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Dave: Someone says it's impossible, and you're like, "Ha ha. Watch me do it." Right?

Announcer: Bulletproof Radio, a state of high performance.

Dave: You're listening to Bulletproof Radio with Dave Asprey. Today's cool fact of the day is that underwater your body is under a lot of pressure and some interesting things happen. If you breathe nitrogen under pressure in really deep water, it produces an intoxicating effect known as nitrogen narcosis, a.k.a. nitrogen euphoria or, very romantically, the raptures of the deep. Nitrogen ... Did you just hear how I sounded kind of like that guy from the Matrix, you know, that agent? I'm feeling pretty good about that. Anyhow, nitrogen, which is actually what we breathe ... We like to say we're oxygen breathers. That's totally BS. We breathe more nitrogen than anything else. So, that's what's in the air. We just don't use it very much. It's inert. It just goes into our fluids and tissues in the body without any chemical changes.

It doesn't support most of our bodily functions, except that nitric oxide stuff, which I'm not going to talk about right now. When it's present in large amounts, it does weird stuff. So, when divers go into the water, the pressure increases, and they have to get air at pressure equal to the water pressure. Nitrogen absorbs into your fatty tissues much faster than other tissues. If you've read any of my books, you know the brain and your nervous system are made out of fat way more than the rest of you. You end up getting those effects there, and your normal functions are impaired. We're talking lightheadedness, euphoria, numbness, and carefree-ness, which might be a bad thing if you're under water. Your reasoning ability and manual dexterity can slow down. Then, my favorites, emotional stability and irrationality can ensue. Then if you keep going, convulsions and unconsciousness. This is why personally I snorkel. Anyhow, if you have never thought about it, you are a nitrogen breather, not an oxygen breather. You just use oxygen as a little electron receptor thing. So, you can rewire your thinking about biology.

Today's guest, Jill Heinerth, is an underwater explorer, one of the greatest cave divers on the planet, and she's considered this generation's Jacques Cousteau. She's dived deeper into caves than any woman in history and explored places in the world where no one has ever been. She's a writer, award-winning photographer, a filmmaker, an absolute legend in the diving community, spent more than three decades of her life submerging herself in caves for National Geographic, NOAA, and TV shows all over the place, and the first explorer in residence for the Royal Canadian Geographical Society. Jill, welcome.

Jill: Hi. Thank you. Nice to be here with you.

Dave: There's so many questions I want to ask you, because you've got all this knowledge about diving and what our bodies do, but there's also something that drives you to go literally into the planet, which, by the way, is the name of your book. Why? Of all the things you could have done with your life ... You could have said, "I want to be the first person in space. I want to be the first X," why did you pick this crazy, dangerous, mysterious thing?

Jill: Well, when I was a little kid, I actually wanted to be an astronaut. I was totally inspired by watching the Apollo astronauts on TV. That's kind of what set the idea in my mind that I could be an explorer. But when I grew up, there was no Canadian space program and no women astronauts, so-

Dave: Yeah. There's that problem. Right?

Jill: There's that problem. But I also saw Jacques Cousteau on TV exploring these underwater places, where nobody had ever been before. I thought, "Oh, wow. That's how I can explore these new, exciting places." The cave diving part of it just I guess sort of happened unintentionally. It wasn't something that I set out to do as a child, but step by step I got involved more and more into diving and more and more into technical diving and going to these crazy places. That led to cave diving. As soon as I had tried that, I was hooked.

Dave: So, it sounds like you had a desire to explore that goes way beyond the normal human. I am dear friends with Peter Diamandis, the guy behind the X Prize, who wanted to go to space. My head neuroscientist at 40 Years of Zen was a nuclear submarine engineer for a long time and spent months under the poles and things like that. So, I'm attracted to people who have this, what's at the very edge. What I want to know is, were you born with that, I have to explore? Did your parents leave you in the forest with wolves? What happened to you?

Jill: Yeah. I was definitely an exploring kid, so I loved being outside. I loved and had quite a bit of freedom on my own to explore the woods, or go paddling in a canoe, or whatever. I've always liked learning, so learning and curiosity was very much at the center of it, too, and problem solving. When somebody says something's impossible, "We can't possibly do that. We can't possibly go inside an iceberg," or, "This is too much for human physiology," I'm like, "Hm. Well, surely there's a way." The problem solving aspect is what's really interesting to me.

Dave: So, you're a hacker you're saying?

Jill: Yeah. I guess. Yeah. In a way.

Dave: Someone says it's impossible, and you're like, "Ha ha. Watch me do it." Right?

Jill: Well, yeah. Yeah. Well, that's another thing. If someone says, "Oh. You can't," for one reason or another, you're too young, you're a woman, whatever, or you're too old, I'm like, "Ah. Watch me. Watch me."

Dave: Got it. So, a little bit of oppositional defiant disorder in your exploratory nature.

Jill: Yeah. Probably. Probably.

Dave: They label it a disorder. I think it's a gift.

Jill: It has been for me.

Dave: Okay. The flip side of that, I interviewed a war correspondent, Lara Logan, who's well-known from 60 Minutes and has been also in exceptionally dangerous places all over the world, just trying to understand what's going on there. But there is for her as well some of that I'm going to do it, because you said I couldn't. That's why I want to live to 180, just because people say, "You can't do that." I'm like, "Watch me." Actually, you won't watch me, because you're not doing it. You're going to die, but you can watch me until you die. It's okay.

Speaking of death, in my quest to live a long time, I am certainly facing death, but Lara certainly faced death multiple times, and you do, too, I mean, every time you go down there. One of Jacques Cousteau's sons died in a cave diving accident. Well, they think he died. He just disappeared, and they never saw him again, in a cave in Belize, if I remember right. So, how do you grasp this every time you go in the water, at some level, whether it's a rational level or somewhere else, you know if I screw up, I might not come out of this cave? What's your mindset? How do you handle that?

