mountaintop removal type mining, which is just awful for the state. But what are you going to do?

Patrick: Right.

Ben: Is it because there's a whole bunch of sediment inside the, inside of the water, so the density is way higher?

Ryan: Yeah.

Charlie: Yeah, it can, it can train more sediment because it has more inertia.

Ryan: It's like a non-Newtonian, a non-Newtonian fluid at that point.

Ben: So hitting it with a hammer does nothing hitting with a hammer makes it harder. I can't swear on the...

Ryan: Yeah you can, also you got kind of garbled, so it's all good.

Ben: Okay.

Charlie: It sounded like a quack.

Ryan: Well, you know what we need is we need a bunch of Ben's friends, the beavers, to come down and build dams around all of our cities on the coast. It seems like, it just seems like the problem becomes comes down to almost scale. Like, too many humans live near the coast. There's no, there's no solution other than just moving us all farther inland, that's gonna be a guaranteed prevention of damage from rising sea levels of warming.

Patrick: Yeah. Um, some of those other exhibits basically had the city built on floating things.

Charlie: Like Venice?

Patrick: Yeah.

Ryan: Yeah, but Venice isn't exactly sustainable.

Patrick: Yeah, and it was more floating than that. Venice is just built on mud.

Charlie: Stilts, yeah.

Patrick: This was actually, things, that if the tide came in, they would, these things would all float, the buildings would...

Ryan: The Aztec capital of Tenochtitlan did the same thing as Venice, kind of, too.

Ben: Yeah.

Ryan: I'm just going for points.

Jamie: Forward.

Ryan: Yes.

Jamie: Forward.

Ryan: I knew I could count on you Jamie.

Jamie: Hahaha ha haha!

Patrick: Next.

Jamie: Alright.

Ben: ... oh god...

Jamie: No, Ben, finish your thought.

Ben: Well yeah, if you wanted to put floats on your buildings wouldn't that take like a huge, you need to put several stories worth of Styrofoam or something under the building to get it to float.

Ryan: Finally a use for styrofoam?

Ben: Yeah, it's, all that plastic, we should, err, in the ocean and take foam out of it to float our terrible cities.

Patrick: Yeah, like that guy who built his island that has old soda bottles.

Jamie: That thing survived the hurricane. I want to live on that island.

Ben: When was that?

Patrick: Um, you can, you can YouTube, I'm sure if you just type in YouTube soda bottle Island, you'll, you'll find it but this guy built his own, his own island and his little hut on top of it. And it's, where was it, off the coast of Mexico or?

Jamie: Yeah, it was. It was definitely in the Gulf, wasn't it?

Patrick: Yeah, I think so.

Ben: Did he just finish off it and eat all the delicious fish that came and lived under his island?

Jamie: I mean, why not, right?

Ben: Yeah, like, like seaweed grows on anything that floats, like on the bottom, and then you get these huge colonies of fish.

Ryan: Yeah, that's true, that's true.

Ben: And then...

Patrick: His idea was eventually sort of sail around on it, but I think it had been it had been anchored through the point I saw the video anyways...

Ryan: Also in the book, *Snow Crash* the Neil Stevenson book, there's like an island of ships...

Charlie: And trash...

Ryan: ...all lashed together, which I think he got from the, the, the kind of urban legend about the Pacific Island trash heap.

Charlie: Central Pacific trash...

Ryan: Which I've heard is not real.

Charlie: It's real.

Patrick: Yeah, it's there.

Charlie: It's totally real.

Ryan: Okay.

Charlie: It's not like an island though. It's ah area of concentrated trash and plastic particles.

Ryan: Okay. I have yet to see a photo but...

Charlie: But yeah, take a cup and scoop up the water, it's gonna be full of micro-plastic filaments.

1:10:01

Ryan: Micro-plastic. So not visible to the naked eye.

Charlie: It's visible to the naked eye but...

Ryan: Send me a picture.

Ben: Yep. The plastic...

Ryan: Okay.

Ben: It gets all flakey.

Ryan: Okay.

Ben: Yeah.

