

Areology with Dr. Jennifer Buz

Ologies Podcast

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Haaaay. It's your stepbrother's girlfriend, the one with the pet rat. What's up? It's Alie Ward. Welcome back, another episode of Ologies, hi guys! Happy continued summer to all of our friends in the Northern hemisphere. Happy sweater weather to the Southern friends. Boy howdy do we have a special two-parter for you this week and next. [drumroll] Mars. Are you ready? Okay. That orange orb in the night sky, it's fodder for science fiction, and it's a place where billionaires ask themselves, "Can we go there when we ruin the planet we're on?" It's kind of like a very dry rebound after we crash and burn our marriage with Earth.

Maybe you love Mars, maybe you don't know why people love Mars. Maybe you're like me, and until a few years ago I was like, "wait is Mars the really hot, like, fiery one because it's red and stuff?" I had no idea! So this week, you're not only getting answers to the questions to you feel too stupid to ask, but also some in-depth knowledge of what's coming up next from one of the most chill, but deeply enthusiastic ologists I've ever gotten to sit down with. Woo!

Okay, but first, I'll be quick. This show would not be made without the Patrons at Patreon.com/Ologies. You can join that club for as little as a dollar a month, 25 cents a week. It lets you see what topics are coming up next, you can submit questions that I ask the ologists directly, also I say your name, sometimes I pronounce it right.

This is an entirely independently made podcast - you guys make it happen. Another way to support the podcast, if you'd like, is to go to OlogiesMerch.com. There's totes, and hats, and shirts, and pins, and just in, are you ready for this? Ologies swimsuits. And backpacks! You can put science on your butts! It's very exciting, it's so exciting that I was like, "I should have a sale!" I should just have a sale! So if you enter the code CAMPOLOGIES at checkout, you'll get 10% off your whole order all through July, so if you decide you need an *Ologies* bathing suit with bugs on your butt or boobs or whatever, go to OlogiesMerch.com. Go get 'em.

Also, your reviews and ratings keep it up in the chart for other people to discover, and I'm often writing this without a bra, I'm recording in my closet, and your reviews make my week. And then I read them, such as Nicki the Nerd who titled her review, "I know You're Reading This Alie." She's not wrong. She said:

This podcast is flipping awesome. Every week I now have new random factoids to spit out at people in awkward situations, so thank you Alie for being a geek and giving your fellow nerds a place to geek out together.

I wanna know how awkward your situations get. I told 100 people over a PA system about getting my hand stuck in an escalator, and the story did not go over as well as I thought. Anyway, it happens.

Okay, areology, let's get into it!

First off, Mars has a lot of iron in the soil, which makes it red, which makes it look like the solar system's big, bloody eyeball. Hence, we named it after the god of war: Mars. So it's Ares in Greek

Mythology. And if you want to know about Romans ripping off Greeks, listen to the mythology episode. So the Greeks were apparently kind of ambivalent towards Ares. They were like “He’s jacked and he could kick ass in battle, but he’s also kind of a dick.” So the word areology means ‘study of Mars.’

This ologist was introduced to me via email by my NASA friend Casey (hi Casey, hi Christine). Casey’s email between us simply said: “Do you need introductions? No, you do not.” Then, I received a message back from her saying that she listens to the podcast, she’s been a patron since approximately 10 minutes after listening to her first episode, and that once, she played Ologies with her friend where she pretended to be me and interviewed him, and she said, and I quote, “I even talked about how dirty my hair was and put in asides.” And let’s just say I wanted to print up her email and frame it in something ornate and gold.

So this interview was ON, it was happening. She grew up in the heart of LA, she has the most laid back, textbook SoCal accent I have ever heard, maybe the chilliest areologists on any of the known planets. So, I got off a plane from a work trip, I headed straight from the airport to a little conference room with squeaky chairs at Caltech in Pasadena to talk about, like, what Mars’ deal is, and the best sci-fi about it, some super recent discoveries about moons and life, insane dust storms, the rovers they’re building, and some of the best science dreams I’ve literally ever heard in my life. So please prepare for a journey into space and your rocky subconscious with areologist, Jennifer Buz.

[intro music]

Alie Ward: Alright, so you know the drill, there’s a microphone, you talk into it.

Jennifer Buz: Okay. This is going to be fun.

Alie: Yeah, it’s great, you just...

Jennifer: You just talk regular but with microphones.

Alie: Yeah, exactly. You just hold, look at this, you’re already a pro. You’re already so good.

Aside: At this point I looked over and I saw that Jennifer was prepared with six printed sheets of questions, from the Patreon page asked by listeners, annotated by hand with her answers! She took the liberty of printing and answering them to prep for this!

Alie: Oh my god! You printed them out!

Jennifer: And answered them.

Alie: Oh my god.

Jennifer: I didn’t want to be caught off guard.

Alie: This is great, this is the most prepared anyone’s ever been.

Aside: We’ll get to all the questions in Part 2 of this series next week, but just know, she is a wonderful genius. Also, her website is so worth perusing, it’s her name minus the vowels, so jnnfr.bz, and it features this pixel-y drawing of herself with purple hair

and a turtle body floating in the cosmos. It has photos of her work, links to significant space labs and a ton of Easter eggs that you just have to click around to get into. And as soon as I saw it, I was like, "I'm interviewing this very bizarrely amazing human being, I love her. Also, someone should clone her and populate a planet with a bunch more of her."

Alie: Your website is so spectacular by the way, I love it so much!

Jennifer: Thank you. I thought about making it more professional.

Alie: Nah.

Jennifer: But it's like, that's lame.

Alie: No, don't do that. Okay, so you study Mars.

Jennifer: Yes.

Alie: You're an areologist?

Jennifer: Yes.

Alie: Is that correct?

Jennifer: Yeah, well I think I'm a planetary geologist who studies Mars, but I study Mars, so I'm an areologist.

Alie: Okay, how long have you studied Mars? I'm gonna get straight into it with basic bitch questions.

Jennifer: K. I started studying Mars when I got to Caltech, so it's been about six and half years.

Aside: So, Dr. Jennifer Buz got her bachelor's and master's degree in geological and planetary sciences at this little start up school, I don't know if you've heard of it, it's called MIT! Dude. And she just defended her geological PhD this April at Caltech. During her schooling, she just always dreamed of working with rocks from faraway lands. It's so easy to spend your twenties focused on dipping pizza into nacho sauce and trying to get your brother to buy you drugs, but Jennifer was like, "I gotta get my mitts on some space rocks!"

Alie: When you got the call that you knew that you would get to work on this, like for real...

Jennifer: Okay, so maybe that moment would be when I was an undergrad, I applied to work in a lab that studied moon rocks, and that would be my first time, my first real exposure. And when I got that research position, it was a summer position, I was like, "Oh my god, I'm going to be touching moon rocks! They're gonna be in my possession!" I get to look at them every day, and they came from the Moon, and I was reading Apollo transcripts from when they found the rocks. And I was listening to the audio tapes and was like, "oh that's when they found my rock! Oh my god!"

And then one day I broke the rock, and I was like, "They're gonna fire me for sure," but they didn't, they were like, "Yeah, well, rocks break." But that day when I got that job, I

was just thrilled beyond belief that someone trusted me with a rock that came from the Moon that an astronaut collected.