Jill: Yeah. Well, I mean, that's a very real possibility, so my life is about risk mitigation, but I also look at the realistic outlook on life in general. I mean, there's a lot of things that are dangerous in our lives. Now, it's sexier to read about some of these untimely deaths people have, and certainly cave diving is risky, but so is driving to the cave diving site. For me, my mom asked me, "Aren't you afraid of dying?" I'm like, "Well, no. I'm more afraid of not living a full, productive, valuable life, I guess, that contributes to a better planet, to humanity, or whatever."

But when I do choose to take risks, I'm very, very careful about assessing risks, trying to prevent as many things that could go wrong, pre-visualizing what could happen underwater, and then ensuring that I have the right training, the right personnel, the right equipment, and redundancy with me, so that I can handle that worst case possible scenario. You can't kind of put your head in the sand and say, "Wow. I'm never going to die." You go, "No. No. No. No. No. I could die. Here's how it could happen in gory details, and then here's how I will respond if the worst happens."

Dave: It sounds like you almost have an acceptance of death as a fact, but it doesn't cause an emotional reactivity in you, because all of us, if you think about it, if you're driving at 70 miles an hour and you twitch the wheel, you have, what, a 50% chance of dying if you

hit a tree? Right? It's not like we're not always at substantial risk. You could choke on your next meal if you don't chew it right. Literally, you can die all the time, but we don't walk around going, "Oh my god." Have you shifted your acceptance of death to the point that it's less of a trigger for you than the average person would you say?

Jill: Oh. Absolutely. I mean, my whole life is about managing fear effectively. I want to step towards fear. I mean, when you think of it today in society, there are a lot of people who are really, really fearful, fearful, you know, killer bees, killer storms, killer accelerators on their Toyotas. It's all consuming, and they're so afraid that they shelter their kids from having experiences and skinning their knees, preferring to prevent it, rather than let them have the experience and learn from the consequences of that experience.

So, yeah. I do separate myself from that fear. Then also in the moment, I have to be able to separate emotions from rational, pragmatic solutions thinking when something does go wrong. In that moment of terror, if I'm trapped in a cave that's no bigger than squeezing underneath your bed, and the guide line's broken, and I can't see in a flurry of silt, sure, your heart wants to race. Your breathing wants to ramp up. Your head wants to explode into what I call chattering monkeys. But you have to be able to say, "Hey. Emotions, you won't serve me well right now. There'll be time to cry and deal with this emotional stuff later, but right now I have to be extremely pragmatic and make very small steps towards success."

Dave: That's almost a Zen master level of emotional control. I hear a similar description from emergency room doctors. When they're a master of their craft, someone comes in with blood spraying all over the ceiling, and they snap into this mode where complete calm and A, B, C, D. If there's some emotional stuff, they'll deal with it later. But how do you learn that? Most people don't ever learn it, or if they do, they're 70 years old like, "I've been meditating every day for a long time," but you got there early.

Jill: I did. Yeah.

Dave: What was your trick?

Jill: Well, I think the first thing to note is exactly what you said. You must learn it and practice it. I don't think that's even possible through the Zen Master Classes in meditation. I think it happens by being scared, and then reviewing what happened, and then thinking about how to deal with it better the next time. For me, that was facing a burglar when I was a young woman.

Dave: Wow. What happened?

Jill: I was in university. I had just moved off campus into a house. I was the first of five girls to move into the house. The very first night that I was curled up in my bed I heard someone break in downstairs.

Dave: Oh, no.

Jill: I knew I was the only person with the key. Yeah. Oh, no is right. I mean, the first reaction like, oh my god, there's someone in the house, that realization. The monster's in the house. My first thought was pull the covers over my head, curl up into the fetal position, and hide. Right? That's normal. That's exactly what someone would do first. You know? Just curl up into that ball in terror. Then I thought, "Well, he's not leaving. I have to do something." So, I was forced to act. I thought, "Okay. I don't know how this is all going to end, but what can I do next?" You know?

I thought, "I need to let him know somebody's home to scare him away." So, I got out of the bed, and I walked around the floor. Even just standing up powerfully, exposed, made me feel like I had more control over the situation. So, I stamped around on the floor, because I didn't want to use my voice and let him know that I was a woman. So, I stamped around on the floor, and he still didn't leave. I thought, "There's no way that this person who is downstairs does not hear me walking around on this creaky, wooden floor upstairs," but he persisted to dig through closets. I could hear him in the cutlery draw in the kitchen. You know, one step at a time he was getting ever closer to where I was. I had no phone. I had no way to jump out of the window, out of the second story. I would have landed in a busy street.

So, there I am, forced to make a decision. How am I going to deal with this terror? I have to say my heart wanted to leap right out of my chest, but I took those deep breaths and tried to press that down and just remove that by breathing deeply. One thing led to another. He came up the stairs. He rifled through the closet outside my bedroom. He even rifled through the bathroom and I heard the shower curtain. I heard him lift the back of the porcelain toilet lid. I heard that scraping of porcelain on porcelain.

Dave: Wow.

Jill: I heard him in my closet. I heard the steel hangers on the steel curtain rod dragging-

Dave: In your bedroom?

Jill: Across one at a time. Outside my bedroom door.

Dave: Oh. Wow. Okay.

Jill: So, then he's outside my bedroom door. It's an accordion pleated, sliding door, and I see his feet in the shadows, and I see his head sort of in that little inch of a crack at the top of the door. I thought, "What am I going to do?" I grabbed two X-Acto knives, two sharp cutting knives, off my drafting table. He busted through that door and came after me, and I turned on a light, shone it in his face to blind him, and then yelled something stupid like, "Who are you? Identify yourself," because I thought, "Is this a snoopy landlord? Who is this person?" Before I choose to fight, I need to make sure this is a real threat. He came after me, and so I reached over, and I slashed down the front of his chest with one of these knives, and cut him, and so surprised him that he jumped backwards. I think he was high or something, because he just kind of looked down at his chest, and he's bleeding, and he looks up at me, and he laughed.