Ryan: I mean, you know, whatever. I'm just I'm just being skeptical.

Ben: It's terribly depressing.

Jamie: Hmmmm. All right. Well, I'm going to throw out the next question.

Ryan: Do it.

Jamie: And it is from Sam. For a while now he's been wondering what the difference between an MRI and an fMRI is? Can anyone here can answer that question?

Ryan: The F stands for functional.

Patrick: It does?

Ryan: I said it first.

Ben: Oh...

Ryan: You may agree Patrick, but I said at first.

Patrick: No, no, I'm, I'm questioning I'm not...

Jamie: ... know where you get your information.

Patrick: I'm not denying...

Ryan: That the MRI would be scanning.

Patrick: So it's functional, it's functional. It's a functional MRI, so that a regular MRI is not worth doing.

Ryan: Okay. So the difference is, as far as I understand it, so the MRI stands for magnetic resonance imaging.

Patrick: Okay.

Ryan: Um, and so an fMRI, from what I understand, is like a live, like you have x-rays and then you have live x-rays. I don't know if you guys have ever seen a live x-ray machine where it's like *Total Recall* where you stick your hand in front of it, you can see the bones moving in real time. So that's how I understand the difference between an MRI and fMRI. So an MRI, an MRI takes an image and fMRI can take a series of images over time.

Patrick: Like, almost like a video.

Ryan: Yes. But of brain activity.

Patrick: Right?

Ben: I'm gonna look this up so that I can give a better explanation because this is the kind of, I mean, I should I'm a physicist, I should know this crap.

Jamie: They're just trying to keep you on your toes Ben.

Ryan: Keep you on your brain toes.

Ben: Well, I, I fell asleep during these talks when I was an undergrad.

Ryan: Ben. You're not supposed to admit that...

Jamie: We all wish...

Ben: I was really...

Patrick: That's why I had to go to grad school.

Ryan: To learn more.

Patrick: Yeah, to learn all that stuff you missed the first time.

Jamie: Yes.

Ben: It says that they use, I think fMRI, they use to, to, to poke different materials than the normal.

Ryan: What does the F stand for Ben?

Ben: They use it for, well, functional. I knew that.

Ryan: Well, I knew that.

Patrick: Okay, so some of Ryan's points...

Ryan: Some of...

Ben: Yeah.

Patrick: We're seeing where this is going here.

Ben: It says it measures hemodynamic response.

Ryan: ... that's movement...

Ben: Yeah, well, okay, so no, it says, you know, it measures, it measures blood. So no more MRI, what they do is they send in a little pulse of magnetism, that kind of demagnetizes all of your well, so, so all of the atoms in your body have little magnets at the center of them because there's, there's little positive charges spinning. And so when you hit them with kind of a magnetic pulse They all kind of reorient themselves. And it takes a couple seconds for them to line back up again. And from the amount of time it takes them to line back up again, your Magnetic Resonance Imager can tell what you're made of.

Ryan: To me that sounds a lot like photons hitting a piece of film.

Ben: Yep. Oh, ah, yeah, but this is a lot subtler, and also this can penetrate solid matter, right? So it's like, it's kind of like that. But anyway, so you hit em, it's like, it's like hitting a bucket or a, full of something, to find out what's inside. So you're tapping the body with magnetism. And the response, the amount of time it takes to remagnetize itself tells you what it's made of. And so from that, you take a three dimensional scan to figure out how long it takes different parts to realign itself and you can tell what the body is made of where you get a three dimensional image. And it sounds like fMRI does this but specifically, it it sends some kind of pulse that blood registers to specifically. And so you can use that to figure out where where the bloods moving around, say in your brain or in the spinal cord or really sensitive places. So they say they, they use it mostly for neuro imaging. So that's the difference. One is specially for blood and the other I guess they just use for regular...

Ryan: Blood is always moving though Ben.

Ben: Yeah, but it moves in different places, depending on what your brain's thinking about, right.

Ryan: Hemodynamic. Blood moving...

Ben: Yes. Right. So if you think...

Ryan: ... blood moving, Ben movie.