Alie: Oh my god, that's must've been just such butterflies.

Jennifer: Yeah, that was super, super exciting.

Alie: And what a good lesson to learn that you can break a moon rock and life will go on.

Jennifer: Yeah, I remember that day I broke the rock, and I just packed up my stuff, and went to my dorm, and I wrote an email to my advisor. I was like, "I broke the rock, I'll be at my dorm." And I went and I was really upset and I told the people in my hall, I was like, "You guys, I definitely got fired just now," and they all comforted me, but they were like, "Yeah, that sounds serious." And then my advisor was like, "Are you coming back? We've all broken rocks." And then I was like, "Oh..."

Alie: That's so cute! Did you pack up your stuff, like your desk area?

Jennifer: Yeah! I'd only been there a couple days, but I packed up everything in the lab and I made it all neat, and I just went home, and was just waiting. He was at lunch, and if he hadn't been at lunch I would have just gone to his office and probably sat down and cried and be like, "I broke a rock!" But I didn't, I just sent them this email, like, "I broke a rock."

Alie: I just picture you walking across campus with a box and a mug that says, "I'm LOONY for the MOON" and just being like, "I guess this isn't my office mug anymore."

Jennifer: Yeah.

Alie: Oh my god, that's the cutest thing ever.

Jennifer: Yeah, it's great that, in my experience, my advisors have been really understanding and patient with me, too.

Alie: I mean, it's nice that even scientists who study the coolest shit even on other planets are all like, "We're all earthlings."

Jennifer: Yeah.

Alie: It's good.

Jennifer: Yeah.

Alie: We're all just little humans.

Jennifer: Yeah.

Alie: Aww, that's so cute.

Aside: And speaking of little humans, when Jennifer was just a wee one, her folks took her on tours of NASA's JPL - the Jet Propulsion Laboratory in Pasadena - and she just became deeply stoked looking at the models and the replicas of the rovers. These things bumble around Mars, scrubbing rocks and taking pictures, and eventually some models zap rocks with lasers.

Right now, NASA is planning the next one - there's a 2020 unnamed rover - to add to the four that are already up there. There's Sojourner, which kinda turned into a pumpkin, metaphorically, in 1997. And there's Spirit, which is stuck with a broken wheel, but up until a few years ago was bravely pinging back. And then there's Spirit's twin rover, Opportunity, which has been cruising around since 2004. And then there's the larger Curiosity, this is the one you've probably heard of a lot more recently. It's about the size of a Mini Cooper, so says NASA itself, and Curiosity landed in August of 2012 and has been bebobbling around a crater named Gale for the last six years.

Fun fact, to help areologists figure out how loose the soil is and how far the rover has traveled, the Curiosity tires have a few dots and dashes in the tread that spell out a secret message in Morse code. [*whispering/singing*] What does it spell? What does it spell? It spells, JPL. Ding dong.

I did some digging in the dusty soil of the internet, and I discovered that rover driver Mark Maimone - he's ginger-haired, jolly looking - is responsible for that Morse code. And also, his cell number was just, like, listed. So um, I did what any classy stranger would do at eight PM on a Wednesday and I texted him, just being like, "Hey Mark! You totally don't know me, but my name is Alie Ward and I just found out you're the one who proposed the JPL Morse code on the Curiosity tires, I'm just saying 'hey, that was badass, super cool idea!'" Um, but it's been five days and I have not received a response, so don't do that.

Back to the Curiosity rover landing in 2012, which was an exciting time for space nuts.

Alie: So, Curiosity rover.

Jennifer: Yeah

Alie: We landed it, what, six years ago?

Jennifer: Yeah, I think that's right

Alie: Did you stay up late to watch it?

Jennifer: Yeah. I volunteered at a public event where they were showing the landing and stuff.

Alie: I didn't see the landing. I think it was in the middle of the night, right?

Jennifer: It was late, I feel like it was 11 or something. I don't really remember though.

Alie: What was that moment like when it touched down, what were you doing?

[*clip from NASA celebrating the landing: "Touchdown confirmed, we're safe on Mars!", cheering*]

Jennifer: We were just all watching the screen, and I think there was lots of screaming, and people were crying, and lots of general excitement.

[*"Time to see where our Curiosity will take us"*]

Aside: There's raw video of the NASA JPL control room when the Curiosity rover touches down safely. Millions of dollars, so many millions of dollars, thousands and

thousands of hours, and trials, and failures, and redoes, and teamwork to get this thing on fucking Mars. People in the control room, bearded men, grown women, just all weeping with joy. Did I watch it and cry? Maybe I did. None of your business.

Jennifer at the time was also pretty jazzed because that meant she didn't have to throw her unfinished PhD thesis into a burning garbage can.

Jennifer: My PhD research was going to be using that data, so I was super nervous also that maybe it wouldn't work and then I was going to have to pick a new project, but I was super excited also. It was a high-emotions night.

Alie: If it literally bit the dust, you'd be like, "There goes my PhD." What was your PhD project?

Jennifer: My PhD basically came down to five projects related to Mars.

Aside: [record scratch] Wait a second, before we even talk about what she was doing on Mars, let's just talk about Mars. Let's just back the hell up for one second.

Alie: As a planetary geologist, can you run me through, like, what the fuck is Mars? What's its deal? Why is it so dry? How cold is it? How big is it? Just tell me what we're working with here. Give me some specs. If you were a dog and you're like, "I don't know what Mars is," how would you start?

Jennifer: [laughing] Okay, so Mars, it's the next planet from our sun, so it's going to be colder. It's also a lot smaller.

Aside: At its closest, Mars is around 34 million miles - that's 55 million kilometers if you live in a country with the metric system and good healthcare - away. Scale-wise, Mars is about half the size of Earth and has roughly one third the gravity. One third! I looked up a few simulators of Mars gravity and in one, there's this human in an orange onesie, supported by slings, taking these graceful leaps around an indoor track, kind of like a giant marionette in a prison jumpsuit.

In another video, I saw what appeared to be a gaggle of French cosmonautical tourists taking a ride in a Vomit Comet, which is a seatless commercial jet that makes these roller coaster dips in flights and simulates lower gravity. I don't know, from what I can tell, less gravity looks fun as hell, with these middle-aged Parisians resorting to whoops. They're hooting like tiny happy donkeys or kids in a ball pit. [clip from video: various "woo-hoo-hoos," "woos," and "aahs"]

So, Mars gravity: take your weight, divide it by three. That is your bounding happy space pony weight.

Jennifer: Its atmosphere is super thin right now. But in the past, it had a thick atmosphere and there was water on it for sure, we have evidence for streams, and lakes, and all sorts of things like that. It was a lot warmer, because it had an atmosphere and it used to have a magnetic field like we have on Earth, but it's dead, it doesn't have one anymore.

Alie: How do magnetic fields die?!

Jennifer: Mars, because it's smaller, it can cool down a lot quicker. On Earth, it's hot down in our core and we've got iron spinning around and it's also a big planet. But Mars doesn't have all those things, so its core is not putting out that kind of motion anymore. So we're not getting a magnetic field anymore.