Dave: Oh, god.

Jill: It was a complete horror show. He laughed at me. Then he turned around and slowly walked out of the room. I was just like ... At this point, the emotions exploded again. I was like oh my god. Oh my god. I thought, "I have to get out of the house. I have to get out of the house." Then I still wasn't sure if he was in the house. So, it was this battle, emotions, and fast breathing, and fast heart rate, or tamp it down with a deep breath and push that aside. Eventually, I ran screaming out of the house, all the way down to the subway station a block away and pounded on the door, like a crazed madwoman in her pajamas with knives in her hand. They let me in. They called the police.

Then, only then, when the police arrived, could I finally calm down and drop the knives. But that experience later, after I processed it all, was so valuable to me. It was easy to play victim and drag that around for a long time, but when I finally chose to analyze what happened and analyze how I dealt with the fear, that enabled me and gave me power to deal with fear again better.

Dave: So, facing a really intense situation did that?

Jill: Yeah.

Dave: I often wonder. I was in more than a few fights when I was in school. It sounds weird, but the first time you get in a real fistfight you experience that, oh my god, this person's going to kill me. I've never started a fight, but if someone walks up and punches you in the face, you got to do something about it. At schools today, I've seen eight-year-olds be arrested in the news. You're like, what the heck? This is childhood stuff. But I remember very much that idea. I'm facing someone who's really out to cause me physical harm, and it's up to me, and to eventually realize, well, if I don't do something about it, I'm probably not going to like what happens. Not as intense as slashing a burglar to make him leave, but there's some value to having experienced that intensity at least once. Do you think that's missing from the world today?

Jill: Absolutely. Absolutely. I think, unfortunately, there's been more of a shift to overprotection of kids. I mean, I'd certainly had an opportunity to run free a lot more. Now, if you let your 12 year old kid get on the subway and go to Downtown Toronto, a big city or whatever, on their own, the parent might be arrested. Who knows? But I don't think the world is any more dangerous to a young person. I really don't think that.

Dave: It's less dangerous.

Jill: Yeah. I agree.

Dave: Statistically speaking.

Jill: I agree. There's more ways for them to get help than there was when I was a little kid. I think that independence is really important for a young person to experience, and facing consequences is important for them too.

Dave: So, for you, the combination of early independence, having faced a potentially life-threatening situation early on in life, helped you to become a master of your own fear.

Jill: Yeah. I think so, but I think I got better at it each time I had an experience like that. I remember I saw a head-on collision, and the woman had come across the median and been hit head-on by a truck. She was badly injured, and her car's smoking, and there's little licks of flame under the hood of the car. She's pinned in the front seat of the car. I remember, again, my heart beat is going, oh my god, oh my god, and my breathing's going fast. I'm thinking, I had to say to myself, "Why are you scared? She's the one that's hurt. Push that aside for now and just go act and help this poor woman. She needs your strength." So, each time I had those experiences I got better at it. I could then more definitively turn to that steely, cold pragmatism. But it's also important when you do that to remember to save time later to process that fear. Otherwise, it just sort of rears its head in unexpected and other ways. You know? So, you can't just say, "I'm beyond it." You have to process it thoroughly.

Dave: So, fear can enter the tissues of the body and become a trauma that causes you to be reactive later. What's your process for letting go of that fear, so it doesn't get stuck in you somewhere? How do you do that?

Jill: You know, I have to really give it intentional time. Hopefully, I have someone that I can talk to very honestly and frankly, someone that'll really listen, because people don't always want to really, truly listen and engage. Yeah. So, you need someone with empathy, I guess.

Dave: Do you use a therapist, or do you have a dear friend, or how do you do that?

Jill: Yeah. It's been different people. Sometimes it's my husband. Sometimes it's a dear friend. Yeah. I don't have a therapist, although that probably would have been useful a few times in life. I think that's probably a really good way to do these things. I'm also an artist, so some of that spills out in creative channels. It's almost like there's a left brain/right brain thing that happens, that creative right brain person shifts into that left brain pragmatist for the intensity of the emergency or dealing with that fear in an effective way, but then I find that right brain way to process it later. I might even draw, or paint, or write. I write a lot. In fact, I found the process of writing my book, *Into The Planet*, to be very therapeutic. My editor became my de facto therapist, telling me, "Give me more. What did that feel like? How did you process that?" You know?

Dave: Wow. That's really cool. Writing can be really therapeutic. I've found that by telling my own story in books, like [inaudible 00:22:43], wow. Things really sucked for me back then. You do enough work, you kind of let it go, and then you go back and you look at it and go, "Whoa." So, that's how you do it then is you find an artistic expression, you share it with someone who's empathetic, and that's your process for letting go. Now, there's something I'm really curious about. I've interviewed Lieutenant Colonel Grossman, who wrote *On Combat*, and *On Killing*, and the psychology of people. He says that somewhere around one in 10 people, they're intrinsically wired to run towards an explosion, instead of away from it, because they're the helpers. It's their job. It's who

they are. They tend to end up as first responders or possibly even cave divers. Are you one of those people, or are you not one of those people?

Jill: Yeah. No. I'm definitely a run towards the situation. I kind of have to be for what I do, for dealing with those emergencies. You can't ignore anything. You got to act and prevent. Yeah.

Dave: Okay. So, you're one of the people who's wired that way. According to Grossman's work, there's a lot of sheep and very few shepherds and that we're wired as a species to do that, because if everyone was a shepherd, we'd probably just be hitting each other with axes all the time.

Jill: Well, yeah. In my book, too, I write about the 7R gene. I'm not sure if you're familiar with that.

Dave: Talk about it. Yeah.

