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 has two parts. I'm recording this episode today, March 14th, which is Albert Einstein's birthday. He was born on this day 140 years ago in 1879. If he wasn't so lazy, he would still be alive. He was going to live 180. I'm just saying. All right. Aside from that, he was just proven right again by two ultra-precise clocks.

Dave: They made a pair of atomic clocks from single ions of … This is a word, ytterbium which never sounds right when I say it, but I know I said it right because I actually did study physics and chemistry in college. Anyhow, these two single ion clocks kept pace with each other for six months and they're fitting something called Lorentz Symmetry which says that the rules of physics should remain the same whether you're standing still, moving at breakneck speed and no matter what direction you're facing.

Dave: These are all classic Einstein stuff. Lorentz Symmetry is the foundation for Einstein's special Theory of Relativity, which is talking about what happens when we're going at nearly the speed of light. What was cool is that these two positively charged atoms absorbed admitted light at a particular frequency exactly like the ticking of a clock hand.

Dave: They were pointed in different directions. They rotated as the earth turned and made a full cycle each day but they kept … Avoid each other which means that even in those weird funky things that tend to break science, they held true. The reason this is relevant to you is that we have lots of these weird funky situations in the human condition especially studying high performers, people who break the rules.

Dave: Is it genetic? Is it their gut bacteria? The typical response throughout medical history has been, that didn't happen because it can't happen because we know everything. What we're finding out is we probably don't know everything. There's some questions of core scientific integrity that are coming to bear and because we have social media.

Dave: We also have big data and machine learning. There are a lot of people who invested billions of dollars in one theory or another about what causes disease and they're wrong and it's getting easier and easier to say, "They're wrong." Today's episode is really cool because you're going to hear what happens in the deep guts. We'll call the microbiome of science.

Dave: The stuff you wouldn't hear about, about how we come to believe, as a species, as scientists, as academics, what is true and what is not true. This is an interview with Brian Keating who wrote a book called *Losing the Nobel Prize*. He is an astrophysicist who's going to make fun of my cool fact that I'm reading today, and a cosmologist, professor of physics at the US Center for Astrophysics & Space Sciences in the Department of Physics at UC San Diego.

Dave: Brian became a celestial evangelist when he was 13. He saw Jupiter next to a bright moon and just wondered what would happen in a telescope and he bought one. Since

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then, he's built in to play some of the world's most advanced and powerful telescopes and detectors and he's trying to find the literal edge of the universe.

Dave: In today's episode, we're going to go over the high-pressure world of science. What happens when you think you're right or maybe you're just looking at a speck of dust. Brian, welcome to the show.

Brian: Thanks, Dave. It's a big pleasure to be on with you.

Dave: What led you to decide you were going to write a book? Not about winning a Nobel Prize, but to losing it? For people who haven't heard of your work, tell me about what happened.

Brian: Yeah, so the book is anti-hero's journey. The description of what it's like to aspire to great things in the edge of human capability along with teammates and colleagues who, at various times, will be collaborators and friends and at other times, maybe competitors and nemesis in various forms and to actually portray science, how it's really done and not this neat wrapped up little bow.

Brian: Science is messy and science is chaotic and then oftentimes, unknowable and it has many of the same features that the business world features and that's been the case all along since the first real astronomer in history, Galileo, to use a telescope who had a lot of needs as an entrepreneur to make money and do all sorts of other things, all the way up to Einstein whose birthday, as you say, we're celebrating his 140th birthday.

Brian: Unfortunately, he's not here. Had he lived to 180, he would still be in his prime. It's too bad, as I often say, that he didn't have any Brain Octane Oil because he could've gone out to some great things and made some great discoveries but what's so interesting about science and that I've come to learn is how similar it is to the world of the executive, a business person, but how little scientists really recognize that growing up and even as mature scientist.

Brian: I aspire to win the Nobel Prize as the ultimate accolade, the same way that startup founders want to get the Triple Comma Club and found a unicorn as things that you've done. You know the intoxication of achievement and great success. In science, you may remember, you come from a family of scientists, physicists, engineers and you know that we're pretty much the biggest great grabbers there are.

Brian: We want to get the highest grade, the A-pluses, go to the highest achievement possible as I'm sure your relatives have convinced you of.

Dave: You're talking about scientific hubris there?

Brian: Yeah, there's a lot of that but there's also this need to be judged, to be graded, to be scored and compared against history's greatest. There is no A … I don't get any grades anymore since I was a first year graduate student, right? Twenty plus years ago. For a

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scientist, the last great, the ultimate A plus is winning the Nobel Prize. There are some books written about winning the Nobel Prize.

Brian: You'll be interested to know, and I always say those are about as useful as books on how to win a lottery or how to … Winning bingo strategies because not that it's purely based on luck but there is the luck element and particular longevity which I know you're very interested in. You have to live long enough to see your fear, ideas, theories, experiments validated.