Alie: I had no idea that was even a thing! I didn't know that was an option.

Jennifer: And the Moon used to have a magnetic field too and it doesn't have one anymore.

Alie: The Mars moon.

Jennifer: No, Earth's moon.

Alie: Really? Damn

Jennifer: So I studied the Moon before I studied Mars.

Alie: Oh god, I got so many moon questions. Oh that's going to be another episode. Does Mars have moons?

Jennifer: It has two moons, Phobos and Deimos. There's some debate about how the moons form, but I think most people think they're captured asteroids. They're really small moons, not like ours. I think from the surface they look more like planets.

Alie: So if you're on Mars, do you see two moons in the sky at the same time?

Jennifer: I think you can, but they're so small, I think that they look more like planets.

Alie: Okay, they are just like little dimmy dots.

Jennifer: Yeah, they don't look like our moon for sure.

Alie: Okay, I thought maybe... Have you ever cracked an egg and you get a double yolk, and you're like, "It's my lucky day!"

Aside: Side note, how lucky is it to get a double-yolker egg? I had to stop and check, because I was like, "How rare is it?" Maybe it's happened to me twice in my life. Anyway, some traditions say it's really good luck, or that someone in the family is gonna get knocked up with twins, but according to Norse legends, it's an ominous sign that death will visit!

So what's actually happening? Like, biologically. So, in about one in every thousand eggs, a hen just boops out an extra yolk. She's like, "boop!" Usually, younger hens do it more frequently, I don't know. Maybe their bodies are like, "HELL YEAH I'M A BABY MACHINE, LET'S GO!"

As for Mars' double moons, some hot goss just came out this past week, Jennifer emailed me that Phobos, which she described as 'a 26 km wide lumpy turd ball,' or 'a cocoa puff,' may not have been a captured asteroid, but possibly it was formed out of a cloud of dust that was left over from a giant impact, kind of like our own beloved moon. And that possibly - possibly - Phobos has formed many times over Mars' history and it just periodically crashes into the surface, forms a dust cloud around Mars again, and then recreates itself into a moon, and then crashes again, forms itself anew again, but smaller,

over and over and over. Which is like the most poetic shit I have ever heard. And also, that's more comebacks than Britney, and I respect that.

Now, the decreasing orbit of Phobos - this tendency to kinda decrease and decrease and crash - convinced even Carl Sagan at one point that Phobos was just a hollow satellite put in place by aliens. And I love the idea that maybe Carl Sagan just thought of it kinda like a backyard shed, like aliens would just store holiday decorations in tubs, or coffee cans filled with nails and IKEA Allen wrenches, maybe a lawnmower that the Martians haven't used in a few billion years, 'cause landscaping got a little parched up there.

Alie: It sounds like that, but moons. And so it's dry - so what do they think happened to make Mars such a dust bowl?

Jennifer: It got dry, basically. It used to have water, but because it's so much smaller, its atmosphere got lost. Basically, it doesn't have as much gravity pulling it in. It also didn't have a magnetic field anymore and we say our magnetic field protects us. And so, the atmosphere just got stripped away over time by the solar wind and other atmospheric loss processes. It just lost... its atmosphere got dryer and dryer and now it has a thin atmosphere and everything's just dusty.

Alie: Does the water evaporate into the solar system?

Jennifer: Yeah, it just gets lost in... yeah basically.

Alie: I wonder where it goes.

Jennifer: Yeah, I dunno, just like, out. *[laughs]*

Alie: Can you imagine just oceans, just kinda like misting around?

Jennifer: Maybe, I think it's probably really scattered apart, it's probably just gas.

Alie: Okay, so we have a super dusty planet. Why is it red?

Jennifer: It has a lot of iron. It's just rusty.

Alie: Ooh. And same as Utah. Similar.

Jennifer: Yeah, in a lot of ways.

Alie: Why do you think people fuckin' love Mars so much?

Jennifer: Because it is awesome. I mean...

Alie: I agree with you.

Jennifer: *[laughs]* It's like, it could have had aliens on it. It's like a little Earth that was way cooler in the past, and now it's a little dead. But it has so much potential, and it's so similar to Earth in a lot of ways that people are like, "We could go there if, you know, we screwed up our own planet." It's so geologically diverse, it's got evidence for maybe an ocean, it's got lakes, it's got deltas, crazy sand dunes, and there's just so many cool things you can look at on Mars that it's just fascinating. I think that's why people love it. And there's just so much potential for thinking about life, and aliens, and space travel, and being on another planet, and fantasies related to that.

Alie: And Martians, like literal Martians. Hear me out, maybe Mars functions for us - Earthlings - as the idea of an old cabin in Joshua Tree, like it's far away but not that far away and it's old and you don't really know why it's kind of decrepit but it has a charm to it, and maybe you could escape there if shit when down.

Jennifer: Yeah. And it's dusty too.

Alie: And it's dusty. It's kind of like our old vintage homesteader cabin in the desert.

Jennifer: Yeah, mm-hmm, I like that idea.

Aside: So what parts of this chilly desert are we really poking around? Now, the Curiosity rover landed in a crater: Gale Crater - named for Walter Frederick Gale, who was an Australian banker by name, but he was a real space dweeb by night. Gale Crater is this huge dent in Mars and it's filled with a mountain of, perhaps, wind-whipped debris that's taller than Mt. Rainier. It looks like if you piled a bunch of brown sugar into a shallow bowl, or like a little tiny tuft of lint in a belly button. Why do we care about this crater? Because, maybe it was a lake?

Alie: Why'd we put Curiosity in the crater?

Jennifer: That's where the lake was. That's where the cool stuff was.

Alie: Okay, got it. So if there were going to be any old beer cans or signs that people had a party there, we would find it in the bottom of what used to be a lake, or we'd be like, "There were maybe some old fish in here."

Jennifer: Yeah, I mean, it's like a basin, so stuff is gonna collect there. And we had seen from orbit that there were layers that looked like they could've been from a lake or something wet. People actually really debated what the layers were, and so people were curious from many different perspectives, and so that's why we went there. But picking the landing site is a multi-year thing, with hundreds of people involved and stuff.

Alie: [*exasperated woo*] Do people debate ferociously? Are they in a boardroom over late-night takeout food being like, "No! We're going to put it in this basin!"

Jennifer: Yeah, so the landing site process is a really interactive process and actually people in the general public can participate too. So the 2020 rover, we're having landing site workshops right now, and basically the way it works is: people who study Mars, or even anybody, can propose a landing site. And you'll be like, "I wanna go to this place," but then they have to make their argument for it, so they have these workshops that are yearly or bi-yearly, and people present what they found out about their spot and why we should go there, and then literally we vote. We raise our hands - people at the workshop - and then it's a popular opinion. But then there's a little bit of influence from NASA headquarters.

Alie: So wait. So it is decided by a hand-raise, and then NASA's like, "I approve."

Jennifer: Say there's 100 people suggesting sites. The hand raising process will narrow it down to, like, eight. And then once it gets to those few landing sites, then NASA starts being like, "Okay, now we have to consider how feasible is it to go there? Are there other

engineering constraints?” And so, people might be super psyched about a place for one reason, but if it’s not going to answer the question that’s a goal of the mission, they’re gonna be like, “No. We need to stay on track.”

