Getting Curious with Jonathan Van Ness & Professor Chris Jackson

JVN [00:00:00] Big news, everyone. My debut solo TV show that I executive produced, Getting Curious with Jonathan Van Ness, debuts on Netflix this Friday, January 28th. If you could ever just do me a gigantic favor and set your reminder on your Netflix app. I'd appreciate it so much. And just give it a little gorgeous gaze this weekend. Can't wait for you to watch it, I hope you all love it. Thank you so much for supporting Getting Curious. And now let's get back to the show. Welcome to Getting Curious, I'm Jonathan Van Ness, and every week, I sit down for a gorgeous conversation with a brilliant expert to learn all about something that makes me curious. On today's episode, I'm joined by Professor Chris Jackson, where I ask him: How major are volcanoes? Welcome to Getting Curious. We are learning about something I've been very curious about for a long time. And this is one of our episodes where I am just so jelly that you guys can't see how stunning our guest is. Welcome to the show Chris Jackson, who is a geologist and an adventurer and is based at the University of Manchester. Welcome, Chris. How are you?

CHRIS JACKSON [00:01:06] I'm great, Jonathan. Thank you. How are you?

JVN [00:01:08] Good. So I have a really random first question that I don't know if you've been prepped for, but I'm just going to ask it. Are you ready?

CHRIS JACKSON [00:01:15] I am ready.

JVN [00:01:16] Have you or have you not seen Dante's Peak?

CHRIS JACKSON [00:01:22] I have seen Dante's Peak. [JVN SIGH OF RELIEF] Exactly, what a relief, otherwise my professional credentials would be… Yeah, no, I watched it even before I was interested in geology. It's that good.

JVN [00:01:32] It's so good. I mean, first of all, Pierce Brosnan, you know, national treasure for you all over there in, you know, the United Kingdom. But the reason why I ask is because that's probably, like, eighty five percent of my knowledge about volcanoes. And then of course, there's, like, five percent Pompeii, five percent Mount St. Helens. And then maybe, like, and then, like, maybe, like, 10 percent, like, Earth science in seventh grade. So I'm scared. I revere a volcano. I need to know more. This is also kind of, like, meant to be in our series of, like, "How to survive an X."

CHRIS JACKSON [00:02:09] Apocalypse.

JVN [00:02:10] Exactly. Or, you know, in this case, the volcano eruption. So first and foremost, you're a literal geologist. So can you just tell us a little bit about, like, how; well, actually, no, I can't even go there first to get even more basic, if you can believe it. Hard hitting question number two: what is a volcano?

CHRIS JACKSON [00:02:31] So a volcano is a landform, you know, a sufficial land form, something we can observe at the Earth's surface, which is constructed from solidified magma. So this is molten rock, which has made its way all the way to the surface of the Earth, has been erupted to form lava, and has crystallized and become hard rock. And that is what a volcano is. Does that help?

JVN [00:02:52] Holy, wait, okay, well, I mean, all I heard was magma, and then all I could hear was Austin Powers or Dr. Evil going "Liquid hot magma."

CHRIS JACKSON [00:03:02] That's a good place to start. That's a good place to start, though. Yeah.

JVN [00:03:06] So literally, the volcano itself is formed from, like, lava coming up and then it, like, forms a mountain?

CHRIS JACKSON [00:03:13] Basically, that's it. You pass the class.

JVN [00:03:16] Well, that's the buried lead that I didn't know. I didn't realize that the mountain itself was literally former, cooled lava. So does that mean that, like, the hole that lifts up the lava that then makes the volcano, does that mean that all volcanoes start flat?

CHRIS JACKSON [00:03:31] Yes, basically. So volcanoes, if I were to ask you to draw a volcano, you'd draw something which is triangular, looking a bit like the pyramids in Egypt sticking above the ground. But they're normally quite old volcanoes that have been constructed from many, many, many eruptions. So during the first eruptions, you have an event where the magma is coming to the surface, you'll build up a very small cone that will get bigger through time. So we have in our head this beautiful mental image of a volcano being this big, tall, pointy thing forming mountains, which they sometimes are, but they obviously are born.

JVN [00:04:05] I really did not even see this coming so early in the podcast. [CROSSTALK] I though I knew, but I didn't even know. So, OK, so you just said vent. [CROSSTALK] So what's a vent, is that, like, a thing where the lava comes out?

CHRIS JACKSON [00:04:19] Yeah, yeah. All it is is a, is a crack in the ground, so it could be a fracture in the ground. So literally just a hole. And from that hole will come the, the, the magma in the form of lava. And that's what, that's what it will start from. So oftentimes a volcano from its earliest stages would be fairly inconspicuous and not a very scary looking thing.

JVN [00:04:40] Ah! OK, wait, so what are the, like, OK, so then every volcano has a vent.

CHRIS JACKSON [00:04:47] They all started off from a very small crack in the ground where magma initially comes out.

JVN [00:04:52] Is there any other, like, key features that every single volcano has?

CHRIS JACKSON [00:04:56] Um, no. That's a very good question. And the reason that all volcanoes are definitely because all volcanoes are forming by fundamentally slightly different processes. So some volcanoes are being formed by lavas which are being explosively thrown out. And that's the, again, the mental image you probably have of most volcanoes, right, a big bang and lava is flying everywhere. But not all volcanos are like that. Some volcanoes are actually more what we call effusive, so they are expelling lava, but the lava's coming out quite gently without all the bangs and whistles we normally think of. And because of that, volcanoes, all our different shapes, different sizes, they're different colors. They have quite a lot of character.

JVN [00:05:37] So I thought that I remembered my seventh grade Earth science teacher whose name was Mrs. Holzmeir. I thought I remember her saying that there was maybe, like, three main types or something? But also maybe, she said there were six, and I just totally fucked up. But is there any, like, main, is there any, like, main volcano types?

CHRIS JACKSON [00:05:58] Yeah. So two of the main volcano types that you'll probably be most familiar with: one volcano called a shield volcano. So these are volcanoes, which are very low relief. So they're not very tall and they're very broad. Hence the name shields because they're like a warrior's shield. So that's where the name comes from.

JVN [00:06:16] Is that, like, a lot of, like, the Hawaiian ones that, like, are slow and, like, you know, ooze, like, wide or whatever?

CHRIS JACKSON [00:06:23] Yes, yes. So some of those, some of those probably started off as shield volcanoes, so they're quite broad. And they're associated with lavas, which are quite runny, so they're not very sticky. So these are runny lavas, which when they come out, they spread out and give the volcano its very broad, low relief shape. But then some of the

other volcanoes are what we call stratovolcanoes and stratovolcanoes, yeah, you might, really, yes, you remember this, Mrs. Holzmeir will be very pleased with you.

JVN [00:06:53] Tell us, what's the strata? Is that the one that we classically think of more pyramid-y?

CHRIS JACKSON [00:06:57] Exactly. And that's formed by not simply just lava being expelled from the volcano, but also ash and pumice and other kind of what we call pyroclasts. And so they are bits of fragmented magma which form these pumice and these ash clasts. So if you have, you know, times where you've got lava coming out, times where you've got these more volcanic kind of explosive eruptions. That's what builds up this stratovolcano. So if you were to slice a stratovolcano in half, imagine you could cut it in half. You would see these beautiful, varying layers of these which are recording these different types of eruptions.

JVN [00:07:35] So what's those volcanoes where, it's, like, a big ass ring, like, it's, like, a big ass ring in the middle.

CHRIS JACKSON [00:07:44] So that's when you have something called a caldera. So a caldera is formed. [CROSSTALK] You know more about this than me! Yeah, a caldera is formed, well, you get different types of caldera. So again, if I asked you to draw a picture, a volcano, you draw a triangle, right? But what you might also draw at the top is a little depression, a little dip at the top up. [CROSSTALK] And that is what we call a caldera. So that is the hole at the top of the volcano. And sometimes those holes are formed because obviously, as you push lava out of the volcano, the lid at the top of the volcano collapses inwards in itself. So that's what gives you the dimple on the top of the volcano.