Jill: Yeah. So, the adventure seekers gene. I've never had genetic analysis, but I guarantee you I have one of these 7R genes. So, there's about I believe it's like 15% or so, it might be more, of the population that is wired to be the adventure seeker, sensation seeker, novelty seeker. These are the ones that were probably the hunter gatherers, the nomads, as opposed to the farmers, staying at home, tending the fire, gathering the food kind of thing. I'd be out hunting.

Dave: Got it.

Jill: Yeah. Yeah.

Dave: The hunter/farmer breakdown, too, is a similar perspective. Okay.

Jill: Yeah. Yeah. The adventure seeker, the novelty seeker, the sensation seeker isn't necessarily risky in that foolish sort of way. We're not adrenaline seekers necessarily. It doesn't mean we're dangerous. It doesn't mean we're death wish kind of thing. It just means we're out and interested in stimulation, learning, curiosity, and new things. Yeah.

Dave: That is so fascinating. So, you think that's genetic at some level.

Jill: Yeah. Yeah. It is.

Dave: Tell me about the most intense experience you've had underwater?

Jill: Well, that one, being trapped inside an underwater cave with a scientist, who was pretty much acting as the cork in the bottle containing my life, would be one of the more intense things that's ever happened. So, in this cave that's shoulders on the ceiling, belly on the floor, squeezing through a small passage, leading a scientist to a location where she could get a critical sample for her work. When we turned around,

she panicked, and became entangled in the guide line and stuck, and disturbed the visibility, so that neither of us could see.

Dave: Wow.

Jill: In the process of panic also broke that safety guide line that we have connecting us all the way back to the entrance. For me, like I say, she's the cork in the bottle containing my life, because she is now between me and a safe exit. If I can't solve this for both of us, we're both going to die. So, I had to calm her down. I had to get her un-wedged. I had to patch the guide line. But then in the intensity of this silt out, I lost track of her, and I had to make a choice to go further into the belly of the beast, further back into the cave to make sure that I wasn't leaving her behind, in case she swam that way. So, as she was actually sprinting for the exit, because she had finally figured out her orientation, I was going back, further into the cave, to make sure I didn't leave my partner behind.

Then she hit the surface, called out an emergency basically, and a rescue and recovery team was on route to what they figured was to come retrieve my body. So, meanwhile, I'm searching and slowly, methodically working my way out of the cave. When I got to the entrance of the cave, it was 73 minutes after she had exited, so the way I look at that is I was dead to my friends for 73 minutes. That was quite a sobering experience, kind of more suffering afterwards to kind of work through, as people wrote me letters and emails of the kinds of things they would have read at my funeral. Yeah.

Dave: That is so intense. Now, were you really pissed at the other diver when you came out?

Jill: No. Not at all, because I think when you choose to take on risk and you choose to take that on with a partner, there's two things that you have to ask yourself before you go on a dive like that. Am I capable of self-rescue? Am I capable and willing to execute a buddy rescue? That's also with the understanding that if that other person has more than they can possibly manage, they got to worry about themselves first. So, she hit her limit. She could not deal with anything else. When she finally figured which way she was oriented and which way was out, she went for it.

In a way, that made my survival easier too, because I no longer had to worry about her directly. I could focus on my steps towards getting out. That even included the fact that in digging her out, I had totally filled one of my two breathing regulators full of mud, to the point where it started malfunctioning. In order to breathe from it, I had to turn on a tank valve, take a breath, and turn it off, turn on a tank valve, take a breath, and turn it off, in order to conserve the gas that was just spilling out of the system. If I also was trying to deal with her in that point, that would have maybe been impossible. So, she did what she had to do, and I have absolutely no ill feelings towards her on that. She got to the surface and called for help. That could have potentially made the difference, too. Yeah. So, that was the right thing to do.

Dave: Wow. That just sounds really frightening, and I'm not someone who scares particularly easily. What about claustrophobia? You just don't have it. Right?

Jill: I just don't have it. No. No.

Dave: Okay. I don't either.

Jill: But I'm not fearless. People always think that I'm fearless, and I'm not. I'm scared all the time, because I think being scared means that I care about the outcome. When I'm diving with a buddy that's also scared, I understand that they get the whole risk scenario. If we're both scared and we both care about the outcome, then we're more likely to prepare properly and do the things we need to do to plan a scenario for as safe as possible of a dive.

Dave: From a technology perspective, there's still no way, other than hand signals and flashlights, to communicate? Is that kind of where we are?

Jill: Well, sometimes we wear what we call a full face mask. It covers your entire face, and you can have a microphone in there, but it knocks back some of your peripheral vision. It knocks back some of your side to side head movement ability. It's one more failure point in the system, so we tend not to use voice communications, unless we're trying to record something for a movie, in which case we'll do that. Yeah.

Dave: In fact, they invented those for a movie. Right?

Jill: Yeah. Yeah. I think so.

Dave: It seems like communication would be so important, but because you're limited to very basic tapping, waving, and blinking, do you feel like there's some sort of a mental, emotionally, spiritual kind of connection with someone you're partnering with on a dive? Do you sort of get this intuitive sense of what's going on?

Jill: Absolutely. Yeah. I mean, my closest, dearest partners in exploration and diving are people that I've dived with for 20 or 30 years. Those people I have an absolute intuitive connection with. In the complete blackness, I know what's going on in their head. When we're trying to film something together, we all know what we're supposed to do and what's going on. I can just look at their kicks or their body motions and know whether everything's okay or not. So, yeah. There is definitely a real intuitive sense. Sometimes minimal communications are a gift. So, things get a lot more complicated when I put on a full face mask and I start to direct a scene underwater that I'm trying to shoot for a movie.

When we don't have the option to communicate, everybody prepares a little better. They know exactly what they're supposed to do, and it's almost just like a nod or a wink that sets the wheels in motion. But we also have very definitive communication rules, like if I give a symbol of the thumbs up, that means I'm calling the dive. It's over, and we should turn around and leave. The understanding with that signal is that anybody can call the dive at any time for any reason, and it's a command, as opposed to a question. So, I can't say thumbs up, call the dive, and then someone go, "Oh. No. No. No. We need more time." It's like, no, when I give you the thumbs up, it's over, and we're leaving. It

doesn't matter if we just blew \$100,000 by aborting the dive. So, those very strict rules of communication are really valuable.