Alie: And what did you think of the Opportunity rover? Do you have a favorite between Curiosity and Opportunity? I mean, I know that Opportunity did bite the dust and it’s just chilling somewhere, right?

Jennifer: Spirit.

Alie: Spirit! What did I say? Opportunity? I’m sorry. What did I tell you? I went into this being like, “I’m going to learn a lot about Mars.”

Jennifer: One way I remember that, well, many ways, but like, “free spirit.” Like, Spirit’s stuck and you want to free it.

Alie: [*awwing and laughing*] Run me through what happened with Spirit, what’s going on with Curiosity, I know there’ve been some dust storms - people are super worried about the dust storms and Curiosity right now - and what they’re finding out.

Jennifer: And then there was the twin rovers, Spirit and Opportunity. And so, Spirit got stuck, its wheel stopped spinning and it was dragging it for a while. I wasn’t involved in this Mission, so I only know a high level, public kind of thing. So it was dragging its wheel around and eventually it couldn’t get out of its hole. But Opportunity’s still operational. But the dust storm is super relevant right now, because there’s a dust storm on Mars. This is not the first time there’s been a dust storm with the rovers, and in the past actually, when there was a global dust storm, they were worried we may never see Spirit and Opportunity again, because they use solar panels for their power. But actually the dust storm cleaned them off a bit.

Alie: No!

Jennifer: When the dust cleared, yeah, because as they’re moving around dust is a major problem for our work, because it’s just really fine and it lands everywhere and it’s just like a dirty apartment, kind of. But if you’re looking at the surface, it’s hard to see stuff underneath the dust sometimes. So actually yeah, it cleaned off the solar panels.

Alie: And they’re doing okay right now?

Jennifer: Yeah. So, Opportunity is not operational right now because it can’t get enough sun. But it’s still alive, it’s still sending pings, like, “Hey I’m here! But I can’t do anything.”

Alie: And is it because of seasonal things happening there?

Jennifer: Because the dust in the sky is blocking the sun from going there.

Alie: How big is this dust storm and why does Mars have these insane dust storms?

Jennifer: It’s a really dusty planet, you know, it doesn’t have an ocean to catch the dust that’s floating around. There is an atmosphere, and so the dust is really fine, it can get picked up just entrained in the atmosphere for a long time.

But Curiosity is also witnessing this dust storm, like when we look at pictures of the sky that it sends us, we can see that the sky is much darker, but Curiosity uses nuclear power.

Alie: It does?!

Jennifer: Yeah, it's not using solar panels, so it can still function with a dust storm.

Alie: I did not know that. How much fuel does it have?

Jennifer: A lot.

Alie: How long will it live?

Jennifer: [*thinking*] For more years. I don't know the exact number of years. But, so the battery, it has a battery that it can recharge and stuff. I don't know the details of how it's powered, but it has some sort of decay. Yeah, it'll live for a while. We'll be able to use the really power-hungry things less in the future, but right now it's like...

Alie: It's chugging along? I didn't know that, I thought they were all solar.

Jennifer: No, yeah and the next one will be similar to Curiosity.

Alie: Okay, and that's the 2020.

Jennifer: Yeah.

Alie: What's the 2020 going to peep? What's it looking at? Where's it going to land?

Jennifer: We don't know yet where it's going to land, it's down to three sites.

Alie: Do you get to vote? With your arm?

Jennifer: [*laughs*] I think that at this stage, I'm not sure how much my individual opinion matters as opposed to the people in charge of the rover. I think they have a lot of say now. But there are still workshops, there's still landing site workshops. So, people are still working on the landing sites and presenting, and then the public and scientists can still go and ask questions and stuff like that.

Aside: So, side note, I wanted to see if any workshops remain, and yes! In October of 2018, NASA will be conducting the fourth and final three-day workshop to determine the landing site for the 2020 rover. Now, according to a page up at MarsNext.jpl.nasa.gov - I'll put a link in the show notes - they'll be gabbing about the potential of three remaining candidate sites, all possible sites where life could have existed and/or there's a lot of evidence for rocks and fluids having interacted.

So this workshop? I picture it taking place in some secret marble hall, but it's just happening at a Hilton in what's being called "Los Angeles North," but hello, it's just Glendale. That's like calling New Jersey, "New York East." But who am I to judge? Oops! Then I went on Yelp to see how this Hilton was, and reviews are mixed. Some people think the pool is too cold and the walls are too thin and one person gave it 3 stars because, "the restrooms needed to be restocked due to my stall not having toilet seat covers and the lady next to my stall asking for toilet paper lol." Perhaps they should

have sent a rover to this Hilton, to see if it was the best place to host the conference. Either way, it's gonna be exciting. And now you have all the info you need to choose the rover spot on Mars.

Jennifer: And so one of the big ideas behind past Mars life is that there was microbes maybe living in cracks in rocks and stuff. In that area there's also volcanism and stuff. A wide variety of rocks there, and a wide variety of ages, which is crucial because Mars was probably habitable in its early history.

Alie: How long ago do you think Mars was probably habitable? Are we talking like, 5 billion years ago? Or like, 30,000 billion years ago?

Jennifer: Oh no a long time ago, billions of years. Like 3 billion years or something. I mean, maybe there's still some fluid activity more recently, but it's such small amounts that these would be really lonely bugs.

There's a big group of people that want to send a rover back to the same spot where Spirit is, which is kind of a cute thought in some ways, but a lot of people are like, "No, we want to go somewhere new." But at that spot, there's hydrothermal activity, which is, like, on Earth where a lot of people think life might have started here. So that's why there's a big argument to go back

Alie: Like primordial Martian soup, kind of?

Jennifer: Yeah, mm-hmm.

Alie: Do you think there's any hope of sending the 2020 rover and it bumps butts with the Spirit and Spirit's like, "I'm back!" and gets its groove back?

Jennifer: [laughs] Oh, you know that'd be kind of cute if they sent it with a little toolbox to fix its friend. I don't know, I think that it may not go to that exact precise spot, but it could, I mean it's possible. But, it's a highly debated thing if it should even be considered, because they're like, "It's a big planet, we should go somewhere new."

Alie: Right, yeah, I do feel like... You know, I've dated people that want to go to the same restaurant every single night. Like, come on dude, a new place opened up down the block, let's try it out, I feel like we can branch out.

Jennifer: Yeah, I'm excited to check out some new spots.

Aside: So day to day, Jennifer works on the computer, she looks at images she gets beamed from another fucking planet, totally normal. Or, she looks at how light hits the surface of certain materials and what they're composed of. And then, of course, fulfilling bebeh Jennifer's dreams, she works on the Mars rovers.

Jennifer: And then another thing that I do often is I'm on the Curiosity rover team, and so some of my days are spent doing operations for the rover, and so we figure out where's the rover today? What's cool around us? Where are gonna shoot our laser? Like, that kind of stuff.

Alie: Oh my god, this is your life!

Jennifer: [*laughs*] Yeah, and so there'll be telecons and stuff. And so I'll be on a telecon most of the day.