JVN [00:08:26] OK, I'm not a good artist, at all, but-

CHRIS JACKSON [00:08:28] Let's see, let's see.

JVN [00:08:30] But is there, like, another, like, well, no, I can't show you, I'm too embarrassed. So just imagine it being a bubble letter zero. Just, like, a, like, is that, so is that, is that, like, a stratovolcano that completely collapsed? And is that a different kind of volcano? And can that still erupt?

CHRIS JACKSON [00:08:47] No, no, no. So it's, there's different stages of collapse of volcanoes in these caldera. So sometimes you just get a small caldera at the top of the volcano associated with one or two big eruptions. Sometimes when you have something like at Pinatubo, so one of the largest documented ever volcanic eruptions, the volcano

basically blows itself apart. It's so explosive it rips the top off. It rips the sides off, and actually you're left with something which doesn't almost even look like a volcano because you've just completely obliterated. And that's, like, a basically a big hole in the ground now. So you've gone from having a triangular shaped volcano to just complete catastrophe.

JVN [00:09:26] Do you remember that volcano that, like, I feel like it exploded, like, maybe, like, right before the pandemic started in New Zealand and some people went missing and stuff. [CROSSTALK] I feel like I saw a video of that that was giving me major, like, gigantic skinny caldera vibes, like, before the eruption?

CHRIS JACKSON [00:09:45] Yeah. So in Whakaari, so that was the volcanic eruption, which was kind of the end of 2019, I think it was. And that was that's, that was a big volcanic island off shore New Zealand. And I mean, that already had a big hole in the side from a number of early eruptions, and in fact It was that hole in the side, which kind of gave access for tourists to go visit that volcano. The eruption itself in Whakaari didn't necessarily blow any more out to the side of that volcano. It didn't make the caldera any bigger, but it was part of the process that leads to those calderas forming in those volcanoes. So that was a very catastrophic eruption, which led to a number of, a number of deaths.

JVN [00:10:25] So, OK, so basically there is shield, strata. So is there, like, a standard, like, height or width of a volcano or are they extremely diverse?

CHRIS JACKSON [00:10:37] So volcanoes don't come in a one-size-fits-all. Because they are all generated in different ways and they form in different places, they come in different shapes and sizes, and obviously they're different ages, of course. So if you have a very young volcano which is, you know, the youngest volcano on Earth, probably some people argue in western Mexico started in 1943.

JVN [00:10:59] How cute!

CHRIS JACKSON [00:11:00] So that's, like, you know, like a little baby volcano and that's, you know, not very big at all.

JVN [00:11:04] How big is it? Like, is it just, like, a is it, like, a one-story building or is it, like, gigantic?

CHRIS JACKSON [00:11:09] No, no, no. It's a one-storey building sort of size. That thing's been going for about 80 years or so. So that's a pocket volcano. Then we could go to something like Mount Etna, which is in Sicily, in Italy, that's about three hundred and fifty

thousand years old, so considerably older than the volcano in western Mexico, and that's about three thousand, four thousand, three and a half thousand meters high, right? So that's quite a big volcano. So it depends on the age. The longer it goes, the bigger it is.

JVN [00:11:42] So, and then, is that the only way that you can tell the age? It's just, like, all based off of the height or, like, how big it is, right?

CHRIS JACKSON [00:11:47] No, no, no. Saying one thing geologists do is we don't just look at the shape and size of the volcano. We can actually get the rock samples themselves from the volcano, and we can use a range of techniques to work out directly the age of those rocks using a process called radiometric dating.

JVN [00:12:04] Oooooh! OK, so, like, do you know, how many, this is, like, this just came to me: how many, like, active volcanoes are there right now?

CHRIS JACKSON [00:12:12] Oh, so, well, it's a good question. The estimates are that every day there's probably about 40 volcanoes erupting on Earth every day.

JVN [00:12:25] Really? [CROSSTALK] Is there? This is another really random one. Is there any, is there any in Britain, in, like, the United Kingdom erupting or just, like, existing access?

CHRIS JACKSON [00:12:37] No, there's not. It's slightly disappointing for a geologist not to live somewhere where there's an active volcano. We have lots of ancient volcanoes.

JVN [00:12:45] I was going to say, cause, like, did you see that show Outlander?

CHRIS JACKSON [00:12:49] No, I didn't, actually.

JVN [00:12:50] It's kind of sexy, but the well, except for some parts, it's also devastating. But, but, like, there's a lot of, like, hills up there. So, like, could there be, like, a volcano in, like, Scotland? Like, there's, like, a little vent and no one's even, like, found it and it could explode. Or probably not?

CHRIS JACKSON [00:13:07] In a Hollywood movie. I think there probably is one waiting to happen.

JVN [00:13:11] So there's probably not one in Scotland?

CHRIS JACKSON [00:13:13] Not active, no. We've got lots of ancient volcanoes that were active millions of years ago in the UK, but we don't have anything which is actively developing now, unfortunately.

JVN [00:13:25] So where are, like, where are they the most common? And I think I have a pre-guess, but in an effort to not: is it the Ring of Fire?

CHRIS JACKSON [00:13:34] So the Ring of Fire? Congratulations. You passed the second class. Yeah, the Ring of Fire is, is a term that we use to describe a zone of intense volcanic activity and earthquakes around the edge of the Pacific. So this is down the western seaboard of the US down and the Chilean coastline, especially of the South American, then all the way to Japan and China and so on. And, and this is an area of very intense volcanic activity, because it's an area where the plates of the Earth's crust are clashing together and melting, so that's why we have lots of volcanoes there. So, yeah, pound-for-pound, there's a lot of volcanoes there. Is it the most volcanic place in terms of volcanoes per square meter? It's perhaps not, right, because that's a huge area around the Pacific.

JVN [00:14:21] What's the most per square meter?

CHRIS JACKSON [00:14:23] Oh, the most per square meter, Jonathan. I want to say somewhere like the East African Rift. So in Eastern Africa, so coming down through the Democratic Republic of Congo, Somalia, Kenya, Ethiopia.

JVN [00:14:37] Ooh, yeah, cause Madagascar. She's going away. She's like floating out.

CHRIS JACKSON [00:14:42] Exactly. Yeah. So where we've got stretching of the East African plates, there's loads and loads of volcanoes there. And so you can go to somewhere like the Democratic Republic of Congo, so where I visited a few years ago. And there are thousands of volcanic vents everywhere, like, in an area which is, you know, a few hundreds of square kilometers in size. But there's just volcanoes everywhere there, of all varying shapes and sizes.

JVN [00:15:08] And there was no more babier volcanoes there than there was in that western Mexico, there was none that were even younger?

CHRIS JACKSON [00:15:14] No. Some of them are very young, young, probably hundreds to thousands of years old, but nothing as recent as, say, 80 years old. We often get very fixated as well in looking at volcanoes on the Earth's surface. There are lots of volcanoes under the sea.

JVN [00:15:31] OK, wait, I'm not ready for that question yet.

CHRIS JACKSON [00:15:34] Sorry!

JVN [00:15:35] Could, okay, so what about this? What if, like, you know, you're Chris Jackson, you are just, like, spelunking in East Africa looking for, like, volcanic activity. If you were there with like 20 other scientists or something and you were just, like, well, this is me flipping my hair while looking for a volcano, you might not do that. What, like, how, can someone discover a brand new one? Like, how did that guy or that lady or maybe that non-binary geologist find the one in west Mexico? Like, how do you get to be like, "This is the, it's new!" like, you just find the hole and in the lava?

CHRIS JACKSON [00:16:09] But it wasn't a geologist who found it. It was the Indigenous people living there who one day saw lava coming out of the Earth's surface and building a volcano in front of their eyes. So this is the, this is, like, the magic of volcanoes, volcanology, and geology in general. It's happening all around us, and it doesn't mean it won't take an expert to realize that there's a volcano building in your back garden because everybody would know what it's like.

JVN [00:16:35] So the chances of you seeing the first eruption, like, it would probably, like, you're probably just someone, like, living there. Probably.