Brian: To me, the experience of losing something and failure and resiliency and humility, that all came together in this book. I realized, most people haven't won a Nobel Prize. Most people haven't won an Oscar or Grammy or another type of accolade or high school class president for that matter.

Brian: It's how you deal with adversity and the failures that you encounter that makes scientist lives very similar to other people that you might encounter. Despite the stereotypes, scientists are normal people.

Dave: You talked about how … You want to see how you stack up, how everyone wants the Nobel Prize. It reminds me of a book by Candace Pert who I didn't get a chance to interview because she passed away. She wrote a book called the *Molecules of Emotion*. It goes into great detail about how, at the National Institutes of Health, there's this competition for a Nobel Prize in medicine.

Dave: How nasty the politics are and how competitive it is and how there's this one thing you don't tell someone in the lab. Oh, sorry. I meant to tell you and now you don't win and I do. It really highlighted for me how we got to where we are in many different fields where if you don't agree with the predominant paradigm, you can't get funding.

Dave: No one will talk to you. You don't get invited to the parties. It seems like this is happening more and more whether we're talking politics, autoimmunity, chronic fatigue syndrome. It doesn't really matter like it's getting really one-sided everywhere we go. Is it that bad in physics now or are we pretty much all in agreement that if you're not studying the cool thing now, no one even knows your name?

Brian: No. It's very much as you describe it. In fact, I was on a show with Scott Eastwood who is Clint Eastwood's son and he's an actor in his own right. He's been in a lot of movies and we're talking about how parallels between the academy which, by the way, Academy of Motion Arts Pictures or whatever and Sciences, so there's science in the title of the Oscar.

Brian: Yet, they do things much more in a holistically, shall we say, than our Swedish counterparts who award the Nobel Prize in physics and literature, medicine, et cetera. I said to him, I said to Scott, "Look. I don't think you're in Hollywood but I don't think like most major studios are expecting a movie like a crummy movie like, let's just say, The Fast and the Furious is going to win an Oscar." He said, "Let me interrupt you. I was in The Fast and the Furious." I didn't mean-

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Dave: No, you did not.

Brian: Yeah, I did. I swear. Yeah, it's all there. He's very gracious and I said, "Look. I don't think you thought you're going to win an Academy Award for that role that you played, nor do I think the studio did, but you better believe that the analog of Hollywood producers are the National Science Foundation, the National Institutes of Health, Department of Energy. They want, just as the movie studios do, they want a certain number of their films to win the Academy Award.

Brian: "In fact, some of what they do in the popular side where they make these blockbuster, Captain Marvel, whatever movies, are really to support the more artsy, creative intellectual films that do go on to win Academy Award." It's just like that. There's a herd mentality in a certain sense and there are plenty of colleagues, I have to say, that do it for the purity of the science but when I … You get told things as a young professor that you won't get tenure unless we think you have a good shot winning a Nobel Prize.

Brian: You say things like that the main defining characteristic of a scientist in their obituary is that they won the Nobel Prize or almost won the Nobel Prize. It sets up this dichotomy of idolatry as I call it, and I think it's very pernicious and ironic because scientists are supposed to be free of prejudice, idolatry, religion worship, things like that.

Brian: Yet, I think we're some of the most susceptible to these biases that exist in society.

Dave: I'm hoping that just talking about this moves the needle a little bit for people listening. If you just believe something is absolutely true, everything we believe about reality as a theorem is asymptotically approach being an absolute truth. There's probably a corner case. All the interesting stuff is the corner case. If you want to do time travel, I'm pretty sure it's not easy.

Dave: You want to live to 180, I'm also pretty sure it's not easy or maybe beyond but there's all sorts of stuff. You want to turn off cancer, just one person has done it somewhere or is doing it right now. It's not evenly distributed and when science accesses immune system to ignore those things instead of focus all of our energies on that one person who seems to know what you're thinking and can do it reliably.

Dave: You can say, "There are no people like that out there." Heck, I don't know, but everyone who claims it like let's either prove that it's not happening or let's figure out why and then let's make it teachable. That's what's cool.

Brian: Yeah. Look, I get a lot of emails every week that say, "Professor Keating, Albert Einstein was wrong. Here's why. I can prove I'm right," and most of those go to the waste bin in my email. On the other hand, sometimes, you do get gems in the rough. I once got an email from a woman and she said, "I got some early speculative ideas in cosmology I'd like to talk to you about."

Brian: I was about to delete it and then I saw, "By the way, I won the Pulitzer Prize from President Obama last year. Would you like to go out for coffee?" Sure. I won't delete

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that email. We went. Her name's Rae Armantrout. She ended up writing a poem about the collaboration, the conversation that we had over a period of weeks. It became ranked as one of the best poems of 2012 in America.