Aside: PS I had to email Jennifer to ask if a telecon is a fancy word for a phone call and she said yeah. But also, you share computer screens, so my guess is it's kind of like a role playing game, but instead of your cousin in another state having her elves attack you, it's a space scientist being like, "Check out these sweet-ass rocks!"

Jennifer: Planning out, making the rover's little agenda for it.

Alie: Is that crazy to you, that you came to JPL, looked at rovers when you were a kid, and now you're like, "I'm on the team deciding where to point the lasers on Mars?" Like is that bananas?

Jennifer: Yeah, it's pretty exciting. I definitely think back to being little and seeing the rovers at JPL. That's pretty cool to me. Then another cool part about being a Mars geologist is that we often study analog sites. We'll go to places on Earth that remind of us of Mars and study them, and think about, if we were on Mars, how would this be different? Or we'll ask a question. Iceland is a place where people go to study Mars, or also the dry valleys of Antarctica, people go there to study Mars.

Alie: Really? What is it about those places, specifically Iceland? I know a lot of people love Mars and are thinking about going to Iceland. Where in Iceland do you go if you want to pretend like you're on Mars?

Jennifer: I don't know specifically, I couldn't say a specific place, but there's lots of rift evidence of volcanic rifting, a lot of hydrothermal interaction kind of stuff. So, where water and hot rock met.

Alie: And there are volcanoes on Mars?

Jennifer: Yeah, so Mars is super volcanic, super basaltic. Basalt is like what's coming out on Iceland, which is why people go there. And then, it's like cold, too - Iceland's super cold and Mars is really cold - so that's like you got kinda a lot of the stuffs in common already.

Alie: A correlate there.

Jennifer: Yeah.

Alie: Would you go to Mars if given the opportunity?

Jennifer: Uh, I think it depends on the circumstances of it, but like, yeah.

Alie: Business class, you're at least going business class.

Jennifer: Yeah, I mean like, is there a colony on Mars that's already established? Then yeah. Or if I'm going to be a cool geologist on Mars, like yeah, for sure. But like...

Alie: One of the first, are you like, "eh..."

Jennifer: Maybe if I was, like, a little older. [*both laugh*]

Alie: You just eked out what you could on Earth and you're like, "Alright I'm ready to retire on Mars"

Jennifer: Yeah, I think I'd just weigh it, be like, "Am I ready to die?" then I would say, if I'm like, "Okay, yeah that'd be kinda cool," then yeah.

Alie: It's like moving to Arizona. Like, "I'm ready to have the last phase of my life."

When you were trying to figure out what you wanted to do with your life, your job, at what point did you know where to steer yourself? At what point were you like, "Okay I'm gonna do this, I'm gonna study this, I'm gonna work there."

Jennifer: Yeah, only very recently.

Alie: Really?

Jennifer: Yeah, because I was super into science in general, but I had a really hard time figuring out what exact science I wanted to study. I love nature, I love camping and stuff like that. I also love weird biology things. I was into a lot of stuff like environmental science and I didn't get exposure to geology until pretty late, until basically my freshman year in college, and then I was like, "Oh dang, you can go camping and do science." So that's how I got into geology, but then I was like, I didn't even know planetary geology. I knew about the rovers and stuff, but I didn't really realize how big of a field it was, and then I just slowly got more and more into it, and I was like [*slowed down*] this is sick. [*airhorns*]

And it's only now that I just graduated, I'm thinking now I need to make a plan for what I want to do in the future and projects to work on strategically for things that I know will crop up. So, getting involved with the 2020 rover, I want to continue to be involved with that kind of research, so I've been doing some stuff related to the 2020 rover calibration and things like that, just to get my name out there.

Alie: Yeah, you're like, "Come to me for your calibration and rover needs."

Jennifer: Yeah, and then participating in the landing site workshops, It's super exciting to me now to know all this background, because when I got involved with Curiosity I didn't know as much about Gale Crater as I know about the potential landing sites for 2020. It's exciting to be involved from an early stage.

Alie: Oh because - hear me out - is it like watching *The Bachelor* from the beginning, you really care about who's in the last couple shows?

Jennifer: Yeah, probably, I've never had that experience, but I imagine that's probably the case.

Alie: You don't need to.

[*clip from The Bachelor: "Lauren, will you accept this rose?" "I will."*]

It's just like an investment in the playoffs, you know what I mean? Then when it comes to the World Series, you're like, "This matters even more to me because I've been watching since the beginning." I get that.

So now that you're in this stage with 2020, where they're deciding where to land it, decisions are being made, so it's going to mean even more when you see that through to completion, to the end, where the rover's there at the site that you all helped decide on. That's going to be enormous, it's huge.

Jennifer: Yeah, it's really exciting.

Alie: Do you dream about Mars?

Jennifer: Yeah, I've had lots of dreams about Mars.

Alie: You have? What happens in them?

Jennifer: Um, so, some of them are nightmares.

Alie: Really?

Jennifer: Yeah.

Aside: Just, head's up, I'm so, so, so glad I asked this question, because the payoff was fucking enormous.

Jennifer: Well, I had one that was like, we were on Mars and I requested an image be taken of a crater wall by the rover. And so the image came down and it was not that interesting. And then somebody was, "Do you know how much we spent on that image?!" and then they guilt tripped me about it. And that was a Mars nightmare.

I mean, all my dreams are really bizarre, I had other dreams where I went to Mars and landed in a crater, and there was a lake there, and then there was an escaped convict that was a stowaway on my rocket ship.

Alie: [*laughing uproariously*] You're like, "What are you doing here?!" and he's like, "None of your business!"

Jennifer: Yeah, exactly. Really, just weird dreams like that. And then, I had a dream one time, that's like maybe my weirdest dream, that I gave birth to a moon rock. And like, in my dream world, you could have a boy, or a girl, or a rock. Like, those are your options. And then the doctors took my rock baby from me. And like, if you had a boy or a girl, you know, they'd just like weigh it on like the little scale. But if you have a rock baby, they put like in a mass spectrometer.

So they put my rock baby in their instrument and they're like, "Ms. Buz we have to tell you something. Are you ready for this?" and I was like, "What's wrong with my rock baby?!" and they're like, "It's a moon rock." And then I looked at my boyfriend at the time, and I was like, "Are you an alien?" and his mom was like, "I never told you, you're an alien." [*laughs*] That was my weirdest dream I ever had.

Alie: [*still laughing*] Everything about this is the best. That's amazing, were you so disappointed when you woke up to real life?

Jennifer: Yeah. It was a nightmare also. No, just kidding. [*laughs*]

Alie: I can't believe these things happen in the dream world, and I'd never know this unless I put a microphone in your face.

Jennifer: Yeah. I have really vivid dreams, I used to keep a journal.

Alie: I don't blame you, you gotta publish these things. Speaking of publishing and Mars, let's talk about *The Martian*.

Aside: Cliff notes: Best-selling book that became a movie. Dude stranded on Mars, has to survive, says things like [sound clip from *The Martian*: Matt Damon saying, "I'm going to have to science the shit out of this."]

Alie: So, Andy Weir, wrote a book, self-published.