CHRIS JACKSON [00:16:41] Exactly. It's as likely to be somebody who's, who's just nearby or flying a plane or on a boat, and they see something happening in the ocean and then they report it. And then it's documented as being a volcano after the fact. So, so, I guess I'm going to break your heart here. We don't really have volcano hunters.

JVN [00:16:56] Well, unless, unless much like in Dante's Peak, when it comes back around, where maybe you are doing a study and, like, some gorgeous female mayor of that town was, like, you know, something something. Maybe you could, you, maybe, I don't know. So but to the expected places question. So a lot of the unexpected places are that's, like, underground?

CHRIS JACKSON [00:17:19] Yeah, yeah. Some of them are underwater and obviously underwater volcanoes are much harder to see them being born, essentially.

JVN [00:17:25] Are those still called volcanoes?

CHRIS JACKSON [00:17:26] Yeah, yeah, yeah. Submarine volcanoes, we call them. Yeah. And we need to have, like, to, to discover submarine volcanoes. We obviously need to use things other than our eyes.

JVN [00:17:36] I don't want to go down there, it's a little scary. Have you ever gone under, have you ever gone on one of those submarines?

CHRIS JACKSON [00:17:41] You know what, though, I'd love to get a submersible where you go with, like, one other person for, like, a few hours.

JVN [00:17:46] I interviewed someone who did it and they were the first female astronaut to go to space and go to the deepest part in the ocean in one of those things, she's major. Yes, Kathy Sullivan! So could it be that, like, you know, how, like, the cenotes in eastern Mexico, like, on the Yucatan, you know? Could it, like, could there be, like, an underground volcano but it's, like, literally underneath, like, other rock? And like, could we be on top of an underground volcano, right the fuck now in Texas? That's the question.

CHRIS JACKSON [00:18:17] Maybe Texas needs it, right?

JVN [00:18:20] I'm here. We're trying to fix it, queen! Give me a minute!

CHRIS JACKSON [00:18:23] I lived in Austin. I lived in Austin, right? So I have total, I lived in, I lived in Hyde Park, so I-

JVN [00:18:28] So could there be, like, an underground one that's about to blow up a major city?

CHRIS JACKSON [00:18:33] So yes, I'm going to say, in a very cautious way. In parts of the Earth, there are areas of molten or semi-molten rock, which, given the right conditions, could erupt. So, now your question as to whether that particular magma chamber, as we like to call them, is present under Austin, Texas? It's unlikely. We probably have a series of end signs from gases coming out in downtown Austin, which would be rich in certain gases that are produced by volcanoes. We might expect lots of earthquakes in Austin. We might even have images of the subsurface of Austin telling us it's there. So in this particular case, maybe not. But there are certain areas on Earth where we have all of those signals telling us that there are volcanoes present. So there are, there's the promise of volcanoes in many parts of the world because of the geological conditions in which those, those places are, like Iceland, La Palma, you may have seen in the Spanish islands as well, which is erupting right now.

JVN [00:19:36] It is?

CHRIS JACKSON [00:19:38] Yeah, La Palma is erupting, it started a few weeks ago. It's absolutely incredible. It's, it's, it's been erupting at incredibly high rates, it's built a new bit of the island. The lava has flowed into the sea, so it's actually, it's actually making the island larger as we speak. It's, it's a really incredible thing.

JVN [00:20:00] And is that a shield volcano or a stratovolcano?

CHRIS JACKSON [00:20:03] I think La Palma would be what we would call an island volcano. So I think it's probably a stratovolcano. It's quite, it's quite tall for how big it is. You know, it's quite a pointy, a pointy island.

JVN [00:20:14] OK, so which leads me to my next question: hard hitting question number three. What is a volcanic eruption?

CHRIS JACKSON [00:20:22] Oh, no, it's a good, yes, so a volcanic eruption is probably best described as the time when the conditions allow for the magma to come out at the Earth's surface, right? So like I said, there's always magma, probably molten rock underneath the Earth's surface somewhere on Earth. And what we need are the conditions for that magma to be able to break through those overlying rocks, the pressure to, in that magma chamber, to be high enough to break through those rocks and to be expelled at the Earth's surface. And so that's what a volcanic eruption is. And to make that magma pressurized enough, one thing we can do is make it rise up. So if magma rises through the Earth's sub-surface, the pressure decreases. That allows the gases to grow.

JVN [00:21:09] Underneath it?

CHRIS JACKSON [00:21:10] Yep, within the magma, the gas has got magma in it, the magma starts to expand, and if you start to expand it like a balloon, it pops. So think about that. You've got the magma's rising up. The bubbles are getting bigger. Eventually, the rocks of both of them aren't strong enough to actually keep the magma in, and it just shatters. And that's when you get the lid blown off and you get lava being expelled from volcanoes.

JVN [00:21:35] So is there different types of eruptions, like, would a shield volcano make a different eruption than a strata?

CHRIS JACKSON [00:21:41] Yeah, yeah. So some, so some volcanoes actually are associated with very runny lava. So this is lava, imagine it's, like, let's say it's just, like, runny like water. So it's not very rich in gas and it's quite runny. That will just ooze out.

JVN [00:21:54] And there's some lava that's like that, or magma, wait, lava's when it comes out, right?

CHRIS JACKSON [00:21:59] Yeah, lava's when it comes out, magma's when it's underneath the Earth's surface.

JVN [00:22:03] So there's some that's literally, like, water consistency.

CHRIS JACKSON [00:22:05] Yeah, yeah, yeah, yeah. There's some lava which can flow at 50, 60, 70 kilometers per hour. [CROSSTALK] Yeah, yeah, so there's some lava where the stickiness is so low in the term we use as a geologist is viscosity. The stickiness, viscous, the viscosity is so low it flows like water, so that lava runs very quickly. And, and, and those sorts of volcanoes that produce that sort of lava are sometimes less likely to have these really catastrophic, energetic eruptions where we see lots of material being blown out the top. At the other end of the scale, though, we have these very vicious, sticky lavas. And if you think about those, those things are very rich in gas. They're also contained in very, very strong rocks, so they build up immense pressures before they erupt. And when they do, they are often, it's often a bigger bang.

JVN [00:22:59] So the thing that makes it more viscous is the amount of gas.

CHRIS JACKSON [00:23:04] One thing is the amount of gas. Another really important control is the amount of silica. When we have large amounts of silica, we have very, very sticky lavas. And when we have very low amounts of silica, we have these very, very runny lavas.

JVN [00:23:16] And when you say silica is that, like, salt?

CHRIS JACKSON [00:23:20] No, so silica, like, you've got, like, silica you'd have in your electronic devices, perhaps. Yeah, yeah. So things that you have on your watch that make it work, so just silicon that we have from a day use, we have silica, which is the chemical element, which is what is a very common in those, in some of those lavas.

JVN [00:23:38] Interest! Okay, so how long can an eruption be, like, an hour or, like, a month or, like, a year?

CHRIS JACKSON [00:23:48] Yes. Volcanoes, volcanoes have different periods of eruption, so some of them could go on for years and years and years and decades. And actually, it's actually quite hard to tell when a volcano stops erupting, take Stromboli, for example, north of Sicily, in Italy, and that erupts every seven to 16 minutes. [CROSSTALK] So that thing is continuously popping. It's continuously exploding small and what we call stromboli eruptions. So you have these small eruptions. Other volcanoes maybe are inactive for 50 or 100, 500 years, and then they may have a very large eruption or a very small one. And so it's quite hard to predict when volcanoes both start and end erupting, but also how long it might go on for as well.

JVN [00:24:38] And then some of, like, the warning that people would potentially have for a volcano is kind of like what you mentioned before, like, maybe would have slight, like, tremors, potentially a bigger earthquake you might see, like, steam coming up from something?