Ben: If you if you think about pretty women, the blood goes to a different part of your brain than if you think about Godzilla or if you think about...

Ryan: I thought you were talking about *Pretty Woman*, the Julia Roberts movie.

Ben: Yeah.

Ryan: What kind of, what kind of blood are you talking about? That movie is about a lady of the evening.

Ben: Well, no, the, that's I mean, that movie is about the blood flowing to the sleepy parts of your brain.

Ryan: I wasn't...

1:15:00

Ben: I get a point for that one, right?

Patrick: Oh, good one. Good one Ben. Point.

Jamie: Point.

Ben: Okay.

Jamie: Okay, so Sophia had a question. Um, she just listened to the zombie segment. Um, so she has been inspired by the zombie segment. She hasn't read the paper yet, but is there some sort of way for zombies to die naturally? If they are the reanimated dead then aren't they in a constant state of decomposition, making a zombie only viable for a period of time, likely in relation to environmental factors? Now if this is the case, you could postulate that tropical climates would be less susceptible to sustained infection rates for the temper, temperate climates, and then a combination of waking up zombies and killing them could work as well.

Patrick: Yes, so she thinks zombies are just going to rot away eventually because they...

Ryan: Well, they can't heal. Yeah, it's true.

Patrick: Right. Which I, you know, I, lots of comics and movies would suggest this they sort, limbs sort of fall off...

Ryan: We gotta, we've got to define exactly what we, what type of zombies we're talking about, you know?

Ben: That's right.

Patrick: I think we're George Romero zombies.

Ryan: Well George Romero zombies are living, so they're dead, they're people who have died and then are reanimated by some force that's causing them to be a zombie. So they're already technically dead. Right We're not, we're not talking *28 Days Later*.

Patrick: Right.

Ben: *28 Days Later* zombies they, you know, what, in the movie that lasted 28 days, right.

Ryan: No, no Ben. That's not, that's not why the movie is titled that.

Ben: No, well, yeah...

Patrick: I thought that's roughly why it was...

Jamie: Yeah...

Charlie: No, it's because he woke up from a coma 28 days later.

Ryan: Thank you Charlie.

Ben: But then 28 days after that they all starve to death, all the zombies.

Patrick: Yeah, I thought, hold out for about a month...

Ryan: The sequel, the sequel...

Jamie: Huh...

Ryan: The sequel is *28 Weeks Later* and that's...

Jamie: Ahhh.

Ryan: Ben.

Ben: But, but, in the Romero ones they're wandering around for a long time afterwards. Plus, they violate one of the laws of thermodynamics, right? I mean, there's no maintenance inside their body. So they should be, they shouldn't be able to move after, like, a day even after coming, back from the dead?

Ryan: Right, the muscles, rigor mortis.

Ben: That's right. And they're tearing muscle fibers that aren't getting repaired and stuff.

Ryan: Yeah.

Ben: So their bodies shouldn't be doing that. So there's something...

Charlie: Yeah, they should be being pointed towards entropy.

Ben: Yeah, right. So there's something, supernatural, causing them to move around and bite people.

Ryan: Or, let's not go supernatural right away, Ben.

Ben: Well, it's violating one of the laws of Thermodynamics.

Ryan: Unless, unless there's some sort of internal metabolism that is as yet unknown that is giving them enough repaired tendons and fibers and muscle liquids to keep them mobile.

Patrick: Like midichlorians.

Ryan: Midichlorians Ben.

Ben: They're powered by light sabers?

Ryan: They're powered by powered by the Force. This zombie's got a midichlorian count even higher than Master Yoda's. Stupid Qui-Gon.

Ben: The lady's question was good though. What is it *World War Z*, (Z pronounced as Zed) that zombie book by Max Brooks...

Ryan: What, are you Canadian? It's *World War Z* (Z pronounced as Zee)

Ben: *World War Z* Anyway. So in *World War Z*, they talk about zombies getting frozen in the ice and then reanimating every summer...

Ryan: Up in, not, not in the tropics.

Ben: No, right, in the winter up in Canada, you know...