Brian: If I had been close-minded and said, "Look, she's a poet. She not even in physics." When you diversify your curiosity, when you explore different realms of activity, the brain is the most phenomenal, as you know, computer in the world and in the known universe. It may be the only type of computer of its kind. Some of the work that we do here revolves around possibilities for artificial intelligence and quantum computing.

Brian: Things that, a decade ago, would've seemed impossible, let alone 100 years ago. I salute the people that really are ambitious and those moon shots and the difficulties as our mutual friend, Peter Diamandis speaks about. That's how progress gets made. You have to have a certain amount of boldness, but when you're in an operational field like mine where most people don't get their first research grant from the government until they're in their late 30s or early 40s.

Brian: By then, maybe some of their greatest years are behind them in some sense and including myself. It sets up a world which has all the negative aspects of the business world. Punishing failure, et cetera, but it has a great field of positive ones of entrepreneurial spirit.

Dave: Unless you win the Nobel Prize, you're probably not going to get rich in academia?

Brian: That's right.

Dave: In order to be on Bulletproof Radio, one of the filters that I run is I want someone who's a game changer. Someone who's breaking out and doing impactful things in their field. It turns out, a lot of the time, there is financial success but no one's targeting that. Eric Kandel who won the Nobel Prize has been on the show and some other people at high levels of achievement.

Dave: They all share that perspective that being the best is a motivator for them regardless of whether it's measured in dollar signs. In business even, I measure success in the number of people who use Bulletproof products, not necessarily in the highest possible revenues or dollars or things like that and I'll spin more to make it convenient for someone to start doing it even if I make less on it because I like a world where people are well-fed because then, they're nice to each other.

Dave: Everybody went, and so you can look at impact or you can look at dollars. I think you just have an impact filter which is great. I got to ask you. When is time travel going to happen?

Brian: Yeah, so there's a lot of news circulating about time travel just recently from a couple of different particles that we're shown to potentially, inhabit. Configuration, a state space that they existed in at a previous time. That's very primitive, I would say. It's not known whether or not time travel from macroscopic objects is possible.

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Brian: This shows in principle from microscopic objects. Now, if you're an atomist, if you believe that we are essentially a giant assemblage of microscopic particles then in principle, there's no reason why something macroscopic could not be teleported back in time. Let me just take a step back. Your listeners are undoubtedly familiar with the fact that it's possible to move forward, backwards, up, down, left and right in the three dimensions of space.

Brian: However, you may have heard also that there's something called space time that the man born on this day, Albert Einstein, pioneered this concept of the intricate interlocking of the concept of space with time. Yet, we all know, at least, despite your question that we can't … We can go any direction, positive or negative in space but not in time.

Brian: At least, as far as we know currently, or we have not been able to actually teleport back in time. However, there's nothing in the laws of physics themselves. If I showed you a pendulum swinging back and forth, you couldn't tell me if that pendulum, movie of a pendulum is running backwards or forwards.

Brian: Similarly, if you look at the orbit of the earth from above in a sense and I didn't tell you which direction you were looking at it from, you couldn't tell which way time is going. In other words, the laws of physics are independent of the time parameters positive or negative sign. That implies that there's a symmetry and that going back in time could, in fact, be possible.

Brian: What I'm connected to in my research is the ultimate origin of the universe which seems to be in one class of models, the ultimate stopping point. In other words, there's a time before which you could not return. If time travel is possible, it would beggar a lot of questions. For example, what if you tried to teleport back to before there was a universe to teleport into?

Brian: That's a question and so the main focus, the main answer to your questions, I don't know. I don't think anybody knows when time travel will be possible but I will say that it's not believed to be fundamentally forbidden by the laws of physics and as the late great Richard Feynman said and others have said, "Anything that's not forbidden is mandatory."

Dave: All right. Actually, I really like that as one of those people with oppositional defiant disorder. This resonates with me. You're saying like maybe it's possible. It certainly hasn't been proven impossible that we'll have time travel at some point. You're looking at the beginning of the universe and certainly, you'd want to understand that. What's your theory?

Dave: Are you a Big Bang guy? I remember, my son's like, "Daddy, I'm grateful for the Big Bang because without it, there wouldn't be anything." Like, that's pretty cool, gratitude, but I'm not sure that's true. Is he right?

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Brian: Throughout human history and even back to the biblical days, so I'm not taking a position on religiosity. If you think about it, the bible begins with, basically, the Big Bang. How did the universe begin? Why is that? The rest of the book is about like different kinds of food you can't eat with other types of food or ways that you do this or that for a tribe of nomadic Semites in the Bronze Age.