CHRIS JACKSON [00:24:50] Yes. So the magma rising up through the, through the volcano itself and underground triggers a number of different processes. One is earthquakes, and that's because the magma is forcing its way through brittle rocks. And when those brittle rocks snap, they pop and they release energy in the form of an earthquake. Sometimes as the magma rises up, like I said earlier on, the gases within the magma actually start to come out of the magma. So at the Earth's surface, we'll see lots of gas coming out, and we might not be able to see it with the naked eye, but we'll see higher flux, as we say, of carbon dioxide, sulfur dioxide, the smell of rotten eggs might become more apparent ahead of an eruption, for example. So there are a number of indirect observations. As geologists, we try and make to try and predict when a volcano will erupt, where, and also how big that eruption might be.

JVN [00:25:47] OK, so speaking of sizes, do eruptions have, like, you know, like, f one f two as three f for Helen Hunt Twister or is there, like, a, you know, like, is there, like, a rating scale for, like, you know, a Richter scale for eruptions?

CHRIS JACKSON [00:26:02] Yeah, there is a scale for eruptions. There's the stuff of volcanic eruptions, which I think goes up to 10. I'm wondering whether it's one of those scales which, like, we're going to keep redefining because eventually we'll have a bigger bang. But we have a scale, so some of the largest and most castoff eruptions would be on the scale, which are from seven to eight to nine in terms of the, the energy released. And this is a really important point to make: it, the, the hazard posed by volcano is not simply how big the eruption is, it's also where the eruption happens and at what time of day. So you could have a very big volcanic eruption happen very far away from where anybody's

living. And that volcano may not be as dangerous as a much smaller eruption happening in a very populated area.

JVN [00:26:47] And sorry if this is, like, 18 questions in a row, but it just came to me: cause you know how, like, in that mass extinction there was, like, those ancient volcanoes, all at the same time and there was all the ash? Is that going to happen again, maybe? Like, how big would it have to be for us to not have sun for, like, a year?

CHRIS JACKSON [00:27:02] So there, that's a very, very good question. Let's go back to the first kind of the first part of that question, so the eruptions which led to, has been suggested has led to the extinction of some dinosaur species. What was interesting about these eruptions is they weren't particularly catastrophic in terms of the bang. They just went on for a very, very long time and they were also very, very rich in carbon dioxide and sulfur dioxide. So these were volcanoes, which were not particularly catastrophic in the sense that they were a big bang. They just went on for a long time. And that's why with the longer-term changes they made to the atmosphere in the climate led to the distinct distinction the extinction of some dinosaurs.

JVN [00:27:47] How do you guys know that?

CHRIS JACKSON [00:27:48] How do we know that?

JVN [00:27:50] Like, how do you know that they were really long eruptions?

CHRIS JACKSON [00:27:52] So they're just like a shit ton of rock. So, so the Deccan Traps is the eruption we're referring to here, which is in India. So the Deccan Traps discover a huge amounts of area. They're just incredibly thick. We have ages for those rocks, so we know exactly sort of the duration over which these rocks were in place. So we know the duration and volume of those eruptions. So geologists have done a lot of work to try and look at the type of eruption that was that led to potentially the extinction of certain types of dinosaurs.

JVN [00:28:22] And what's very long?

CHRIS JACKSON [00:28:24] Tens to probably tens of thousands of years of eruptions in that case.

JVN [00:28:29] So in that, like, mass extinction, was there probably, like, ash in the atmosphere, like, to where there was no sun for, like, years and years? Or was it like a little bit?

CHRIS JACKSON [00:28:37] In that particular case, as I understand it, it wasn't necessarily the ash in the atmosphere, it was the gases that were the most, you know, so it was a longer term issue, right? It wasn't like the sun was blotted out next Tuesday by this eruption. It was that there was a longer term, term, we say, perturbation change in the Earth's climate, which eventually led to conditions that weren't conducive to life. Now, something like Mount St. Helens or Pinatubo, which were these very big, relatively ash-rich eruptions. It is those volcanoes which, yes, next year, after an eruption of that size, you will get a slight cooling, actually, of the Earth's climate because you are, as you say, blocking out the sun. So they're very, hugely different timescales, hugely different types of volcanic eruption, with hugely different impacts on life on Earth.

JVN [00:29:30] OK, so let's talk about, like, the biggest ones fucking ever! Was Mount St. Helens the biggest one ever? Or was that Pinatubo?

CHRIS JACKSON [00:29:40] So something like Pinatubo is bigger or Krakatoa, as well, is another volcanic eruption, they were bigger simply by the estimated energy that was released from those eruptions. I mean, Mount St. Helens was, was big, but it's also just super famous. It's super famous, partly because it happened in the US and it has this, this history of it being relatively well documented. You know, there was, and there's a visitor center there, you know, and it's very well populated part of the Earth near Seattle, Portland. So there's a lot of press around it, but it's not necessarily the biggest. There, is, it is, an incredibly important volcanic eruption in terms of our understanding of how volcanoes work as geologists and our understanding of hazards to people. But it wasn't the biggest. So something like Krakatoa or Pinatubo. The energy released in those was just substantially larger, orders of magnitude greater this Mount St. Helens.

JVN [00:30:33] Where was Krakatoa?

CHRIS JACKSON [00:30:35] Krakatoa was in Indonesia. The eruption in Krakatoa happened in 1883, so, you know, way over 100 years ago. And what's interesting about some of these older eruptions, like Krakatoa, is a lot of the records of those volcanic eruptions are, like, written records or visual records by, in that case, islanders. Right. So people who witnessed firsthand the immediate effects of that eruption. Fast forward 130, 140 years to the present day, and we have much, kind of better technologies for remotely monitoring those volcanoes and characterizing those volcanic eruptions. So even if we weren't there, we'd have satellites, which would be able to tell us sort of how big they were, what was released from them, how much was released from those in forms of gases as well.

JVN [00:31:21] OK, so then, like, do we know how many people died in that one? Or, like, Mount St. Helens? Which eruption killed the most people? Was it Pompeii?

CHRIS JACKSON [00:31:31] Oh, that's a very good question.

JVN [00:31:34] Kind of a dark question.

CHRIS JACKSON [00:31:36] No, it's a very important question, and I think if you look at something like Mount St. Helens. The number of fatalities in Mount St. Helens eruption was actually quite small because there was a series of warning signals which allowed a large part of that area to be evacuated. You know, there were a few people who refused to leave and they died in the ensuing pyroclastic flow, which came from that volcano, the kind of ash fall. So in that case, people were quite well prepared for that. I think somewhere like Krakatoa in 1883, where the warning signals, even if they were known, probably would have been less, we were less able to communicate those to the local populations that where significantly more people died. But it is a very good question as to how many people died in that. So in the eruption of Krakatoa in 1883, there was an estimated 36,000 people died as a function not just of the eruption itself, but also the ensuing tsunami. So there's a, you know, there was a what you would refer to as a tidal wave sort of incorrectly. But the wave of water, which was generated by the eruption, which then inundated land and killed people.

JVN [00:32:42] Was that, like, the biggest tsunami ever because the volcano explosion was so big?

CHRIS JACKSON [00:32:46] No, I don't think the tsunamis being triggered by these volcanic eruptions are particularly big, but they don't need to be. You can be talking about wave heights of a few meters. Right? And if you've got a very low lying coastline, four or five meters will get you 20 kilometers inland, very quickly.

JVN [00:33:04] OK, but I feel like you, like, British slash, like, European people who use meters, like, you just say meters like it's no big thing. Three meters is, like, nine feet tall, as tall as but bug like you to sit down and you see like or a four or five because it's a three meters like, isn't that you or is it a meter three feet?

CHRIS JACKSON [00:33:20] Yeah, that's right.

JVN [00:33:22] Yes. Five times three is 15 feet. If you turn around and you look up and there is a wave 15 feet tall, you are fucked. And also, along with being fucked, can you

survive a pyroclastic flow or are you just fucked, like, there is no fire blanket strong enough to get you through that?

CHRIS JACKSON [00:33:38] That, that there's nothing that strikes fear into the hearts of geologists and volcanologists more than pyroclastic flows.

JVN [00:33:45] So can you tell people what a pyroclastic flow is? Because I think I know it from Dante's Peak or from, like, something else? But can you tell people who don't? Or no, maybe it's from Pompeii?