Charlie: In the, in the real world.

Ben: So it's, in the real world. So you know that having different amounts of time before they fall to pieces is consistent with zombie cannon, though, isn't it, as a result?

Charlie: May, may...

Ryan: But also in that same book, he does talk about zombies in the tropics running away, just to the point where they can't even move or bite because they're so to decayed.

Charlie: Yeah, maybe a zombie isn't one unified, functioning organism anymore. Maybe it's like, you know, those colonies of cyanobacteria or, where, like, different, different cells can adapt different functional forms, even though they're actually individual organisms. So maybe the cells of zombies are, are all individual organisms, and they behave as some functioning form...

Ryan: Well, there's also the...

Charlie: ...in synthesis even though the it's not actually one of...

Ryan: There's also the idea that zombie flesh is so toxic that not even bacteria can bring it, like, it's like styrofoam, basically, like it's, it's outside the realms of what normal bacteria can even decompose.

Patrick: Even so they're not healing themselves.

Ryan: Right, but what I'm saying, if you put, a dead body in a complete vacuum, would it still be decompose?

Patrick: Right.

Ryan: If there was no bacteria that could survive in that environment. You know, it would just be. It wouldn't heal, but it also wouldn't just decay naturally.

Patrick: Right. It's basically the glacier scenario, I guess.

1:20:00

Ben: But okay, I mean, if, ah, I don't know, I think, I think it's implausible to expect zombies to...

Patrick: But they're not in a vacuum, okay, right, they're not in a vacuum...

Ryan: But I'm saying, I'm using the vacuum as a metaphor for being impervious to bacteria getting, getting...

Patrick: Right. Yeah, right. But I think still if it rains, if it, if you just soak a body in bacteria-less water, it's gonna start to...

Charlie: Pass entropy occur because of a degradation of an energy gradient. So if you remove all energy gradients, then there would be no decomposition.

Ryan: The heat death of the zombie universe. Now there's a book, there's a book.

Patrick: Or at least a fake paper. Mm hmm.

Ben: Yeah, well, okay. So yeah, there's all sorts of reasons the cells of the zombie degrade over time. And so they should be falling apart long before they do in the Romero universes. I mean, there's, there's no maintenance going on inside the body or blood pumping and yet somehow these cells are still, these muscle cells are still contracting around, right? And there's no digestion evidently, because

otherwise they would need to eat more food than they actually do. So I figure something, they're supernatural beings, so we shouldn't expect them to decay like supernatural beings until they completely fall apart.

Charlie: Yeah, I think it's the same answer as the lightsaber, these things actually don't exist. Yeah,

Ryan: What Charlie... afraid. Let me tell you a little bit about Voodoo and fugu.

Charlie: Hoodoo...

Ryan: Because there's the Haitian priests that use the neurotoxin, neurotoxin of the blowfish to put people in that, in that crazy state of like, the pulse and respiration are so low that you can't...

Charlie: The same journalists that check out the, the toxic island, the Vice Broadcasting Network, they also do a segment on the Haitian zombies.

Ryan: So...

Ben: But Haitian zombies aren't man eating zombies. I mean, we should distinguish here that they're not the, the terrible man eating monsters. These are people who are enslaved through brain damage.

Ryan: Yeah, so they're not...

Charlie: Way to make it sound bad.

Ryan: I guess is the point yeah.

Ben: Yeah, they're not undead so I mean... just like anybody else who doesn't get fed food. Poor zombies.

Patrick: Okay.

Ryan: Wait, did we answer that question?

Charlie: I think we degraded it beyond all recognition.

Ryan: Entropy.

Patrick: Yeah.

Ryan: Second Law of Thermodynamics. Go!

Jamie: Hmm. So we have two more questions and they're both audio. So I'm going to go ahead with the first one. It's Sam from Maryland. "Hi, this is Sam, 13 year old listener from the Bethesda, Maryland. I was just calling with a few questions for you guys. So my first question is, where did you get the theme music that's at the beginning and end of every show. I know for example, that the Skeptics Guide to the Universe use your music and also I was wondering how you guys really figured out, well, I guess my question is how do mole rats keep warm because they just seem to be this Science sort of animal and keeping warm seems to be one questions, keep good work and keep the science and geek flowing. Thanks. Bye."