Dave: So, you've got some set rules. I know that there's been studies of humans and horses. If you walk into a stall with a horse that's used to humans, its heart rate variability will actually change to match yours. That's why people who are super stressed get with a horse, they can't ride the horse. People who are calm walking in, the horse just holds still. Do you think that there's some sort of magnetic sort of connection there? Are you guys synchronized at that level biologically? Has anyone ever studied it? I haven't seen anything in divers, but-

Jill: Yeah. No. That's really interesting. I'm not aware of any studies, but I certainly feel that way with my closest colleagues underwater. If I'm teaching a student or something, I still sense what's going on in their body, but I sense the chaos. You know? I have a really good idea of being able to guess what's going to happen next I suppose. But with those really close colleagues there's certainly a synchronicity between us.

Dave: Do you have to spend a lot of time out of the water with those colleagues to form that connection? I mean, are you guys going drinking, eating, going on vacation together? Are these more like work colleagues? How long does it take? Tell me, at what point does someone turn into someone who's intuitively connected to you? What's the process? What's it like?

Jill: So, that's kind of interesting, because some of these people have been in my life for, like I say, 20 or 30 years, and I count them as my closest friends. You know? They might live in the Bahamas or halfway around the world, but if I had some family emergency and I needed them, they'd be on the next plane to be here. But I've also met people ... So, like a few years back I had a student, a cave diving student, that I didn't know before that first day as a student. Within the course of that cave diving class, I knew this person was going to be a very deeply trusted friend in the future and someone that I would want to dive with over and over again. So, there is I guess that gut instinct or just almost indiscernible connection with some people that you meet right away, and you just know there's a good fit.

Dave: Okay. So, sometimes you know, but it takes a while. Do you have to go on a dive with someone to have that, or do you just build that the first time you go on a dive, if they're an experienced diver, and like, "Oh, yeah. We sync"? I'm kind of curious about how long it takes you to do that? Because the rest of us listening, we're probably not going to be cave divers, but effective teamwork like that, you're a crucible for that.

Jill: Yeah. Yeah. I guess there's certain prejudgments I make about people when I meet them, just from their vibe or whatever. If I'm hiring for an expedition or finding someone for an expedition, I'm not necessarily looking for the very best cave diver in the world, or the very best camera person underwater, or the very best lighting person, or the very best scientific mind to collect animals in the cave or something like that. I'm actually looking for different things. I'm looking for, yeah, teamwork capability, someone who has an extremely open mind, someone who's curious, wants to learn, because I think that you can't teach those skills. You can teach someone other skills, like

how to be a better camera operator or even teach them more of the wisdom of cave diving over time, but you can't necessarily teach those very core ... I think some people call them soft skills, but I like to think of them more as hard skills, because they're more important to me. Yeah. Yeah.

Dave: That is so fascinating.

Jill: Yeah. I mean, 60 days on a ship, and you've got to know that the other people on the ship are going to be good to hang out with, but are also going to be willing to jump to deal with an emergency in a heartbeat, that they're going to run to the fire. You know?

Dave: Has there been a time when one of your colleagues or maybe someone who wasn't quite a friend like that yet just completely violated your trust on a trip, either underwater or above water?

Jill: Well, I mean, I've certainly been on trips where I realized that we made bad choices about people to take with us and then had to completely kind of reset and choose a way to utilize someone on a project, maybe not the way they were intended when we first staffed it. That's really how I've learned to do a better job at picking the right people. I'm totally happier picking someone who's a brand new cave diver that has the right people skills, the right general skills to take with me than someone who's hard and fast in their ideas and not flexible. Yeah.

Dave: Did you get a lot of crap for being a woman, especially at the beginning of cave diving, or was it a non-issue?

Jill: Oh, yeah. I got a lot of crap. Throughout this entire career, I've always been. ... It's a niche sport within a niche within a niche within a niche. None of those niches had very many women in them. It's been an uphill battle at times, where I had to maybe work harder, or jump up and down, or have a pretty hard exterior to deal with some of the misogyny. But at the same time, there are times when being a woman has been an advantage to me, like I've been on a project where I'm the only woman on a small exploration team doing dives that are way outside our understanding of physiologically possible. The guys are having to be kind of competitive for their spot on the team, not so much for me, once I proved myself worthy. I was just always out to do better for myself, improve, go farther, do more, where these guys were like, "Oh, man. If I don't do what he did, I'm not going to get the next opportunity." In that sense, sometimes it's been advantageous to be the lone woman.

Dave: I'm a tall, white dude, and I was formerly obese, so I know you can be treated differently like that, but I have no concept of what misogyny would look like or feel like as a recipient of it. Tell me a story. What's an example of a time where you're like, "I can't believe that just happened." Because I would never see that in my life. So, by sharing stuff like that ... I don't want you to name names or anything like that, but-

Jill: No. That's okay. Well, I mean, as a young woman, I thought, "Well, gee. Maybe I'll do commercial diving." I knew that I wanted to be underwater, and I thought, "Commercial

diving. I'll be a commercial diver. They make great money. Look. There's a workshop I can go to for a weekend at a commercial diving school, where I can see everything that's going to be involved. It's like an orientation. Then, presumably, everyone that goes to the orientation then signs up, pays their tuition, and ends up going to the school for a couple years." So, I thought, "All right. This is it. I'm so excited. This is fantastic." Literally, on the first day, after I had asked a ton of questions, and I always think asking questions is a good thing, the instructor walked right up to me, and he said, "Listen." I was the only woman in the room. He said, "Listen. There's no room in commercial diving for women." He said, "If you just want to go off and train dolphins, there are other ways to do that. So, you best find yourself something else to do."

Dave: Wow.