CHRIS JACKSON [00:33:54] You need to fill that. You need to put the link to Dante's Peak in the show notes.

JVN [00:33:58] I know it's true, I really should! But what is a pyroclastic flow and is there one? Well, no, I have to ask that first. What's a pyroclastic flow?

CHRIS JACKSON [00:34:05] So pyroclastic flow is generated when a volcano is erupting and the, the kind of the material being expelled from the volcano is carried high into the atmosphere, sometimes a few tens of miles it, it can be this giant column of ash. Now, at some point, the amount of, the flux of the material coming out the volcano is and the energy coming out of that volcano is not enough to keep all that material up so that big column collapses back down. And as that column collapses back down, it flows down the sides of the volcano. That's what a pyroclastic flow is. It's the material, the gases, the bits of rock, which previously was shot up into the Earth's atmosphere, which no longer can be kept up and they come racing down very quickly the sides of the volcano. By very quickly, I'm talking tens to maybe a hundred miles an hour or more. We're talking about temperatures of a few hundred degrees Celsius. And, and we're talking about a flow which contains boulders of considerable size, house-sized boulders, maybe car-sized boulders, and on top of that, the cherry on the cake is these pyroclastic flows are just full of very, very noxious gases as well.

JVN [00:35:24] So if you are going to survive a pyroclastic flow, you would have to have, like, a Chernobyl-type, like, limestone sarcophagus and, like, a gas mask and, like, and, like…

CHRIS JACKSON [00:35:36] A gas mask won't help!

JVN [00:35:38] Has anyone ever survived one? Or has anyone ever been on, like, the edge of one and survived? Or could you, like, outrun one? Like, if you were, like, on the side of a volcano and you saw that it fucking, like, "boom," like, you've got the column going up.

Do you have enough times to, like, get in your car and go, like, 150 miles, like, down the fuckin', like, road to get away from the flow? Or can you even see it? Or is it just the area?

CHRIS JACKSON [00:36:00] No, no, no, you'd you'd have a chance, I think. So have you seen Jurassic Park: Lost World? You know, there's a bit, I think, in there where the volcano erupts and all the dinosaurs are running away, and they're driving away in some four-by-four and lots of volcanologists and geologists laugh at that because it's implausible. I mean. If you saw that pyroclastic flow coming to you from 10 kilometers away, because, quite frankly, you shouldn't be that close to the volcano in many, in many cases you probably do have enough time to at least get away or to at least seek shelter because obviously, as the pyroclastic flow flows away from the volcano, it slows down and cools down. So the further you are away from there, the better chance you have of firstly having the time to seek shelter. But also, if you're caught out in this big plume that's billowing around you, it won't be moving too quickly, it won't be too hot, and it won't be too gassy. So to survive it, what you really need to do is seek shelter. You need to try and hide underground. Or if you couldn't, you could hide behind a wall, whatever, it would afford you some protection. But as we know from the eruption of Pompeii in 79 AD, you know, if you're too close to the eruption and that flow, that pyroclastic flow is still very hot and fast and gassy, you can hide underground and you will still get buried underneath all the ash and choke on the ash.

JVN [00:37:15] Cause that that happened. Like, that's, like, where they find the people, like, underneath so, like, you know, perfectly. Yeah, I know that you're a geologist and not necessarily a Pompeii historian. But have you ever heard of any stories from someone surviving that pyroclastic flow is ever, like, a cute little story of, like, "We were with our horse," but in Italian and, "We, like, totally outran it because we were far enough away."

CHRIS JACKSON [00:37:36] Yeah, there's people who were rescued from Pompeii and from Herculaneum. So there was, a there was a boat, I think, sent from across the Bay of Naples that went across and rescued some people who'd managed to make it to the coastline. So the Italian military went and saved people from there. And then incredibly, again, we go back to this issue of the oral history of volcanic eruptions. There we have Pliny the Younger who provided this written report of Vesuvius erupting in that case. But we didn't have the internet. We didn't have mobile phones to video this. We, we really struggle to catalog what happened during the eruption, what the impacts were on life, and who survived and what their written testimony was of how they survived it. So your question is a very good one, but we kind of struggle to answer it because we don't have the same written records or the same documentation we have present day where everything's over-documented.

JVN [00:38:31] Did any of the people who refused to leave Mount St. Helens at any of them outrun the pyroclastic flow?

CHRIS JACKSON [00:38:37] No. The only person I think was the geologist Johnston, who, there's a ridge next to Mount St. Helens called Johnston Ridge, and he was a geoscientist, I think, working for the United States Geological Survey, USGS. And he stayed and and he witnessed the, the, the, the eruption and, and photographed bits of it. But he died in that.

JVN [00:38:59] He did?! I think I saw those pictures and it's like coming towards him.

CHRIS JACKSON [00:39:03] Yes. So the very famous pictures of Mount St. Helens were taken from there. And, and it's a very sad story, you know, but you know, a very committed science is trying to collect data because it's not just fascinating, it's also important and placing themselves in harm's way.

JVN [00:39:21] Dev! So, is there ever, is there, OK, can a shield volcano have a pyroclastic flow or pyroclastic flow? Because it's like, maybe not. No, because it's got like more of that. Like one like red.

CHRIS JACKSON [00:39:34] Yeah, yeah. I mean, I think you probably get, you might get small pyroclastic flows, but it wouldn't be one of the characteristic types of behavior you'd expect from that type of volcano. You'd be expecting these really big, vigorous pyroclastic flows to come from these volcanoes, which are capable of blowing their lids off, capable of blowing out lots and lots of material into the atmosphere, which then collapses back down on itself.

JVN [00:39:56] Has there ever been a gigantic strata eruption that had the big column, but then didn't make a pyroclastic flow?

CHRIS JACKSON [00:40:03] Oh. I don't know. I don't know, actually, I mean, I can imagine there are. Yeah, I don’t actually know the answer to that.

JVN [00:40:13] Like, maybe it was like thick, but it was thick for some other reason and it wasn't that gas, so it didn't get that hot or something, I don't know.

CHRIS JACKSON [00:40:20] Yeah, I mean, a lot of the dangers posed by pyroclastic flows relate to the atmospheric conditions at the time of the eruption. So imagine you have this big column of ash coming out of a volcano. If the, if the wind speeds in the upper atmosphere or in the, in the lower atmosphere are very high, they can carry that material away. And actually, that material then has less gravitational potential. And by that, I mean

it's less heavy. It won't collapse down because you're basically sucking that material away from that tower.

JVN [00:40:48] Or if maybe there was, like, it just so happened to, like, erupt like, in a rainstorm or, like, around a hurricane or something, maybe?

CHRIS JACKSON [00:40:54] Yeah, maybe then you can sort of, like, dampen down some of it. But I just think the energy coming out of these volcanoes in the material or the flux is, the rates are so high.

JVN [00:41:03] It's like get fucked with your rainstorm, you're not going to, yeah.

CHRIS JACKSON [00:41:06] But rain is important, though, if what happens afterwards, so if you do have eruptions during rainstorms or you have rainstorms immediately after an eruption, that water can mix with the ash to form mudflows.

JVN [00:41:20] Oh, I thought you were gonna say, like pumice, like, I was, like, is that how it is, like, Liquid Lake? And then again, and then you can scrub your food with it?

CHRIS JACKSON [00:41:26] Yeah. So yeah, so you end up creating what was something and exfoliant.

JVN [00:41:32] Like a dimply rock?

CHRIS JACKSON [00:41:33] Exactly. So that's just why all geologists are so good looking.

JVN [00:41:43] So if we were doing that, I'm obsessed. So if we were doing, like, a Miss Universe of top five biggest volcanic eruptions in history and you are the judge, so you don't necessarily have to be right because, like, you're the judge and you're going to be smarter than all of us because you are a literal fucking geologist. So would the top five be, like, what are the top five?