Ryan: Well Patrick, don't you answer the music question.

Patrick: The music question, we, well, when we first were looking for a theme, we decided it would be worth our while to purchase rights to use a song so that if someone got angry later, that if we actually ever made it big and people were angry that we were using their music, we thought that would be a shame to have to change the intro music so we went out looking on the internet for where you could buy rights to music cheaply. And so we bought the rights to some music called JS Bach Breakbeat. So I assume it's a, it's a take on some Bach tune...

Ryan: Bach-Tune!

Patrick: ...I'm unfamiliar with and, yeah, so we we don't own an exclusive rights to that music. It could be used by lots of other people who pay to sort of rent it. But that's, that's where our theme show music came from. And what was the mole rat question? How did that go?

Charlie: How do they keep warm?

Ryan: They live underground.

Patrick: Yeah and I assume they're kleptothermic as well. I, they're mammals, they keep warm the same way...

Ryan: But I think he's, I think he's concerned because they don't have fur. But they may not have fur but they live underground in Africa and underground is actually a pretty consistent, a pretty good way of maintaining a temperature which is why a lot of reptiles burrow.

Charlie: And it's why we keep wine underground too...

Ryan: Because we want it consistent.

Charlie: ...in a wine cellar. Stays the same temperature.

Ryan: Consistent, that means the same.

Charlie: Do they handle together?

Patrick: Yeah, they're hive like...

Ryan: They're eusocial.

Charlie: Take turns on the outside.

Patrick: Probably.

Charlie: On those cold African nights.

Ryan: Does it get cold at night in Africa.

1:25:00

Patrick: I guess it gets cold at night in lots of...

Charlie: Arid environments. It's all altitude dependent.

Patrick: Yeah, that's true too.

Charlie: There are snows on Kilimanjaro.

Patrick: Were.

Jamie: Were. Mm hmm. All right. Do we want to go on with the next question?

Charlie: Yeah let's...

Jamie: It's Danielle from Illinois. "Hi, Paleo Pals. This is Danielle from Ithaca, New York, aka Davan on Twitter. And I have a question for you guys. I love it when you talk about dinosaurs and I work in bio acoustics. So my question is, dinosaurs in the movies always have nice, big roars. Do we know anything about actual dinosaur vocal tracks and if they really were like that, thanks, love your show. Bye."

Patrick: Right, so I guess that's Ithaca, not Illinois. Ah, we know a little bit about dinosaur noises. We know that they probably made noise. That's because their close relatives, the birds are sort of famous noisemakers and their next closest living relatives, the alligators and crocodiles also make this rumbling, mating, song noise. So somewhere in between those two noises I guess you would come up with a dinosaur roar.

Ben: Can you imagine T-rexs singing to each other like sparrows?

Patrick: Not really. I assume that noise is more like the alligator rumble.

Ryan: Um...

Ben: But you're assuming, I mean, it could be awesome.

Ryan: I was the one who, okay, wait. So I know where they got the noise for the T-rex roar in *Jurassic Park*.

Patrick: Well, yeah, but that has nothing to do with real dinosaurs.

Ryan: I'm just trying to throw out, trying to throw out facts to get points, Patrick. You're not...

Patrick: Okay.

Ryan: This is how the game is played dude.

Patrick: All right.

Ryan: The the roar of the T-rex in *Jurassic Park* is a mixture of lion, tiger, alligator. Because not, not many people might know but Patrick can back me up, but alligators roar.

Patrick: We just talked about this.

Ryan: And baby elephant, baby elephant trumpeting is where that kind of high pitched note in the T-rex roar comes from.

Patrick: I thought I had a track of the alligator noise but I...

Ryan: Well this, I mean, people will find, we should probably, maybe post a link to the video. But like when alligators are in mating season they do that thing where they, they vibrate their whole body with the low frequency rumble and the water around them dances.