Brian: Why did it begin with the Big Bang? I think the Big Bang is a story. It's built into our consciousness as human beings. This quest that must have an origin. Human beings are very uncomfortable with them not being in the middle of a story and maybe erased, it's called like almost everything, your life. You only know who your dad was because your mom told you and you trust your mom, right?

Dave: I know. I used 23andMe [inaudible 00:18:32].

Brian: That's true. You do-

Dave: Just kidding.

Brian: If you go back in time far enough, you might reach a time where you're not in the middle of anything. You're at the beginning of it. What's so interesting to me is that throughout human history, from the Ancient Greeks, as I said, from the bible to the Ancient Greeks, to modern day Einstein himself, believe the universe was static, unchanging and eternal.

Brian: The bible was standing in opposition to that with what could be read into it, that there was a beginning, time equals zero. What's so interesting to me is throughout the last hundred years, the more that we learn about the conditions that prevailed at the earliest epoch that we can measure which is my field of study. We are learning that it's potentially impossible to know, not only if there was a Big Bang.

Brian: In other words, if there was a single Big Bang but we may not be able … Ever to know if there are other universes with their own Big Bangs. That's called the multiverse. Similarly, we may not be able to know if our own universe is just one cycle out of, potentially, infinite number of bangs and collapses and Big Bangs and big crunches throughout eternity.

Brian: Surely, eternity and the human brain is, even with all the Octane Oil in the world, it's very difficult for human beings to conceive of the implications of the number infinity. It's the most baffling concept that we think it's only accessible to human consciousness and yet, we don't really have a visceral feeling for what it means.

Brian: To answer your son's question, everything we see is consistent with the Big Bang except for the origins of Big Bang itself. In other words, we don't know what banged. We don't know what caused the Big Bang to occur. We don't know if there are other Big Bangs going on right now or if there were other Big Bangs in the past.

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Brian: Similarly and lastly perhaps, we don't know if our universe will last forever or will it come to a fiery end in a trillion years, but I say, "Keep paying your taxes just in case."

Dave: Love it. Some of my favorite people to get in deep conversations over coffee with are physicists but also, people who are PhD philosophers and it's very hard to tell them apart. In terms of the thinking model, because the question of how did the universe begin, also it's almost identical to the question of how consciousness began.

Dave: What is your work in physics showing us about how consciousness may have arisen?

Brian: Yeah, I actually speak of the three questions I would most like to ask a supreme being, mother nature, whatever as what was the nature of the origin of the universe, the real Big Bang, what we call the Big Bang. Then the origin of life must have come, at some point, from nonlife, right? There must've been some molecular combination of enzymes, proteins, amino acids or whatever you want.

Brian: That formed the first biological organism in the universe, perhaps here on earth, perhaps elsewhere as some speculate. A concept called panspermia which sounds dirty but it's not. Then the origin of consciousness. These are the three Big Bangs. We must've had an origin of the universe, Ex Nihilo, potentially, from nothing.

Brian: The origin of life from nonlife and the origin of consciousness from nonconsciousness. These are the greatest puzzles I think that exist and in some way, my research touches on all three of them. Obviously, through the origin of the universe, we build telescopes. We build detectors. We build sensors that are cooled down nearly to absolute zero, cooler than the freezer in the background, than your office-

Dave: Cooler than my cryotherapy chamber that goes to 260 below zero.

Brian: That's nothing. I got 454 below zero Fahrenheit. Then, there's the obvious creation of life from nonlife which some of the earliest work that was done here at UC San Diego by Harold Urey who did an experiment with his graduate student, Stanley Miller on the origin of what they thought was the prebiotic earth atmosphere composition.

Brian: They put some sparks and lightning out, immerse some amino acids from that and that was the origin of life. Supposedly, it turns out, there were some flaws in that we can get to. Then the origin of consciousness, we have a great deal of thinkers and people here that study consciousness. What we do, I'm the co-director of what's called the Arthur C. Clarke Center for Human Imagination which was licensed … The name is licensed to us from the Arthur C. Clarke Foundation.

Brian: It was a great honor to work with this great scientist, but science fiction author and we bring in people from around the world including someone who, if you haven't had on the radio show, you should, Roger Penrose, Sir Roger Penrose who's responsible … He's probably the greatest living physicist. He was contemporary to Stephen Hawking, was actually advisor to Stephen Hawking many times.

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Brian: He believes that consciousness is one of the most diabolical mysteries that there is because you're trying to study yourself in the same way, you can't really tickle yourself. I don't know if you've tried but it's very difficult to make yourself laugh with your tickle. It's just like it's very difficult to put yourself in a basket and pick yourself up.

Brian: You don't know if it's even theoretically possible to study the origin of consciousness using the consciousness that we have. In other words, it might take another three-dimensional system, a quantum computer, a room temperature liquid, not unlike a brain to study the brain. Just as the same way it's very hard to study things that you are a part of.