Jennifer: Yeah, mm-hmm. I read it.

Alie: He was not a Mars scientist.

Jennifer: No.

Alie: Just a fan.

Jennifer: Yeah.

Alie: It was fanfic about Mars. Right?

Jennifer: [laughs] Yeah.

Alie: But it got people kinda pumped about Mars.

Jennifer: Yeah.

Alie: How did you feel about it, as someone who works on Mars?

Jennifer: I was excited about it. I enjoyed the book and I like people getting excited about Mars. I love when people, you know, ask me questions and I can answer them. And I enjoyed the book, and for the most part I wasn't appalled by it. So yeah, it was good. There are other books, similar, kind of in the same line, that are super accurate about Mars.

Alie: Really? What's some of the best sci-fi about Mars?

Jennifer: I think the Kim Stanley Robinson series, *Red Mars*, *Blue Mars*, *Green Mars*. The first book, *Red Mars*, he just did a ton of a research on what's actually happening on Mars and he paints these landscapes that are actually incredibly accurate, and the way he describes them is just incredible and beautiful. He did a great job of painting Mars scenes.

Alie: Good on him, man

Aside: So this is a trilogy about Mars and making it habitable, and long story short, I went down a rabbit hole about author Kim Stanley Robinson - who is not a girl Kim, but a boy Kim - and he's married to a chemist, and sometimes he goes by his wife's last name, which is cute. Also he lives in Davis, California. He prefers to write out of doors. Anyway, back to Andy Weir's *The Martian*, which I did read on a plane, and confession:

Alie: I will say I did read the *Martian* and I cried. A couple times. I was like, "They're coming to get you buddy!" I felt very emotional. I didn't think the movie did quite as good a job, but what are you going to do?

Aside: Also, I had to stop to look this up, but scientists say that the reason we're more likely to cry on an airplane than on the ground may be due to hypoxia, or lack of oxygen due to air pressure, because being on a plane is equivalent to being at an altitude of around 8,000 feet. Isn't that crazy? Even with the pressurized cabin. Or, it may be the

emotional liability of unfamiliar surroundings, and humans tend to cry when we're a li'l scared to promote emotional bonding with others, to increase our safety. So the next time you find yourself, like, sobbing at a tender moment of a Jean-Claude Van Damme movie, blame hypoxia. Okay, let's get back to Mars rovers.

Alie: Okay, tell me a little bit about how the rovers are gathering. They gather rock samples, correct?

Jennifer: Yeah. Well they're not gathering them.

Alie: Tell me how they do their business.

Jennifer: Okay, so they take pictures, and they zap them with lasers, and the pictures are not just like regular pictures though, they have many wavelengths of light sometimes. And so you can tell more from them than you could from just a regular picture. And then they drill them sometimes. And they put them in... on the Curiosity rover there's an instrument that's like an oven, so they put their rock powder that they drilled in the oven and they heat it up, and then they measure the stuff that comes off of it, and they learn about different compounds that are in the rock. And there's another thing where they vibrate the rock and they can tell what different mineral crystals are.

Alie: Oooh. And then do they just dump it? Do they just blow it off when they're like, "Done with you!"

Jennifer: Yeah. For the most part yeah, they drill it, and then they analyze the... it's called the 'dump pile.'

Alie: Okay [*laughs*] I didn't know that.

Jennifer: Yeah, they dump out the stuff they drilled and they look at the dump pile. And we have an arm on the rover, so we'll put the arm up close and look at it. Yeah, it's just like a lot of imaging and then a couple different scientific instruments. That's for the geology, but then there's also stuff for atmospheric detections, that sense the winds, and gases, and stuff like that.

Alie: And so, is there a feed coming through that just is like, "dee-dee-dee, this is what we're gathering."

Jennifer: Okay, so the way it works is kind of cool. We relay with satellites that orbit Mars. We send stuff to the satellites, and the satellites send it down to the rover, and the rover sends it back to the satellite, and back to us.

Aside: So, to recap: they send information up to the satellites, the satellites send it down to the rover, the rover sends it back to the satellite, and back to us. The satellite is like our mutual friend who has cell service when we don't, and we keep being like, "Oh my god, ask the rover to take a soil sample" and the rover's like, "Holy shit, satellite, tell them the soil is sooo red, I can't even."

Jennifer: And so we get our data in batches. So in a way, yes, but it's not constantly coming down, we get data deliveries at specified times.

Alie: Okay. Woo. Are you ever waiting for one, like knowing, “We should get a data delivery in like 12 minutes?”

Jennifer: Yeah that’s how planning works sometimes, we might not get data until a certain place in our planning cycle, and so we’ll be waiting for something to come down to figure out how interesting something was, if we want to keep looking at it or if we want to move on.

Alie: What do you think the weirdest thing is about Mars’ surface?

Jennifer: Maybe... [long pause] like, the sand dunes, they’re really weird.

Alie: Really? Do they look like sand dunes, like when people ride camels for Egypt and they’re like, “Look at my vacation.”?

Jennifer: There’s a large variety of sand dunes on Mars, and some of them are dusty and some of them are less dusty. And then sometimes we can see the sand dunes moving, which is kind of cool, like with the winds on Mars. But then something like a dust devil will pick up and then we can see active motion.

Alie: What are some of the weird pictures that come back? Because I think I went down like a Google hole once of like “shit that may or may not have been placed there by aliens.” What are some weird pictures?

Jennifer: Okay, the most famous thing... I have two examples.

Alie: Oh my god, I’m so excited!

Jennifer: Okay, so Percival Lowell. He looked at Mars through his telescope and Lowell Observatory in Flagstaff.

Aside: Percival Lowell, PS, was a Boston aristocrat, AKA a hella rich guy, in the late 1800s, and he was so passionate about astronomy that he founded observatories with all of his monies. He also had a formidable moustache, and he had some theories that were well-intentioned, but turned out to be, um... crackpot.

Jennifer: And he thought he saw canals. Like, there are rivers and stuff he thought he saw. And so he made all these drawings of what he thought was a Mars civilization. He was sure there were people on Mars. But when we got better pictures, it was like, “no, there’s no canals that are built there.” So that’s like, people were so psyched on that, and he was super psyched on it. But then we got higher resolution stuff and we’re like, “oh, no, turns out it’s not the case.”

And then, our first images, you might have heard of the face on Mars?

Alie: Yes.

Jennifer: Yeah, so it looks really creepy, like, I’m not gonna lie, it looks like a giant guy and he’s angry and he’s looking at you.

Aside: If you haven’t seen this, there are images in the Cydonia region of Mars that appear to be an alien face monument staring into the void of the cosmos. But it looks like someone left a Halloween mask in the bushes for a year, and then you took a picture

of it with a Razr phone, at night, from 300 feet away. Also, sadly it's just called The Face on Mars. No one even named it Luke or Denise or anything, which is kind of a bummer.

Also, the tendency to see tendency to see faces in inanimate objects like light sockets and toast, et cetera, is called 'pareidolia.' I follow an account on Instagram called @facedbook, and it's a collection of things that look like they have faces. It's rocks, and clothespins, and wood grain, and it creeps me out SO hard, but I can't unfollow it 'cause it's like a good creepy? Anyway, @facedbook, if you're interested. Okay, The Face on Mars, when we got better cameras, we zoomed in on this shit and? AND?