Ben: Wow.

Ryan: It's pretty cool.

Charlie: Is there a single animal, a single vertebrate that doesn't make noise.

Patrick: Ahhhhh...

Charlie: So just on that...

Patrick: I don't know, fish?

Ben: What about molerats, do they make noise?

Patrick: I'm sure. They probably communicate through telepathy.

Patrick: Yeah, I guess fish don't, don't make noise.

Charlie: Okay, any aerial, any, any non-water based...

Ryan: The mime bird...

Charlie: ...that doesn't make...

Ryan: I don't know. I just made it up.

Patrick: I don't know. I mean...

Charlie: I can't think of one.

Patrick: ...I don't know about salamanders and other...

Ben: Yeah What about salamanders?

Patrick: They probably make some...

Ryan: ...there's a really loud gecko that's on TV all the time.

Patrick: Yeah, yeah, they probably do. Yeah so they probably make some kind of noise. I'm really upset, this alligator, I can't find this alligator track. I guess I got rid of it because it was in my, my iTunes list and it was only you know, five seconds long so it would get played repeatedly. And I get probably get sick of it showing up in my, like, most played playlist and things.

Ryan: So one other comment on dinosaur vocalizations. Certain dinosaurs like some of the hadrosaurs and the lambeosaurs that had the really impressive head crests, it's thought those head crests were actually reverberation chambers for making

trumpet, trombone like sounds. Ah, the Parasaurolophus is the most famous example where it's actually got these tubes that look similar to the inner workings of a brass instrument. So maybe it used those to make some complex vocalizations.

Patrick: Perhaps.

Ryan: Perhaps, I mean, there was a paleontologist that actually tried to build an instrument out of PVC pipes based on the inner, inner skull workings of a parasaurolophus and it sounded kinda like a didgeridoo but who knows.

Patrick: Unsurprisingly.

Ryan: It, yeah, it looks, it looks kinda like a didgeridoo made out of PVC pipes. So what are you gonna do? But there's also creationists that think that the parasaurolophus could have breathed fire and that the the cavities in the skull were mixing chambers for various liquids that it could spit out of its mouth as fire like a some kind of, what's that beetle?

Ben: That's awesome. Who believed that?

Ryan: What's that beetle that does that?

Ben: The bombardier beetle.

Ryan: Yeah, bombardier beetle. Ah, there's some creationists that believe that Ben because there's a movement among the creationists right now that actually intersects with cryptozoology.

1:30:05

Where if, if we can prove that, like dinosaurs coexisted with humans that goes a long way towards proving creationism. So if, if there were people back in the day who claimed to see dragons and we can, and dragons were supposedly fire breathers, and then we can make an argument that this one dinosaur is breathing fire, the creationists can make the assertion that this dinosaur was mistaken as a dragon back in the day, but there were humans actually seeing a living dinosaur. Therefore the earth is much younger than we thought.

Ben: Those creationists sure are creative.

Ryan: Yeah, I know, right?

Ben: They live up to their name.

Ryan: Their strategy, but their strategies for convincing us that they're right evolve over time.

Ben: Well, at least there's evolution in there somewhere. Eventually, they'll see the self similarity between their arguments and the natural world and either give up or think of something even crazier.

Ryan: I think you give them a lot of credit Ben and you're good to do so, you're a nice nice guy for doing so. What's left?

Jamie: That's, that's, that's all I've got. That's all she wrote.

Ryan: Wrap it up for us, Jamie, tell us how we all do.

Jamie: All right, well, I have been keeping score throughout the show. So I'm just tallying it up with a calculator right now. Okay, hmm. It appears the Canadian has won.

Ryan: What!!??

Ben: Oh, yes. You know what this is like? Olympic hockey.

Ryan: I'm gonna drop you from the call.

Jamie: I'm gonna, I'm gonna say, Ryan, you're an honorably mentioned noble person in this trivia show. But basically, when Ben said creative orphans, orphans and stuff, that was the, that was where he won his point. Your, your rebuttal was Mowgli from Jungle Book and I just, you know, you actually got some points deducted for that.