Brian: Psychology on yourself is very difficult to do unless you're really good at meditation, et cetera. In this case, the problem with consciousness of those three Big Bangs, the origin of the universe, the origin of life, the origin of consciousness. I feel consciousness is the most mysterious because we can't even agree on what a definition of consciousness-

Dave: Right.

Brian: There are great many people who believe in what's called pan-consciousness or pan-psychism which would mean that not only does your brain have consciousness but the Bulletproof Coffee that you drink, the molecules have consciousness too and it-

Dave: I put it in there. It's actually part of the third step of this … Okay. Just kidding. By the way, thanks for the plugs and just so you guys all know, I don't even know if Brian uses Bulletproof Coffee or he doesn't like that but he's kind enough to mention it. Thank you.

Brian: Yeah. Yes, yes. As you know, the famous mathematician, Erdos, said that a mathematician is a machine that converts coffee into theorems so-

Dave: That's a beautiful quote.

Brian: We do use it. That should be and you can get that license for free because he's long dead. Anyway, yeah, the consciousness problem of actually having fundamental attributes of what we … It's like the Supreme Court definition of pornography like you know it when you see it. In this case, consciousness, you know it when you see it.

Brian: You know it when you take it away. There's a researcher that Sir Roger Penrose works with named Stuart Hameroff at the University of Arizona who works on these things called microtubules. He and I disagree a lot on the fundamental basis of consciousness but what he … He's an anesthesiologist so what does he do?

Brian: He makes people unconscious all day long. From the studies of before and after anesthesia, he's developed these theories of consciousness that are very controversial. Again, point to the fact that in this field, there's no universal definition of consciousness. It makes it very difficult to make progress when the lexicon vocabulary is not agreed upon even in principle. It frustrates me to deal with that.

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Dave: All right, so it's awesome in academia. Say, there's this theory that's out there. All right, straight up. You have $100,000 bet on where consciousness comes from. Where are you going to place it?

Brian: Where-

Dave: I love it. You're already going off in the professor … Give it to me straight.

Brian: I'm thinking about all the slide rules I can buy with that.

Dave: My God. That's the best answer ever.

Brian: I still use them. I would say it's most likely a quantum phenomena which doesn't help because actually, the … Quantum mechanics, the properties of the very small microscopic behavior of light and matter are some of the most mysterious laws of nature. Again, this famous physicist, Richard Feynman said, "If somebody tells you that he understands or she understands quantum mechanics, they're a liar. That's the only thing you know about them."

Brian: We're learning more and more each day about how ignorant we are, but I would say, there are properties of quantum mechanical systems that demonstrate the same behaviors as the human brain. It's called neural networks that can be processed. The problem is that to actually assemble and test these things, we're at really the abacus level now of quantum computer.

Brian: It's so primitive, and so the amount that we can actually learn from it, I would say, is pretty small but yeah, if you're forcing the … Now, to stake my bets, I would say, it originates as some kind of emergence phenomena from the collective behavior of nearly infinite numbers of quantum mechanical systems, but there's a big mystery as to how you can have a liquid, wet, room temperature quantum computer.

Brian: All our quantum computers nowadays are basically almost at absolute zero temperature and so to have a quantum computer at room temperature, i.e. your brain, it's very mysterious but I do believe there must be a link between the two. Again, this makes the problem so under representative of what it actually is.

Dave: We do know that some parts of our neuro system are superconductive at room temperature which is interesting.

Brian: I wasn't aware of that. The superconductors that we study in the laboratory. The record for room temp or for … That's called a high temperature superconductor is not really that high. It's actually about minus 150 Celsius or so where it starts to super conduct. In other words, exhibit zero resistance for your listeners that might not know what a superconductor is.

Brian: It's an actual quantum mechanical phenomenon discovered by one of my teachers at Brown University, Leon Cooper and colleagues and this phenomenon was not well-

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understood and still is not very well-understood, how it curves near at higher temperatures than close to absolute zero.

Dave: I love the very polite academic way of saying, Dave. That sounds like bullshit. That was what I translated through my quantum filter. I'm quoting Robert O. Becker in a book called Electromagnetism and Life which is a fascinating read that really helps. I think I read it in the early '90s. It really helped to shape my … Wow, there's a lot more going on. He's talking about like the Hall effect and things you can get off nerves that just aren't fold out-

Brian: Look, if they were true, I would be the biggest backer of it. I would love to see that book and I will make a note to look at it. Look, if it were true, we'd be using … We'd be extracting the superconducting material from our bodies and using it to do levitating trains and communication with zero resistance. There would be wonderful … It's like when people say, "Homeopathy is real or this is real and the big drug companies."