CHRIS JACKSON [00:42:02] Oh, goodness. And I would say that this is a very good question. And it's a bit nerdy, so I think the 2002 eruption in a volcano called Nyiragongo, so this is a volcano that erupted in the Democratic Republic of Congo. An eruption which was kind of, you know, geologically very interesting, but what's very interesting about that volcano was it happened in a very, very war torn area. It happened in an area which had lots of factors that compounded the volcanic eruption. So in terms of our learning about volcanic eruptions and the impacts on human life and human society, I find that volcano and that eruption in 2002 very interesting because it wasn't the biggest bang, but it it, I

think as a scientist, I find that very kind of exciting enriching to think about the way our science affects other people. So I'd say that's probably number one.

Number two, I would probably say something like maybe Mount St. Helens, because for me, you know, with that volcano happening when I was a young child and then it being a thing that was taught, was very much as I, as I grew up. It very much informed and enthused my, my love of geology, really. I mean, again, a very important volcanic eruption for many different reasons scientifically, but from a personal point of view, that, that image you talked about, that image of the, of the side being blown off Mount St. Helens, I mean, like, it's just jaw-dropping stuff and it and it's just, you know, as a scientist to be going into that field, it was it was very important to kind of to witness that. And, and the third volcano or the third volcanic eruption, I would say, is and this is again not very glamorous, but the first ever volcanic eruption I saw.

JVN [00:43:52] Which was…

CHRIS JACKSON [00:43:53] So the first volcanic eruption I ever saw was actually in Stromboli. So this volcanic island north of Sicily in Italy. And I think everybody thinks geologists hang around volcanoes all the time looking at volcanic eruptions or hanging around waiting for earthquakes to happen. And we don't actually see or witness or feel those things as geologists, it's very rare, but it's incredibly stimulating and can be quite scary. But I remember getting the boat out to Stromboli, to the island and looking up through the rain clouds as we approach. And suddenly I just saw like a big puff of black kind of ash come out the top and it was quite dark and you could see an orange glow. And that was my first ever volcanic eruption and that, Jonathan, was only about three years ago.

JVN [00:44:35] Oh, OK. Not to interrupt the question, but do you remember when-

CHRIS JACKSON [00:44:37] I'm an old man!

JVN [00:44:38] You're not an old man, you're a gorgeous, but I also love old men, too. But anyway, when you said that volcanoes can be different colors? What are, like, the kookiest volcano colors that we wouldn't think of?

CHRIS JACKSON [00:44:50] Oh, so there are volcanoes in the north and bits of the East African Rift so, like, into Ethiopia. So the northern, northeastern bit of the African continent. And these are volcanoes which produce a certain type of lava called a carbonatite. And they are blue.

JVN [00:45:11] I can, you know, it's a fucking crazy. I literally had no idea, but I had this feeling that they were going to be blue, and I don't know why. I thought it was going to be like, some, like, really, like, the mixing with the ocean because I'm basic and I was, like, "That's blue," but it's the other rock that's so fierce. OK, is there any other colors?

CHRIS JACKSON [00:45:27] Yes. You know, most the classic colors of volcanoes you know, lava is just this orange red glow. But one of the really? Yeah, I've noticed the ones that spring to mind has been the most atypical kind of color for a lava. They, they can have this very bluish glow and they look like, you know, aliens. I think where they cut one of their kind of Alien eggs open and it sort of oozes out in one of the night scenes. I think it's a bit like that.

JVN [00:45:50] Or is it, is it also kind of like the blue of a flame or, like, darker?

CHRIS JACKSON [00:45:54] It's like, yeah, it's like a Bunsen burner type blue. So a really, really kind of bright, intense blue color, especially, and it's most apparent, obviously, at night, you see it.

JVN [00:46:05] The officials from the Miss Universe biggest eruptions in history pageant still need your answer for the fourth and fifth.

CHRIS JACKSON [00:46:13] All right. OK, so the next one, what would I say? Maybe again, the eruption in and Whakaari, Whakaari, I think, is the way to pronounce the New Zealand White Island, is the settlers and then for the island, but Whakaari is the Indigenous term. And, and again, you know, really interesting and volcano, very young volcano. You think it's a few thousands of years old? But again, it was a volcanic eruption, which was not grossly unusual in its behavior, but again, it led to a number of fatalities. But what it's led to was questioning is our relationship in terms of tourism with volcano. So volcanoes are understandably very kind of appealing. Visually, they're very dramatic. And we in certain parts of the world, if you have a volcano, is actually financially the basis of your economy, right? You know, it's, it's a really important reason people come to see where you live. But Whakaari has really made us think about, you know, whether, you know, do we have safety protocols in place? Do we have, do we have a license to operate in certain places? And then, you know, obviously in New Zealand. This is an issue to do with the Indigenous communities who have a very different relationship with the volcano above and beyond, simply being a tourist destination.

JVN [00:47:30] So of those four, have any of them, like, erupted again and has climate change created, like, an effect on frequency or intensity of eruptions?

CHRIS JACKSON [00:47:41] Oh, no. So, you know, like, Stomboli's erupting all the time. Nyiragongo was 2002, but also erupted earlier this year as well. So these volcanoes are still turning over. They're still taking over. The question as to whether climate change is going to impact volcanic behavior, that is a very good one and it's one that's actively being worked on at the moment. There are some research results, which suggest that as we have a warming world, as the Earth gets warmer, we may actually see more melting of the ice sheets and mountain glasses we've heard about that I'm sure. But as the function of the melting the ice sheets, what we do is we unload the Earth's crust, we take the weight off. And if we take the weight off the top of the Earth's crust, we can depressurize magma chambers and maybe cause more volcanic activity in certain parts of the world. Let me just stress that: if you don't have an ice sheet, you're not, this isn't going to be a, you know, a mechanism that is going to be of concern. It's the unloading of the Earth by the kind of thawing of ice and the removal of ice that might cause that. So there are some, there are some people looking at the fact that the changing climate might impact volcanic behavior. The more important piece of that puzzle is the fact that volcanic behavior kind of partly influences the climate, but not to the same degree as we do as humans.

JVN [00:49:03] So what would it take for us to, like, protect folks against volcanic hazards? Like is, I mean, like, because there is tourism. But then there's also people that just, like, live around volcanoes, like what? How can people protect themselves?

CHRIS JACKSON [00:49:15] It's a really important part of the science we do is whether we can better forecast volcanic eruptions. So can we, can we characterize volcanoes enough that we know that when there's these, these earthquakes or there's this gas comes out, can we then say, "Next Tuesday this volcano is going to erupt here," and that, you know, it's kind of the holy grail, if you will, of volcano science. It's probably, well, it's undoubtedly not achievable because the volcanic behavior is very complicated, but it is just something we need to aspire to. We need to better study volcanoes to see, "Okay, this volcano erupted, what happened before it did," and then use those things to then try and understand another volcano and its behavior. The problem we have is there's a number of false starts. There's lots of volcanoes that do all the right things but never erupt. So it's a bit like the boy who cried wolf.

JVN [00:50:11] That was Dante's Peak! That was happening with Dante's Peak!

CHRIS JACKSON [00:50:15] Exactly! Because, and the, and the problem's worse, of course, depending on where you are on Earth, because you can keep sending out these warnings to people and they can keep leaving their house and grabbing their DVDs and going to stay with their friends down the road and then come back the week later. But in some parts of the world, they can't, because they don't have anything to pick up, or they

don't have anywhere to go. So, you know, understanding the volcano itself is only as useful as understanding the places in which those volcanoes are found.

JVN [00:50:42] Your millennial nature did just come out when you said, like, to grab your DVDs. [CROSSTALK] I feel like we're, I feel like…

CHRIS JACKSON [00:50:50] I didn't say my mixtape.

JVN [00:50:52] I know, it's, like, but I feel like it's I feel like these kids these days are starting to look at you. Like, if you see a DVD, they're like, "OK…" like, yeah, yeah.

CHRIS JACKSON [00:50:59] Granted, everything's in the cloud, right? Yeah.