Jill: He said that with absolute confidence, and I was young enough and not confident enough in the diving end of things that that slammed a door for me. It's the same way when someone says, "Oh. Well, we don't have a Canadian space program or woman astronauts, so, nah. Sorry." When a young person has an experience like that, it slams the door in their face, never to be opened again in many ways. Now that I'm older and I have experiences like that, I'm like, "Yeah. Watch me." So, the wisdom of age has changed things for me. Yeah. I realized that anything I want to do is possible.

Dave: Wow. It just blows me away that people do that sort of thing, but obviously they do. Hearing stories about that, it's enlightening I think for everyone. Of course, probably the 51% of the population who are women are like, "Duh, Dave. That happens all the time," but if you're not one of the people doing it, you might just not really have access to seeing it. So, thank you for telling me about that. I'm sort of dumbfounded by that, but it clearly happens. Now, you've developed an incredible resilience, and mindset, and ability to calm yourself. Have the decades of diving changed your biology? Have you experienced things? Like the space program, we know that changes people's biology. What's different in you physically as a result of that?

Jill: Yeah. Some of the things we don't know, because I'm really that first generation, especially that first generation of women that have done some of these really extreme dives. I mean, for the divers in the listeners out there, I've done missions that are 22 hours long. So, we don't know in the long-term what that could do in terms of ... One thing is osteonecrosis. So, there could be an issue with my bones, but there could be all kinds of issues we just don't know about yet. But in terms of different enhancements, I have some interesting experiences where I think that I have heightened some of my sensory capability. As a cave diver, we often train in the complete blackness, holding a thin guide line and following that through a maze-like network of tunnels of rock. There's things jutting out of the wall that you can bump your head on. There's all kinds of hazards. There's fat parts of the cave. There's skinny parts of the cave. You're just holding onto a thin piece of string and slowly following that in this three dimensional environment.

Over the years of doing that so much, over, and over, and over again for thousands and thousands of dives, I feel that I have a proximity sensation in the darkness. I don't know whether that is an understanding of the flow of the water and how that moves around

objects and then strikes my face or the hairs on my face. I don't know whether it's that or whether it's something else, but I do work with some biologists who study the animals that live in the darkness of underwater caves, and they have unique sensory organs. So, why wouldn't we have capabilities that we don't necessarily understand?

Dave: I can think of two examples that would support your observation there. One is that when ... In fact, it's a Russian Special Forces martial art called Systema or System A. They train blindfolded walking through forests at night. Even in one night of training like that, you realize there are sensory apparatus that we have. By the end of the night, even people who haven't done it before are quite often not walking into trees, and it doesn't make any sense. The other one would be ... Actually, it's related to that. It would be the Tom Brown Tracker School people. They say within a couple days of that kind of walking around barefoot in the forest doing all sorts of primal animal things, that eventually you just sort of wake up and say, "Oh. I have a GPS map of where all the animals are around me that I didn't have before, that this is somehow built in."

There's legends from the Vietnam era of Native Americans who became trackers for the military. Once they cut their hair, it didn't work right, so there's a whole idea that perhaps our hair really, as you're saying, is a part of that. The old navigators in Polynesia, they'd stare at the waves. They'd do it for 30, 40 years, and they could see by the wave pattern there's an island 500 miles away. God knows how they did it, but they knew. In their bones they knew. You've probably developed some of that.

Jill: Yeah. I think so. I've been in the middle of the Sahara Desert with a [inaudible 00:46:47] Bedouin guide. I'm using a GPS and some military maps, and he's just, yeah, looking off into the horizon, looking into the sand. Who's the better navigator? It's funny. He did not even understand the concept of GPS or two dimensional maps that I had, because I kept saying, "[inaudible 00:47:08], don't we need to go that way, towards the sun?", and he's like, "Yes, but no. We have to first go this way, because there it's not passable." So, he just had this incredible understanding and ability to navigate in a featureless desert. I thought, "Wow. That's amazing."

Dave: So, you're one of the outliers probably by many orders of magnitude there.

Jill: I don't know.

Dave: What about the bends? You always see this in movies, like, "Oh, the bends," and people exploding inside of pressure chambers and things like that, which isn't how it really works. Tell me about when you've had the bends.

Jill: Yeah. So, I got bent almost 20 years ago on an exploration project in Mexico. For those that don't know what it is, basically, like you were saying in the opening, as we descend underwater, our body will use the oxygen molecules to metabolize and fuel the human body, but that nitrogen or helium that we might use for deeper dives that's in our breathing mix is not useful to the human body. It's inert. So, the way that we deal with it under pressure is that it gets basically packed into our tissues, dissolved into our tissues. You can think of that much like a bottle of soda pop with the cap on it. There's lots of

dissolved gases in there. If you take the cap off quickly or you shake up the soda pop bottle and take the cap off, it'll fizz. Right? Because that's gas coming out of solution when the pressure is being reduced.

So, the diver that goes down and stays down will never get bent, but if you have to come up from a very deep or long dive, you have to come up slowly over a series of steps that allows your body to just naturally off gas through respiration, like removing that cap in so infinitesimally small steps that the gas is released without creating a mess. If we fail or if the mathematical algorithm fails to predict what's happening in the real human body, then some of those bubbles can cause issues. It could be everything from a rash to paralysis, and that's the bends.

Dave: Now, are there long-term effects from having the bends? I mean, does it cause permanent damage in the body?

Jill: Yeah. So, again, we don't know. We do know that once you've been bent, you're more statistically likely to get bent. For some people getting bent once is enough to make sure that they never dive again. So, I could have done long-term damage. I'm more likely to get bent. As I age some more, I'm sure there'll be lots of people interested in poking and prodding and seeing what more than 7,500 dives have done to my body. Yeah.

Dave: What about temperature? I mean, you've dived in the Antarctic, inside an iceberg. What was that like? What did the temperature do to all these other crazy things that you deal with?