Ryan: What?! That's absurd.

Jamie: So, um, congratulations Ben.

Ryan: Boooooo.

Jamie: You'll be getting a secret package in the mail.

Ben: Thank you. Thank you everyone.

Ryan: Delete both your email accounts before you can figure out which this is.

Jamie: Congratulations.

Ben: My email is ben@sciencesortof.com everyone.

Ryan: Which I can delete Ben. And Ben's password is awesome because I just changed it. So everybody go read Ben's email.

Patrick: I guess we should play the Canadian national anthem.

Ryan: We already played the Canadian national anthem which is... "Oh Canada, our home and sacred land..."

Jamie: Now, Ben, real quick. When do I get my \$50, I'm sorry, because I'm really short on cash.

Patrick: Now, is that Canadian or...

Ryan: You better hope it's Canadian Jamie.

Jamie: Yeah, right.

Ben: Yeah, right, yeah, we're doing good.

Ryan: Wait, who were second, third and fourth place Jamie. Do we even want to know?

Jamie: Ryan, you were second. Patrick was tied with Charlie for third.

Ryan: For last.

Jamie: For last.

Charlie: I want to say something in defense of, for myself and for Patrick. If we did amount of points divided by time speaking I think we'd be

Ryan: Ouch Charlie. I thought we were going to be nice today.

Charlie: Quality over quantity.

Jamie: Yes, in an alternative universe, these results would change.

Ryan: Yeah, that'd be really interesting podcast. Let's all wait 10 minutes while Charlie thinks. If the Paleo Posse only knew how much editing happens so we all sound snappy, like a Kevin Smith movie.

Charlie: I don't know. I'd rather have 10 minutes of silence. Then 10 minutes of blather that breaks my brain.

Patrick: I well, yeah, well, if you want to find out how the Paleo Posse thinks you can send an email to paleopals@sciencesortof.com or email us individually, if you're worried about one of us taking up the whole email, while the other ones get shunted into the shadows, you can send it to us individually at Patrick@sciencesortof.com...

Ben: ben@sciencesortof.com.

Ryan: Not for long.

Charlie: And if you want to send a message without anything in the subject, or the body, you can send it to Charlie@sciencesortof.com.

Ryan: Wait, what? Why don't you want anything in the subject or the body? I don't get it.

Charlie: Cuz it'd be totally silent.

Ryan: Oh, okay. Or if you want to send him once a blather that breaks his brain.

Charlie: I was trying to make fun of myself. It's called self deprecatory humor.

Ryan: Hmmm. Okay, well, Ryan@sciencesortof.com. You can make fun of me there too, I guess I don't know.

Patrick: You can find show notes and other fun stuff at our website, sciencesortof.com. Or you can read our blog, paleocave.sciencesortof.com.

1:35:06

Ryan: We have a blog.

Jamie: Yay.

Patrick: And what's, what's our phone number Ryan, if you want to call.

Ryan: Our phone number, you can call in and talk to us. It's 312-paleopals, which is 312-725-3672. Feel free to keep the questions coming. Just because we've done the quiz show doesn't mean that we don't want more questions, so call in with more questions. And they'll just make it in the regular Paleo POW segment that we do every week, which this whole episode was kind of a one long, extended Paleo POW segment.

Patrick: That's right. So we'll be back next week with more science stories and our traditional Trailer Trash Talk.

Jamie: Yeee Hawwww!

Patrick: But until then...

Ryan: I want to talk more about the blog. That things going well.

Patrick: Do you want to talk about it on air or off air?

Ryan: I was just saying I think it's going well, I think people should be checking it out. I'm just...

Jamie: That zombie lab was awesome. I read that.

Ryan: Yeah Ben, good job. Yeah...

Ben: Yeah.

Ryan: You got picked up by Reddit.

Ben: What, really?

Jamie: Yeah, I liked it a lot, just saying...

Ryan: You got maybe, maybe 10 to 100 times more hits than any of the other blog posts this week.

Ben: All right. Most of them were mine.

Jamie: That was definitely sexy. You know, it was...