JVN [00:51:01] They're like, You don't need like you just you go on the thing and you press it and it's there. It's like these kids these days. Yes. I'm not. I'm obsessed with you, I'm just kidding. And I would imagine that, like, if you are in a country that has, like, financial hardship or political strife, like what you're talking about with what's going on in the Democratic Republic of Congo. If you're having air warfare, if you're having any like, you know, political strife, financial stuff, I would imagine that it's harder to readily communicate and prepare your people for an eruption.

CHRIS JACKSON [00:51:29] Exactly. You compound the, the hazard, if you will, posed by the volcano with the geopolitical and human hazard of what happens when the volcano erupts.

JVN [00:51:39] So based on your accent, it seems like you're British.

CHRIS JACKSON [00:51:44] Yes, very.

JVN [00:51:45] So you were just, like, minding your own business. You were just, like, a cute little baby boy in Britain. And then you had these, like, little glasses and then you were, like, "Mommy, I want to be like, I'm into rocks?" Like, how did you get into, like, geology?

CHRIS JACKSON [00:52:00] Um, I got into geology two ways, one is that I was just not very good at lots of other things. So I was, I was not particularly engaged in lots of other bits of work at school, and geology just happened to be one of the things that captivated me. And, you know, it wasn't like I was just a stellar student and this thing just stood out. It was just, you know, struggling to find kind of enjoyment and engagement in other things I was studying at school. And then geology just for some reason just grabbed me. The kind

of other reason I got into geology because I grew up in an area, which is quite, it's kind of up towards the hills in a place called the Peak District, which is in the central part of the UK. And so I spent a lot of time outdoors with my parents walking, caravaning, camping. And I think, like, looking back by osmosis of being in the natural world is spending quite a lot of time outdoors, when geology was floated as being a plausible career and one bit of a geology career can be spending time outdoors in the natural world, looking at volcanoes and rocks and minerals, that then drew me in as well, was the opportunity to spend time outdoors looking at the beauty of planet Earth and to be paid for that is super awesome.

JVN [00:53:10] So with geology, there's, like, some geologists who are, like, "I'm obsessed with geodes, I'm obsessed with rocks." But then there's other geologists who are, like, "I do volcanoes."

CHRIS JACKSON [00:53:21] So I am, so I'm a kind of a bit of a hybrid geologist, so I work on lots and lots of different things to do with geology. And principally what I'm interested in is the structure and evolution of the Earth. So why does the Earth look like it does in terms of its shape? But also, how do we wind back geological time to try and understand how it's come to look like it does today? Volcanoes are obviously one part of that puzzle, right? Because as the Earth has evolved, volcanic activity has been a really central, fundamental process that's been occurring. So I've been drawn into volcano science or volcanology, if you will, in the last 10 years, because I've just been asking these really general questions about why does the Earth look like it does and then volcanoes a part of that puzzle?

JVN [00:54:07] Well, that's interest. OK, so what have been some of, like, the most standout moments from your fieldwork and have you ever been out somewhere? I've been like, "Fuck me, I need to get out of here. Like, this is dangerous. Like, the pyroclastic flow I feel it," but maybe it didn't happen, or maybe it did. Like, I think what's been, like, the most exciting thing?

CHRIS JACKSON [00:54:23] One of the most exciting places I've been working in recent years is in the Andes. So in the Argentinean Andes, so right on the border with Chile. And we were doing a bunch of fieldwork out there, looking at some rocks, which were a hundred and fifty million years old, and it was super nerdy fieldwork. We were having a great time. We got in some trouble with the local police, not through any bad conduct of ours, I should add, but we ended up getting arrested and put in a, in a, in an Argentine prison cell in the middle of the Andean mountain belts at about two and a half thousand meters above sea level. And it's about minus 10 degrees in the prison cell and we had our passports taken off us. And you know, as a scientist, what do you call it, a humble geologist? You're just sitting there thinking, "How did it come to this?"

JVN [00:55:12] How did it come to that? What happened? How did you go, what, what happened?

CHRIS JACKSON [00:55:16] So Argentina and many countries rightly have very strict laws around collecting fossils. Fossils are viewed as local, rightly, now as local artifacts of the natural history in the same way human remains would be or cave art or anything, right? That's fine. So you're not allowed to take fossils away. We have very strict protocols when we do fieldwork to not take fossils away. Somebody in our group picks up a fossil. And the police found that fossil and all of us then got thrown under the bus and it was all very, very painful, but you kind of see a situation which looks fairly innocuous just go south very quickly and then you realize at this point, you're not in, like, downtown Manchester in a prison cell kind of chilling out. You're actually two and a half thousand meters in the middle of a mountain range with no passport. And so…

JVN [00:56:10] Was there ever, like, a different story where you were, like, you guys discovered something cool or, like, saw something cute or, like, anything else?

CHRIS JACKSON [00:5619] And had a good time? Yeah. Yeah. We, um, let me try and think of a time when we, when we found something which made our jaws drop. Um, oh. It's a very good question, I think lots of places literally think it's somewhere where we went, where it was, where we where we did find something very cool. Oh yes. So yeah, we went to, we did some fieldwork in the Sinai Peninsula. So in Egypt, so south, southeast of Cairo, so just north of the Red Sea. And we were doing fieldwork out there and it was super super cool. We were chilling with the Bedouin, they're the local people who live there and they were kind of occasionally coming up to us and while we have done some fieldwork. And, "Oh, you know, we've seen this rock around the corner. It's black," and we were, like, "Oh, there's not supposed to be any black rocks here. The rocks here are all supposed to be brown." They're like, "Oh, no, no, where we farm our goats, there's black rocks." And I was thinking, "You know, these Bedouin don't know anything. I'm going to go and have a look and see what they're talking about."

And we walked round the corner and there was this incredibly huge lava flow deposits from 23 million years ago, which nobody had ever seen because you had to walk down this very complicated set of canyons and the Bedouin were taking their goats in there every day and we'd not gone there and we went in. And so we found this ancient lava flow 23 million years old. We subsequently did a bunch of work. We worked out what the age of the rocks were. But I was just super awesome to have, to find something geologically just fantastic. But then also for it to have come from a really beautiful interaction with really wonderful people and and they did it in this really kind of, "Oh, come on, have a look at these black

rocks." And then it was a typical western, like, "These people don't know anything." And then you go there and it's and it's just amazing.

JVN [00:58:00] So when you said that you were, like, outside with your parents and then they, like, they floated the geology was, like a, like, a, literal, like, career choice? Did I hear that right?

CHRIS JACKSON [00:58:11] Or no? I saw my my parents are both nurses, so they didn't know what the hell the rock was, really. But they, they were just interested in the natural world. They came from the Caribbean, from Jamaica and Saint Vincent. So they sort of had a very different relationship growing up on volcanic islands as children. And they just wanted me and my brothers to spend time outdoors. And I think. What they did do is when I just said, "I want to do this thing." They didn't stop me, which I think for me growing up as a child, and I don't know about you, but for me, my character, my personality very much needed somebody to allow me to be who I needed to be and to do what I wanted to do, and I reacted very poorly to being told to do something else and be somebody else.

JVN [00:58:54] That's beautiful. I also just, I mean, the name of this podcast is Getting Curious. I love that, like, a natural curiosity for you, like, took you into your literal career. And so I think one question that I have that's a little bit off is just that, like, I think I have a lot of folks listening to this podcast that are obviously curious people. I also think that in the last couple of years, a lot of people are really looking at their, like, career choices, like, "Am I happy? Do I want to do this anymore?" I think about Dr. Edith Eger, who is one of our past guests, she's a Holocaust survivor, I love her so much, she said this really incredible thing about when she was wanting to become a psychologist, maybe it was a psychiatrist, but regardless it was a doctor and she was, like, forty six. And she was, like, "Well, gosh, if I," or however old she or she's like, "Well, gosh, if I start now, I'm going to be 50 by the time that I get it." And she had a professor that said to her, "Edith, you're going to be 50 anyway. So do you want to be 50 with a doctorate degree or do you want to do it without?" Yeah. So what has been for you? If there's someone who is, like, maybe has a young person in their life or maybe they're not young, but they're, like, "I've been obsessed with rocks forever, and I don't want to be accountant anymore." How? And it doesn't even have to be necessarily with geology. But what would you say to someone that wanted to get involved in science, wanted to maybe make a career or a life change around science? Do you have any advice as a scientist about what has worked for you?