Jill: Yeah. I do a lot of diving in the polar regions, but the one project you're talking about was when I was the first person to cave dive inside an iceberg. The water is minus 1.8 Celsius or 28 degrees Fahrenheit, so one tenth of a degree colder and it would be frozen solid. So, it's as cold as water can really get.

Dave: Wow.

Jill: It's tough. It's very hard on the body. You're never comfortable. You do everything you can to wear the right layers of stuff to make it as comfortable as possible, but you're never totally happy.

Dave: So, it's uncomfortable. I've talked with a few divers, actually more than a few, who've started using Bulletproof Coffee, because they want to boost their ketones, just to have more energy, especially in cold water. A lot of big wave surfers do it as well. They're saying, "I feel like I can hold my breath longer. I feel like I have a different kind of energy." I mean, do you power up with gels? Do you change what you eat when you're going in cold water, or is pretty much the same as you would normally do?

Jill: Well, yeah. It's pretty much the same as what I normally do, but I am a real believer in keto diet.

Dave: Oh. You are, because you're already in the keto circle. How long have you been in that world?

Jill: Well, about three years.

Dave: Okay. So, recent.

Jill: Recent. Yeah. Yeah. But I think it does make a big difference. Absolutely. Yeah.

Dave: Do you see a difference underwater when you're in ketosis versus burning glucose?

Jill: Yeah. Yeah. I'm definitely more tolerant to cold. So, I don't know whether-

Dave: That does help. Okay.

Jill: Yeah. I don't know whether it's necessarily just the keto diet or whether it's other things as well, like certainly learning how to breathe properly and effectively is part of that, too. You're probably familiar with Wim Hof Method.

Dave: He's been on the show. He's a friend.

Jill: He's been on the ... Yeah. Yeah. Okay. Cool.

Dave: Okay. So, you do the Wim Hof breathing before you go down?

Jill: Yeah.

Dave: Wow.

Jill: I think that that's really helpful in the whole pre-visualization phase of my dive, also in ... like if I need to warm up afterwards, really focusing in on my inner fire and breathing is very helpful, too. Yeah.

Dave: There's something interesting with hypoxia, which ideally you're not getting when you're underwater.

Jill: Right. Yeah.

Dave: But I've done some high altitude mountaineering, and there's multiple pictures of Bulletproof Coffee at Everest base camp and things like that, because people have figured out when there's less oxygen, it's kind of funny, if you can burn fat in the form of ketones, there's more electrons available, so it's easier. But traditional science says, "Oh. It's easier to burn sugar when there's less oxygen," for reasons I don't quite remember or even understand. But my experience has been if there's less oxygen ... and I do hypoxic training, intermittent hypoxic training at labs.

Jill: Oh, interesting.

Dave: Where you actually are under an exercise load and you get your blood oxygen down to 87, but you do it because you're breathing air that's been scrubbed of oxygen. So, you can breathe all you want. It just doesn't do anything for you. Then you switch over to 100% oxygen for a little while, which trains you hemoglobin receptors to more easily grab onto oxygen and makes you altitude acclimated. I do feel like having at least 0.5 ketones on a finger stick, which is what I get from just using Brain Octane, that I feel like I do have more ability to hang in there at those low oxygen levels and my brain still works versus if I as just burning rice, it wouldn't work the same.

Jill: Well, that's interesting, I mean, especially when you're saying, "And my brain still works." I'm one of the pioneers in what we call rebreather diving. Most scuba divers wear a tank on their back. They inhale from the tank. They exhale and make bubbles. With a rebreather it's exactly the same gear that you would use to make a space walk from the International Space Station. We exhale into a loop, trapping the gas. We scrub the carbon dioxide out, and then we make micro-injections of oxygen back into the breathing mix to make up for what we've metabolized. So, you're not wasting anything at all, and you can use far fewer resources for deep and long dives. You also won't make bubbles, which can be quite handy. It's also a little bit warmer.

Dave: Oh. Nice. Yeah.

Jill: Yeah. Yeah. So, that's all really, really helpful. So, we're constantly manipulating our breathing loop. We're constantly manipulating our life support gases, which could be one of the most dangerous things you'll ever do in life, but it has a lot of advantages, too. When we were first starting to use rebreathers, I wanted to know about what's it going to feel like if I'm hyperoxic? What's it going to feel like if I'm hypoxic? What's it going to feel like if I'm breaking through the carbon dioxide scrubber? Now, this is not the safest way to figure these things out, but in those early days, we knew nothing about the rebreathers. We knew nothing about how to safely train on them, and so we wanted to have these experiences and see how we would respond. We did this hypoxia training in a somewhat controlled situation. The instruction to the diver was if you start to feel hypoxic, bale out. So, we-

Dave: What does that feel like?

Jill: Yeah. So, we hid the display from them, so they don't actually know what their PO₂ is, their partial pressure of oxygen in their body. They're just supposed to go on gut. What we discovered is that the afflicted diver would recognize symptoms, even be capable of writing down a word, like tingling, on a piece of paper, but if you're feeling tingling and you recognize that that's hypoxia, that should have triggered the manual motor control of actually switching off the loop and saving your life. So, somebody who actually writes down a symptom or reports a symptom, but doesn't necessarily physically act to save their life, it's kind of interesting. We found that most people kind of drifted down into that hypoxia, where they still had the mental acuity to know, oh, this is hypoxia. It's happening. I'm going to die. Even in their mind sometimes they actually thought they had made the physical motion of baling out, but they didn't before they physically passed out and we had to rescue them.

Dave: It's a very odd feeling to be hypoxic. It's like you're swimming in mud a little bit, and you have this awareness, but you're not really in there. When I do this kind of work, just for training my physiology, some may call it hypoxia-inducible factor 1-alpha, which makes you live longer apparently, I just did a show on that, I will hold the oxygen scrubber in my hand, or I will hold the mask against my face, depending on which technology I'm using. That way if I pass out, I'll drop it, and then I'll get oxygen from the air around me, because otherwise, if you put a mask on that does that and you accidentally pass out, you are dead. That would be sad.