Ryan: Sexy zombies.

Jamie: Exactly.

Ben: People like zombies and Superman. I don't know why. Anyway...

Jamie: And Canadians, I don't know.

Ben: Yeah.

Patrick: Might just be the Canadian or...

Ryan: Yeah, it might be. His English is more closer to the Queen's English so people just intuitively.

Ben: Letter U, I don't know what you have against it.

Ryan: You just add a u to everything.

Ben: Yeah, it's not rocket science or...

Ryan: It's not rocket science...

Ben: ...that's right.

Jamie: It's not rocket science or rog science.

Ryan: Rooket science.

Ben: Roucket science it's pronounced

Ryan: It's, it's R-O-U-Q-U-E-T-T-E.

Ben: That's right. Rouquette.

Ryan: Rouquette science. You dork.

Patrick: Oh yeah. Join us next week for Episode 39 where we'll go back to our normal format of science stories, laughter, trailers and more.

Charlie: A whole lot of sort of.

Ryan: The first, it's the first time, we haven't done a trailer.

Patrick: Yeah, I know, but there's a first time for everything.

Ryan: I don't know how I feel about this. *Toy Story 3* thumbs up.

Jamie: Well. I've not seen it.

Ryan: Okay.

Patrick: See you guys next time on Science...

Charlie: Sort of...

Ryan: Sort of...

Patrick: So how does how does it feel Ryan, how does it feel being on the...

Ryan: I loved it. I think it's a great sign off line and I think you guys just need to embrace it.

Ben: It's as pleasant as swimming and mustard. Christ.

Ryan: Ah, mustard's so good though. Like a spicy mustard, Ben? What kind of mustard do Canadians like?

Ben: Ah, we like ah, dijon mustard.

Ryan: Celine Dijon mustard. Bazinga! How many points do I get for that Jamie?

Ben: That was a pretty good zinga.

Jamie: Two.

Patrick: Game over.

Ryan: ...for being a sore loser Patrick.

Patrick: ...time ran out.

Jamie: That's all and thanks for listening to Science sort of. Do the dance. Do the dance.

Ryan: You can get in touch with us at...

Jamie: Oh, that, okay...

Ryan: I just think it's a funny line.

Jamie: You can get in touch with us at sciencesortof.com...

Ryan: No, it's Paleo Pals...

Patrick: paleopals@sciencesortof.com

Ryan: I edited the outro to make it sound like you said paleopals@sciencesortof.com even though that's not the original recording. Fun fact.

Patrick: Yeah, I think it's fairly obvious that we edited that, or that you edited that.

Jamie: So is it sciencesortof.paleopals...

Ryan: No, wait, what? Where are we.

Jamie: [paleopals@gmail](mailto:paleopals@gmail.com).

Patrick: It's sciencesortof.com. paleopals@sciencesortof.com

Jamie: Oh my gosh. I'm in trouble. I'm going to be fired. Don't forget our Twitter account, Jamie.

Jamie: Yeah. See, it's there's a lot.

Patrick: There's a lot there.

Ryan: And if you...

Jamie: And...

Ryan: ... give us a try. That's all for this week. Thanks for listening. And see you next time on Science sort of.

Jamie: Wow. You guys...

Ryan: I listen to it a lot.

Jamie: Yeah, you listen to my voice a lot.

Ryan: But just, I have...

Jamie: Yeah, It's okay, it's not...

Ryan: ...might like us.

1:40:00

Music

Ryan: What are you, um, if you find it or can redownload it, send it to me and I'll drop it in the editing.

Patrick: Okay.

Ryan: So ready? Here comes your alligator. 12345 alligator time is done.

Patrick: All right, uh, what's it?

Ben: So alligators count loudly.

Ryan: No, I was counting so I can edit it easily Ben. Oh, so the alligator...

Ryan: Yes, in the future you will hear it. If Patrick sends it to me.

Ben: Oh, I see.

Patrick: The magic of editing.

Ben: Oh, I see. Oh, that was a great sound you guys. Boy. That was real interesting.

Charlie: Do you believe it?