Jennifer: But then when we took a higher resolution image many years later, it's like, oh it's just a little mountain that's got some shadows on it.

Alie: Damn it.

Jennifer: Yeah, so those are really weird. The polar caps of Mars, they're carbon dioxide, and water, and dust, and when they melt or evaporate, they make crazy morphologies like weird pits and stuff that your brain has a hard time figuring out what's up and down when you're looking at these pictures. And they just look so alien.

Alie: How much water is on Mars and when did we find it? I say we as though I had anything to do with it.

Jennifer: Currently on Mars, there's not a lot of water. There's some water, liquid water just in pores of rocks and buried, basically not really exposed on the surface. But there's water ice in the caps. And when did we find it? I think probably the best... When we started getting these early images that showed channels, there was no solid evidence that it was formed by water, but people were like, "it looks like it was formed by water," and then you get more and more info on it.

Alie: How fast does our knowledge of other planets accumulate? Like, have we just gone crazy with information in the last 20, 30, 40 years?

Jennifer: Yeah, right now we're in a time when we have got recently and are still getting lots of information about planets from the different satellites that we've sent. But we're about to enter a time when we don't have a lot of stuff going out now. And you know, a lot of these missions that went out, they took many years to get to where they were going. And so now, either now or recently, they've gone and done their stuff. But we haven't sent out a steady stream, and so we're about to enter a little bit of a lull.

Alie: Oh that's interesting. And how long, just refresh for me, does it take for us to get something to Mars?

Jennifer: So the data transmission, I think it's like seven minutes one way.

Alie: And then what about an object?

Jennifer: Oh, okay, so it depends on where Mars is in its orbit and stuff like that, but I think it's like three months or something.

Alie: Oh okay, that seems really fast.

Jennifer: Yeah, I think that's for a really fast thing, but you can take way longer also.

Alie: Sure, you can send it ground or something. [*both laugh*] Not Prime it.

Jennifer: I want to mention that we also have Mars rocks, though.

Alie: Tell me about Mars rocks.

Jennifer: That they came to Earth, meteorites that were on the surface, and then they got ejected, and then we can study them too.

Alie: How does that happen? How does a Mars meteorite just get flung off the planet and just go, "woosh woosh woosh" and just land here?

Jennifer: Yeah, so a big rock flies through space and hits Mars. And then it makes a crater on Mars and it shoots off rocks. Some of the rocks land on Mars, but some of them get shot off - like straight up in the air - and they reach Mars' escape velocity, and they're just flying through space. And then they fly through space for like millions of years probably. And then they land on Earth as another impact. And then we collect them.

Alie: It goes from a meteor, to once it hits it becomes a meteorite? Is that right?

Jennifer: Yeah, I think that's right.

Alie: Okay so once it touches down, it's like, "Boop! I just turned into a meteorite!" How do you know what they are?

Jennifer: Yeah, so we now have, like, classes, because we can kind of lump them, into like, "These are similar to these other ones." But then there are some that are bizarre. And so, that's how we found out that we had like a group of meteorites that were different from the rest, and people started to wonder if they could have come from Mars, because the minerals in them were similar to what we thought we knew was on Mars. So this group was finally confirmed to be from Mars when we sent a lander to Mars and we measured the atmosphere and isotopes in the atmosphere, and the different ratios were the same ratios that were trapped in bubbles in these rocks. So we're like, "Yep, they're from Mars."

Alie: [*gasps*] Woah! And then, where do you put the meteorites? Like, do they get stored under lock and key because they're so rare?

Jennifer: Yeah. Well, it depends who found them. So, NASA has missions to Antarctica to collect meteorites, and to some deserts I think? And so those are property of NASA and you can apply to study them. But you can only ever borrow them. They are owned by NASA and they're stored at Johnson Space Center in Houston. But people can also find a meteorite on their own, and then I think it's their meteorite, depending on where they found it.

Alie: How often do areologists - planetary geologists - have someone say, "Yo, I found a meteorite," and you're like, "That's a lump of granite." How often does that happen?

Jennifer: A lot. Yeah. People bring me rocks all the time and ask me if they're meteorites.

Alie: How do you know that they're not?

Jennifer: Sometimes I can just be like, “That’s an Earth rock” because it looks like a lump of granite. So meteorites often have a fusion crust, which is when it’s all glassy on the outside of the rock, and that’s from heating up when it entered the atmosphere. So that’s like one thing that we can tell. And then there are certain things that we only see in meteorites, like this cool metal pattern called a Widmanstätten pattern, and it’s like a crazy kind of etching looking thing.

Aside: By the by, these crosshatch patterns in meteorites are caused by, apparently, nickel iron crystals, and they’re credited to an Austrian printer named, ready? [*struggling, with Austrian accent*] Count Alois von Beckh Widmanstätten, which honestly would be such a great name for a cat. Anyway, he discovered the patterns, he was like, “Woah, look at these patterns!” So we named them [*struggling*] Widden... Widmanstätten in his honor.

And then we found out later that a British guy with a way more boring name - William Thomson - discovered them four years earlier, but no one cared. So, some people call these pretty, geometric, meteorite patterns Thomson structures out of fairness, but I think we should just say Widmanthomson or Williamstatten. People into meteorites - let me know, because I’ll have a press conference about it. Note, I will be wearing a monocle. Just for flair.

Alie: Do you have a favorite meteorite?

Jennifer: Yeah.

Alie: You do? What is it? I love that there was zero hesitation.

Jennifer: Yeah, so a meteorite that I studied for one of my PhD projects is a Martian meteorite. It’s called ALH84001.

Alie: Sure it is.

Jennifer: Which is named from the Allen Hills of Antarctica - that’s the ALH - was found in 84 - that’s where the 84 comes from. And then double-0 1, it was the first meteorite found that year. And it was this meteorite that sparked this great debate about if there was life on Mars, because the people who first studied it thought that it had fossils in it.

Alie: [*gasps*] And?

Jennifer: So, it’s still a little bit of a debate.

Alie: Is it seriously?

Jennifer: Yeah, that was one of my projects, was trying to figure out, people have studied this rock since... ‘96 was when that paper came out. Some people still think that there’s fossils in it. Bacteria fossils. So I was trying to apply new techniques to see if there could be a more definitive test. And so even my stuff, it was a little inconclusive.

Alie: Oh my god, what kind of tests do you do to figure out if there’s bacteria in there?

Jennifer: So, I was trying to figure out... I was using what’s called paleomagnetism, where we’re studying the magnetic properties of the rock. And so I was trying to figure out if

proposed bacteria, which they thought were magnetotactic bacteria - they travel along magnetic field lines and have little magnetites in them. I was trying to figure out which one it was, and basically it was inconclusive.

Alie: Aww.

Jennifer: Yeah, I know. And we thought we were being so clever.

Alie: At what point do you have to call it and say it's inconclusive?

Jennifer: So, it's really easy to say no, but it's not so easy to say yes.