Brian: My wife is a big proponent of it. I don't want to scribe too much negativity to it and I believe it can help and look, placebo is the most effective drug ever invented, right? I don't want to rain too much on people's parades, but it's not like Pfizer is going to say, "Here's this wonderful herb that we can basically get for free from Taiwan and we're just not going to use it because we can't patent it."

Brian: I just think that's very cynical and so similarly, if there is a superconductor in the human body, there'd be billions and trillions of dollars of potential revenue for commercial applications.

Dave: I actually had the same thought when I read the book and I'm completely willing to be proven wrong because I studied computer science, not physics.

Brian: Yeah.

Dave: Not medicine. A lot of people think I'm a doctor.

Brian: Some of my best friends are computer scientists.

Dave: Yeah, they share a lot with the philosophers and some with physics. Now, getting back to this whole consciousness thing, I love being able to talk about it from a physics perspective. You talked about an emerging phenomenon that happens from a highly distributed base system. I believe that most of our egoic behaviors. In fact, the ego itself is an emergent phenomenon and emergent consciousness.

Dave: It's held inside our meat that comes mostly from mitochondrial priorities. Now, going back to Stephen Wolfram's book which you've probably read and maybe even understood unlike me. A book called A New Kind of Science. To sum up this incredible book, full equations that I don't understand is that if you take very simple rules and repeat them almost infinite numbers of times, you get very amazing complex, beautiful things that don't look like they're based on three rules repeated 20 billion times.

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Dave: I think some of our behaviors are that way but in companies and I've studied business at Wharton and I'm a reasonable entrepreneur. There is an emergent behavior set that isn't necessarily conscious, it's what we call company culture. It's those hundreds or thousands or millions of micro decisions made every day based on a certain goal.

Dave: I don't think in my experience, almost … I would say, almost none of the people running big companies have evil in their heart. They're not out there. No one would ever say, "I'm going to screw the planet to do this."

Brian: Right.

Dave: What they're saying is, "I'm going to set this direction, set this goal," and then two billion micro decisions later, evil happens. They scratch their head and say, "That can't possibly be evil, therefore it's not." The classical scientific hubris and then you get Monsanto or whoever else we're talking about. Sorry if they offend you. I hope not.

Dave: No. When you look at that, interesting. All right, so there's some quantum thing going on. How does that affect what you do on a daily basis? Are you living up in the clouds there? Do you wake up in the morning going, "I'm going to meditate on my quantum nature and increase my performance." Like what's the … So what? For you personally?

Brian: Right, so I agree with you 100%. Just taking, rewinding three or four sentences, you talked about the culture of entrepreneurs and leaders and CEOs so whenever you say CEO or you say startup or you say company or entrepreneur, I want you to think experiment or scientist because we're exactly the same.

Brian: There's no doubt in my mind. I once said this to one of my professor colleagues, "Look, I have payrolls. I have travel. I have expense reports. I have receipts. I have shipping. I have receiving. It just takes up all the stuff that you do in the business world." Then he said, "But you don't have to … A business person has to teach 40 hours a week on top of it."

Brian: That being aside, putting that aside, still, we have the same needs, same urges and same ego-driven motivations except in our world, again, it's not for financial. If you look at some of the greatest inventions. Look at Einstein. You know how much money he died with in his bank? The smartest man who ever lived allegedly, won the Nobel Prize. Could've won it seven times according to most physicists.

Brian: A couple, maybe $100,000 in today's dollars. Look at people that invented the GPS, the laser. The laser, the transistor, Shockley and other people. These guys died almost penniless. In his case, he was insane. Shockley, he was a eugenicist. He wanted to rid the world of African-Americans through bribery. Just an awful human being and on the same token.

Brian: The notion of scientist is beard-stroking scholar and intellectual, quiet, focused or … That's total nonsense. Even going back, as I said, to Galileo. Galileo is the prototypical scientist, the lone genius, working by himself and discovering things and then wanting to

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promote himself, make money from these discoveries and support his enterprise because what is the credit?

Brian: What is the dollar sign equivalent for scientist? It's citations. It's credit. It's influence. It's setting the priorities for national agendas in science. There's nothing wrong with that. Look, I think there's an inclination towards good and then sometimes, as you say, it'll spiral into Monsanto who used to sponsor my research until ... No, I'm just kidding.

Brian: Okay, but not anymore. The actual, the stock and trade that the exchange, the medium of exchange is credit and so when you have anything for credit. Look at like Neil Armstrong. Did he die with like billions of … No. He died, relatively middle class and yet, he wouldn't trade that experience for all the money in the world.

Brian: We have to look at ourselves as people, so what I do every day is just getting back to the second to last sentence here, is really, I try to be a little bit different because I'm running an enterprise, a hundred-million-dollar experiment in Chile that has 245 employees if you like. Some are much more senior, much more brilliant than I am, much more renowned.