Jill: Yeah. We actually learned from our experience and were instructed that even if you drop that mask, in the face of hypoxia the human body does not always trigger to breathe again.

Dave: Oh. You're probably getting more hypoxic than I do. I have an SpO monitor on. If I go below 87, I stop. 87 would be it's time to go to the ER and the ICU for most people, but it's not really dangerous. I'm talking about doing it for one minute at a time. I think I'm within really clear safety tolerances, but you would know better than me. I mean, am I taking more risk than I think?

Jill: Yeah. I don't know. I mean, for us, we were finding that at 0.13 partial pressure of oxygen, like you're normally breathing 0.21 and you're breathing air, that would be significantly lower than your O2 sat of 87%, but we found that people were reporting issues and starting to lose the ability to act. Then at 0.11 to 0.1 they're passing out physically. Yeah.

Dave: Wow. Well, I have certainly never passed out. I've seen some stars. There's really interesting science around when you trigger these emergency hypoxic responses, your cells are so receptive to receiving oxygen that when you put oxygen in, you can get a 26 times increase of oxygen in the brain for brief periods of time.

Jill: I believe that, because when we were doing those experiments, when somebody finally passed out, we'd rescue them basically, put them on 100% O2. We discovered that even though 100% O2 is completely tolerable by a human at normal atmospheric pressures, we were causing seizures. So, it was such a spike and such a shock to the body the person went into an actual seizure. So, yeah, I believe that. Yeah.

Dave: I mean, you are some of the ultimate biohackers. I've long thought, especially free diving, but even diving just with the pressure things, you're testing the very limits of what the human body is known to be able to do. Of course you're going to find all kinds of cool stuff that no one noticed. What is the craziest thing you've noticed that you just wouldn't have thought a human body could do that, but it did?

Jill: Oh, wow. I don't know. I mean, certainly the whole navigating in the dark has always been really, really fascinating to me.

Dave: Yeah. That's a superpower.

Jill: Yeah. Yeah. But even sort of the endurance factors for me, when I look back on some of the things I've done, some of the things that I've survived, I realize we are capable of so much more than we could possibly imagine. So, even the course of doing this 22-hour mission, after being up for a whole day just to prepare for it, we can really dig deep and do so much, but you got to be willing. So, I've been with people on dives where I've had a really good mental framework around the dive. I've had a very positive dive. It's gone well. I haven't been scared, but I've been with someone who's had a bit of a something scary happened, and their whole mindset changes. Then that person has gotten bent after exactly the same exposure that I've had. I kind of feel like there's so much more about our mental state of mind that will deliver physical success or more detrimental things, too. Yeah.

Dave: You've seen the changes in our oceans over the last 30 years, the increase in plastic and just the way the environment's changing. You've also seen some of the most unspoiled, most amazing parts of the ocean. Do you think that the oceans are recoverable at the state they are now?

Jill: Well, we're in a really tough point in human history with climate change and everything that's happening, the acidification of the oceans, the plastification of the oceans. I truly believe that we are very close to, if we have not already, passed the tipping point, where decisions that we make in the next couple of years will determine the survival of our species. The Earth's going to be fine. Whether we're on it or not is another question.

Dave: Yeah. There will be life on Earth, too. It just might not look like us.

Jill: Right. Right. Yeah. I believe that. I used to feel like I had gone to these places that were so pristine and untouched by humanity. Going to Antarctica you don't see contrails in the sky for six weeks, eight weeks. You see no evidence of humanity, and you feel like you're on another planet. But now with the whole understanding of plastic oceans and even how we're acidifying the ocean and changing the global circulation of water around the planet, I realize that there's no place that's untouched. There's places that should be pristine and untouched that are suffering great ills from the actions of people very, very far away.

Dave: Yeah. We're not aware of that. Given that context, how long do you think you're going to live?

Jill: Oh. I think I have some good genes and some good lifestyle choices. I kind of think I'm going to be about 110, 120 years old.

Dave: All right. I like that. Do you mind if I ask how old you are now?

Jill: 55 in a couple weeks.

Dave: 55. Okay. Got it. So, you're only 50% of the way there.

Jill: Halfway there. Yeah.

Dave: Beautiful. Beautiful.

Jill: It's funny. I read an article the other day about how they're saying, "Well, the human body genetically is only meant to be 38 years old." I was like, oh my god, I was just starting then.

Dave: Yeah. That's such BS. No.

Jill: No. Yeah. I believe that there's so much that we can do to determine our future really. You just got to be wide awake.

Dave: I believe the more people who understand they might live for at least 100 and possible hundreds of years, the more quickly we're going to clean crap up around here, because if you realize you're going to be there to deal with the impact of your actions, you might actually do something more now.

Jill: That's a good point. Good point.

Dave: Jill, it's been really fascinating interviewing you. Is there something I should have asked you that I didn't?

Jill: Oh my gosh. I don't know. This has been a really interesting conversation. I could talk to you all day.

Dave: Well, I appreciate you being on Bulletproof Radio, and I appreciate your work, just exploring new realms, and your mindset. You've developed a very interesting self-awareness through the path you've been through. I appreciate the way you're able to put it into words and just share it with everyone listening. Likewise, it's been a pleasure.

Jill: Thank you so much. Thanks for what you do. all this great information out in the world is helping a lot of people.

Dave: If you liked today's episode, you know what to do. Head on out there and pick up Jill's book, Into The Planet. You could also go to IntoThePlanet.com. If you want to get inside her mind even more and inside the planet, read the book. It's actually really a fascinating account of what makes someone this many standard deviations from normal actually tick. That's a compliment, by the way. If you do read Into The Planet, you also know what to do. You've got to leave a review, because if someone spends thousands of hours writing a book that was worth five or six hours of your time to read, just say thanks. It's easier than leaving a tip for an Uber driver.