Alie: So what happened with the recent announcement? Like, "Everyone, watch out, we have announcement to make about Mars," and everyone's like, "I'm setting my alarm clock, I'm staying up late." What happened with that announcement?

Jennifer: Yeah, so there were what people call the building blocks of life that were found with the Curiosity rover. These molecules that are actually really hard to preserve, they were found by the rover, pretty fresh looking. And so they're... I don't know, it's just the building blocks of life that were found and we didn't think that we would find them 'cause they can get destroyed really easily. So that means that they resurfaced pretty recently, which is really exciting, and that they were there at all was exciting, that they could have formed.

Alie: And so this was a, "Head's up - we have the ingredients to make life, we didn't find it yet, but we found the ingredients." And that's a big deal.

Jennifer: Yeah. It's especially a big deal that we found it at all, because it's so easy for these things to be destroyed on the surface of Mars. Mars' surface is subject to a lot of radiation, and then there's lots of things on the surface, like oxidizing species, or they're just not good for these molecules, and so I don't think we expected that they would even still be there, and they were there.

Alie: How did you react when you found out the news, and did you get a head's up, like, way before?

Jennifer: Well, that was like a Curiosity rover press release. I did know about that before.

Alie: How did you feel when you found out with your team?

Jennifer: It was exciting. A lot of times when stuff like that, when there's an exciting potential for an astrobiology kind of thing coming out, what people do is try to figure out how could it be wrong? Kind of, "Okay, this is what it LOOKS like, but could we explain it some other way? Could we have screwed up or something?" And so, a lot of times there's discussion about that, like, could it be actually a blip in the instrument or could it be something else? And so, that's a hard discussion to go through, but it's interesting, too. But then when all those things get crossed off the list, and what's left is that it's actual detection, then it's exciting.

Alie: Oooh, I bet, because it's just like, kind of incremental discoveries, too, until you have another breakthrough, right?

Jennifer: Yeah, like the methane. People proposed so many different ways. So methane is a thing that doesn't survive a long time in the atmosphere, and so if it's there at all, it had to have come from relatively recent times, and it's often a product of life. You know, like they say, cow farts and stuff like that. [*both laugh*] Or like bacteria. And so, yeah, people were like, "Oh man, how can we explain this methane any other way other than life?" I don't think anyone's saying that it's life making this methane, but there was lots of debate, like, could the methane have come from something we did? Like from the tire breaking or the wheel breaking or something like that?

Alie: Right, but it might just be an underground cavern of farting cows.

Jennifer: Maybe.

Alie: You never know.

Jennifer: Yeah, you don't know. I mean, anything's possible.

Alie: Just a cow emerges from a space cave, being like, "Oh hey, didn't see you there."

Jennifer: The next rover, the 2020 rover has a little microphone on it.

Alie: Does it really?

Jennifer: Yeah, so you can listen to the surface of Mars and maybe we'll hear like [*echoey*] "Mooooo."

Alie: Now is it called the 2020 rover because they're going to launch in 2020?

Jennifer: Yeah.

Alie: Okay, that's cool. And it's also like clear vision.

Jennifer: Yeah. It's catchy, but it's gonna be named.

Alie: Oh.

Jennifer: Yeah, it's a schoolchildren contest. They're going to pick the name. I think all the rovers have been named like that.

Alie: Ahh, that's such a cool distinction. It's like, "Hey kids, you're gonna inherit this planet once we've turned it to garbage, so you get to name the rovers for your next planet!"

Jennifer: Yeah.

Alie: Pretty much. Um, I have one million questions for you.

Jennifer: Okay.

Alie: Is it okay if I ask you one million?

Jennifer: Yeah.

Alie: So many questions. I love that you... Now, you are a patron, you've looked at some of these.

Jennifer: [*laughs*] Yeah.

Alie: You've looked at all of them?

Jennifer: The ones that were posted as of a few hours ago. [*both laugh*]

Alie: This is what I want in someone who studies other planets, is this level of detail and preparation. This gives me faith in the space program.

Okay, that is it for Part 1! You now have a primer on Areology, Mars, the absolute gem of an Earthling Jennifer Buz. So next week, we come back with all kinds of very weird and awesome questions. We talk about habitability, more sci-fi stuff, it's all the weird stuff next week. To learn more about Jennifer and her work, visit JNNFR.BZ - it's her name, no vowels. We are @Ologies on [Twitter](https://twitter.com/Ologies) and [Instagram](https://www.instagram.com/Ologies), and I'll post some photos of me and Jennifer at CalTech recording this. I'm also @AlieWard on [Twitter](https://twitter.com/AlieWard) and [Instagram](https://www.instagram.com/AlieWard).

And thank you so much to Steven Ray Morris for editing this, literally the day that it goes up. I've been shooting a new show for the last few weeks and have not had a lot of time for sleeping, or eating, or anything, and so Steven - you're a trooper for helping me get this up on time.

Thank you to the patrons at [Patreon.com/Ologies](https://www.patreon.com/Ologies) for the amazing Mars questions you asked next week. They are hilarious questions, you are going to want to hear them - trust me. Also, feel free to join if you like, as little as 25 cents an episode. Thank you Boni Dutch and Shannon Feltus for running [OlogiesMerch.com](https://www.OlogiesMerch.com) for me. Feel free to join the Facebook [Ologies Podcast group](https://www.facebook.com/OlogiesPodcastGroup). Thank you Hannah Lipow and Erin Talbert for running that, you're amazing. Theme song was written and performed by Nick Thorburn of the band Islands.

And if you stick around past the credits, you know I tell a secret. And this week I freaked out because I've known Erin Talbert since I was 4, and I've been so crazy with early call times that I forgot her birthday on the 25th. And I almost started crying, I texted her apologizing, I'm so sorry, I was mortified, and she was like, "Bitch, my birthday is in January," and I was like, "Yeah?" and she's like, "It's June." So, happy early birthday next year Erin, and thank you for reminding me that it's not currently January, and that I should probably get some sleep.

Okay, come back next week for really weird Mars questions. It'll make you 1,000% more informed for your next cocktail party, or capable of making the decision of which planet to live on if shit goes down here. Okay, berbye.

[outro music]

[*Life on Mars? by David Bowie plays, slowed down*]

Transcribed by Lucia Huntting.

Some links which may be of use to you:

Info on the [2020 rover workshop via JPL](#)

[Rover tracks leave Morse code!](#)

[Basic bitch Mars geology wiki](#)

[NASA JPL control room goes OFF:](#)

[Parabolic flight and hooting French people](#)

[2020 rover 411](#)

[Los Angeles North aka Glendale Hilton](#)

[Walter Frederick Gale](#)

[Sojourner, the pumpkin rover](#)

[Jennifer Buz-approved Mars sci-fi](#)

[Cydonia, home of the Face on Mars](#)

[Pareidolia aka: when you see faces everywhere](#)

[Instagram for Facebook](#)

[Why meteorites look cool](#)

[Okay but really why is the sky blue](#)

[Yes of course we talk about The Martian again](#)

[Get a load of this haboob](#)

[Jupiter's got MOONS](#)

[How much do we spend on dickpills?](#)

[Mars is in retrograde but what does that MEAN](#)

[Elon Musk friggin loves Mars](#)

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