Brian: Down to graduate students and 18-year-old freshmen that work in our labs. I have to somehow, get them the funding, the resources to travel, the screws, bolts and nuts that they need to do their actual work at almost 18,000 ft. above sea level. I look at it and I say, "How would a business manager do this? How would a business person do this?"

Brian: I started reading. Every day, I tried to read as part of my alleged morning routine after meditating for four hours. Actually, I should say, I once met the Dalai Lama at UC San Diego and he said … Somebody asked him, what's his daily routine. He goes, "I wake up and I meditate for five hours and I almost throw up," because you could tell, he doesn't have any kids, right?

Brian: Because no one with kids is meditating for five hours but anyway, so what I like to do is to read books by Andy Grove or I read books by Ernest Shackleton's daughter, granddaughter and about how do you manage culture. Right now, I'm reading a book by Simon Sinek called Start with Why. It's so interesting to me because I keep reading his book and I've noticed that elsewhere, we, scientific entrepreneurs, we are merchants of truth and light as we're supposed to be.

Brian: We actually end with why. We're terrible at promoting and marketing ourselves and instead, I think, we could really learn a lot from the business world and to not do so, I think, is at our own peril.

Dave: Let's talk a little bit more so you have five hours of meditation, right? I actually did two hours of meditation in the morning until I had kids 11 years ago, and realized, kids have an uncanny ability to know when you're meditating because that's when they're going to scream and ask for attention. If you say, "I'm going to wake up early."

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Dave: They're like, "Yeah, I'll wake up early too." Yeah, it helps to have an army of monks helping you meditate five hours a day.

Brian: Exactly.

Dave: Great respect for the traditions they've done after thousands of years to study human consciousness but it's work. Right? You have other work to do. You're seeking another truth, running 100-million-dollar project as much as internationally is not at all, trivial.

Dave: I want to know though, to be a merchant of truth and light, you must have a brain that's on and that was what attracted me to interviewing you. If you're going to be at the elite levels of science, you've got to be able to notice these facts and do the numbers and ponder and be like a high-performance ponderer and draw models in your head.

Dave: I know that when I'm in the face of my career where I'm running strategy for technology, where is technology going to be in five years? How do we make sure we're at the middle of that? It is such a demanding but nebulous task that I found it to be high energy. It's stimulating but it's also exhausting. What do you do to turn your brain on so you can lecture the way you lecture?

Dave: Then pick up the phone and talk, I'm assuming, with the president of Chile or something and then switch to something else.

Brian: Exactly.

Dave: It's exhausting. What's your regimen for that?

Brian: Yeah. I'm Jewish and in our tradition, called the Talmudic tradition. There's a famous statement that a man should have two pockets and a woman too. Those two pockets and this is the philosophy I lived my life by. Those two pockets should have two different messages. In one pocket, it should say, "The universe was made for me."

Brian: In the other pocket, it should say, "I'm not nothing but dust and ashes." In other words, you should have this concept that you're eventually, your life is finite and yet, there's a richness to the universe that you … Look, the universe doesn't. If you don't exist, Dave, does the universe exist? I don't know.

Brian: You don't know what exist other than this construction that people have made for themselves as to what their definition of reality or consciousness is. I know we're getting a little off-track but I actually say, "People think I'm really smart but I still have to sing the alphabet song to know what letter comes after Q," and it's just a different intellectual pursuit.

Brian: I would say I'm very similar in some ways to you and that I don't like or other people that try to achieve at a high level. I don't think it's something magical or special about me, but I think the secret weapon that I have is this passion of curiosity. I have an unyielding scholastic intellect that I'm interested in literally everything.

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Brian: There's nothing that bores me, and my kids say, "I'm bored, daddy. I say you're boring. You're just like," there's something that you're just not … You have this gift called life and yeah, I hope I live 180. I don't know if I will. I hope I live much beyond that to be honest with you. On the other hand, who knows how much time we all have left. What I try to do in life is maximize every moment.

Brian: That might mean not getting enough sleep, not doing the meditation, not doing this and that. To me, it's this unyielding desire to know as much as I can while I can and be productive and contribute to this chain of knowledge. I have to say, I had much pace or desires when I was 25 year old, 30 year old in this field. I wanted to win a Nobel Prize. That was my focus. That was my goal. That was my idol.

Brian: That was what I was going for above almost everything else to the point that I really, I did create an experiment that was going to be shoo-in for the Nobel Prize if our results held up. From the title of the book, you can tell they didn't. The aftermath of that episode really affected my own self-reflection as to why I'm a scientist. I could do other things. I could probably program a computer really well. I actually liked working on cars and doing physical labor, and that's something I've always been good at.