CHRIS JACKSON [01:00:12] Yeah, I think be curious and seek fulfillment, right? I think the seeking fulfillment piece is, you know, that can be just reading blog posts, reading books, watching documentaries on TV, you know, about geology or about science in general, you

know? And you might have to do that alongside your personal life, your busy personal life, you might have to do it alongside your, your, your, your career because you're paying the rent, right? You, that might just be the reality of it. As a young person or somebody who's older, but actually has a career choice, you know, available to them, yeah, go and seek it out again, use your curiosity to ask questions to find out what plausible career choices are out there for you, but start to bring science into your life. And I say that, but science is in our lives all the time, remember. And we've probably always been curious about what's around us, but actually be more proactive in seeking out answers to those questions and, and then see where it takes you. And even if it just enriches your life in the evening by watching a documentary on TV, that's as awesome as it is than it becoming your, your future life career goal.

JVN [01:01:20] OK, so now this is my last official question, but I'll have one more after this for you if we've just been remiss if you didn't mention anything. But, so if, if after this, people have been listening to your gorgeous, creamy British accent and they are, like, "I am butt crazy in love with volcanoes, I started this off and didn't really mind them that much. But now I'm fucking obsessed and I already saw Dante's Peak." Where would you direct people to learn more about volcanoes? Like, are you tweeting about volcanoes a lot? Do you post a lot of pictures on the gram about it? Do you follow some volcano people that you're obsessed with? Any favorite movies, books, whatever? Lay it on us.

CHRIS JACKSON [01:01:58] Yeah, yeah. So I think there's some awesome people on social media who tweet about this all the time. Jeanine Krippner is a very good friend of mine. She tweets a lot of volcanic content. She works with the Smithsonian Institute and the Smithsonian have this very strong group in volcano science, so they just post, like, loads and loads of awesome information about volcanic eruptions today. Volcanic eruptions in the past, they have this amazing art gallery of volcanic eruptions, and people do volcano science in the field. That the Smithsonian Institute is a, is a really good landing place, I think, and Janine to, to really enrich your life about volcanoes. The Kraffts as well. They were a couple who wrote books about they were they were probably the closest to volcano chasers. They died in an eruption in Unzen in Japan in, I think in the 80s, the Krafft couple. They, they wrote books and documented volcanic behavior. So go and look at the Kraffts, K-R-A-F-F-T, and read about their lives and read about the, the way they talked about volcanoes with Indigenous peoples almost in a spiritual way, they had they had it, they had an appreciation of the physicality of volcanoes, but they also saw volcanoes as being much more than simply a big lump of rock out of which lava occasionally comes. And so I think I think I would recommend those things to your listeners as a kind of landing point for learning more about volcanoes.

JVN [01:03:26] And they went to go see it, a volcano in Japan, and they got the wrong side of the volcano at the wrong time and they died?

CHRIS JACKSON [01:03:34] They died in a pyroclastic flow, yeah. [CROSSTALK] This is why I said I told you, I told you that the, you know, there and the one thing that does fear the volcano, volcanologists fear more than anything else is pyroclastic flows.

JVN [01:03:49] OK? Actually, I have one more question. I'm sorry. Remember that part in Dante's Peak when the grandma sacrifices herself and jumps out of the fucking, like, that boat, because it's, like, sinking and they're in the, is that geologically possible? Can a river turn into like a liquefied acid fucking like pyro plastic flow ass fucking melt your body in half like it did to her?

CHRIS JACKSON [01:04:09] No.

JVN [01:04:10] Oh.

CHRIS JACKSON [01:04:11] You can get probably quite acidic waters from hydrothermal vents, right? So but that but they're often associated not with the, you know, the Dante's Peak always gonna erupt next Tuesday. These are things which are. Which have been forming over a long period of time, so gases have been coming out for a long, long time, this water has been absorbing those gases for a long, long time.

JVN [01:04:30 I'm talking, like, could a volcano erupt a la Dante's Peak, and turn a local creek into a running river of hot acid that would kill your grandma in the way that she died in that movie?

CHRIS JACKSON [01:04:45] I would, I my, my sense is not, sorry.

JVN [01:04:48] So that's probably never happened.

CHRIS JACKSON [01:04:49] No, because this is it: as scientists, we sort of know what we know, but there's lots more we don't know, right?

JVN [01:04:55] So she was just such a pivotal character and she literally sacrificed herself in that, like, acid river. That scene really stuck with me.

CHRIS JACKSON [01:05:02] I know, well, this is probably what puts people off volcanology.

JVN [01:05:06] Do you remember that scene, right? That, you know, with her little bob, her little gray hair haircut?

CHRIS JACKSON [01:05:10] I think she isn't is, isn't it, it seemed to be-

JVN [01:05:13] It's her mother-in-law, honey. Oh, well, yeah, I really know this movie too well. It's the mayor's mother-in-law. It's, like, her ex-husband's mom, and they go up to get her. But she doesn't want to evacuate and then it's too fucking late. And then it's erupting. And then they have the kids and the mom and Piece, they jump in the boat. But honey, what they don't know is that creek turned into, like, hot lava water. Yes. And then she said, then they're almost to the bank, but it's totally fucking sinking. So she jumps out of the boat and then like, walks them onto the bank and they're, like, "No, no." And then she's like, "Oh," and then she's all burned, and it's just devastating.

CHRIS JACKSON [01:05:46] I know it is. It is a pivotal moment in volcano science and volcano films. I think because a… [CROSSTALK]

JVN [01:05:53] Yeah, like, making things that are impossible, like, making them seem like art.

CHRIS JACKSON [01:05:57] Yeah, mother in law's are never popular. So maybe it was the right character to go. I'm not sure.

JVN [01:06:01] It's true, but that is annoying when there's like things that just like, aren't real, like, in, like, you know.

CHRIS JACKSON [01:06:06] I know. But you know, as a scientist, I can admit this to now. I think if we made films just about science, they'd be quite dull because large parts of science are not that exciting, so we are faced with the challenge of how do we portray the science realistically so that we engage people without them making them completely ridiculous? And that is a very, you know, I've made a few TV programs and given talks about this like, you know, it is a very fine line to try to in terms of engaging people with a topic and then just boring them out of their minds.

JVN [01:06:35] Well, I mean, this has been working for me. I guess, that was creative of them, they basically turn like a river into, like, a liquid pyroclastic flow, which is, like, interesting. Chris Jackson, is there anything that you would be remiss as a literal geologist that we did not cover today about volcanoes? I would also tell you that next time a big volcano eruption happens, you're going to have to come back and be like an emergency

guest on Getting Curious. But I just had so much fun learning. I feel like I've learned so much and I've had so much fun. Did we miss anything that you feel we need to mention?

CHRIS JACKSON [01:07:04] No, no. You had a very wide ranging set of questions. So yeah, and I thank you for inviting me on. It's been absolutely fantastic.

JVN [01:07:11] And we're going to put the links to your socials to an episode of People on follow because we are just obsessed and you all you obviously on this podcast you can't see. But honey. Chris Jackson is everything, stunning Brit, like, just the voice, the socials must follow. Chris, thank you so much for everything. We appreciate you so much.

CHRIS JACKSON [01:07:27] Brilliant. Thank you so much for having me on Jonathan. It's been a pleasure.

JVN [01:07:32] You've been listening to Getting Curious with me. Jonathan Van Ness, my guest this week was Professor Chris Jackson. You'll find links to his work in the episode description of whatever you're listening to the show on. Our theme music is Freak by Quiñ. Thanks so much to her for letting us use it. If you enjoyed our show, introduce a friend and please show them how to subscribe. You can follow us on Instagram and Twitter @CuriouswithJVN, and our socials are running. Curated by Middle Seat Digital, our editor is Andrew Carson. Getting Curious is produced by me, Erica Getto, and Zahra Crim.