Brian: The bottom line is I never take it for granted. I'm here by a whole lucky string in sequence of events and I aim to take advantage of all that, and I really want to know everything. That's what drives me alive, is the humility that I made some huge mistakes in my life and I'm going to take advantage of the lessons I've learned from those mistakes, decapitalize on it, and hopefully make the universe a better palace.

Dave: How do you go about doing that? One thing that attracts me is that your observatory is at 17,500 feet. I first had [inaudible 00:41:22] at 18,000 feet in Western Tibet and like, "Wow, my brain just turned back on." You're physically challenging. I mean, that's pretty much mountaineering territory. It takes time to acclimate and all that.

Brian: It's basecamp of Everest basically, right?

Dave: Yeah. I mean, your physiology is very different there. Your brain actually requires oxygen in order to do its maximal things. You're sitting there trying to do this. The travel there is rigor and you're at the highest possible demand on your brain. What do you do for that?

Brian: Yeah.

Dave: I mean, is there an astronomer diet? Is there do calisthenics, cryotherapy in the morning? I have no idea, but like what is the day in the life of a high altitude, high consciousness, high demand astronomer?

Brian: Yeah. We didn't coordinate this again for your listeners but I do feel like of all the professions that could benefit from both proved lifestyle astronomers or some of the most likely to benefit why, because we have totally messed up circadian rhythms where we have to work at night and we're up during the day like vampires, we have to operate

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at extremely high altitudes for long periods of time. It's not like, no offense, I think a lot of skiers, I'm sure Lindsey Vonn is brilliant.

Brian: She's not relying on doing mathematical calculations and operating heavy machinery, and dealing with science at the literal highest level on earth. When she's up at those high altitude, astronomers are.

Dave: Plus, she gets a break. I mean, she trains but-

Brian: Right. How long is she up at high altitude?

Dave: Yeah.

Brian: Two minutes? I mean, if she's good, she's not there very long or she's [crosstalk 00:42:59]. The other thing is we're also dealing with extreme cold environments. My research in the book takes place in the South Pole Antarctica, the very bottom of the world where it gets to say 100 degrees below zero Fahrenheit, and you can do things there to rejuvenate your soul. One thing they have there, which I don't know if I want you to do it, because it would mean probably six month break from your family, but they have something called the 300 Degree Club.

Brian: The 300 Degree Club involves using the sauna. At the South Pole there is a Sauna. There is a basketball court. There's a sauna. It would be surprising to learn for your listeners but there's a sauna. They heat it up almost to the boiling point of water, which is 212 degrees Fahrenheit. Then, they go outside in the middle of winter. This is usually in June 21st, which remember, is the winter down there. They'll go outside. It'll be 100 degrees below zero Fahrenheit. You've got 300 degree change in temperature.

Brian: It's more than the cryotherapy or at least they use it for more than a cryotherapy. The goal of this experience is to go outside, run around the geographic South Pole naked, because if you wear clothes, you're going to get frostbite in some places you really don't want to get frostbitten in, and you're only wearing boots. To do this, you join the 300 Degree Club. Again, these are things where astronomers go that normal people fear to tread.

Brian: There hasn't been, although I think there should be, because when I send one of my graduate students to Chile, for the first two or three days, she's useless or he's useless. I mean, their brains are foggy. Our basecamp is about 9,000 or 2,000 meters or so, 9,000 feet, and then they go up to 18,000 feet. Sometimes in the winter, the day of productivity is only six hours long, it takes an hour to get up and down, but not enough to 18,000 feet in almost. I've been thinking a lot about, how do you acclimatize people?

Brian: There's researchers here in San Diego, Frank Powell and others, that have a high-altitude research station on the White Mountain, which is the second highest mountain in the US, one of the top mountains in the US, 14,000 something feet. We've talked about how you would acclimatize the student before they go down to Chile.

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Dave: Do you want the answer?

Brian: Yeah.

Dave: I mean, I actually know this one.

Brian: I know, the chamber, right?

Dave: No. No, the chamber is expensive, a huge pain in the ass, although having a hyperbaric chamber up there would be good. We're talking about 400 bucks in 20 days ahead of time.

Brian: Okay.

Dave: There's a little company no one's ever heard of. I don't know how to deal with these guys. What they do is they make a little oxygen scrubber and you breathe for an hour a day through this thing until your blood oxygen level drops, and then you breathe normal air until it goes back up. Then you breathe again until it drops. You do this for 20 days and after that you're acclimated to 15,000 feet elevation. I mean, seriously, all the way acclimated.

Dave: The reason this was invented, it makes me happy, because the Russian mindset on physics and just on all hard science is different than most of the rest of the world and admirable. They thought about this on military respect and they said, "Pressurizing an airplane is really expensive. Wouldn't it be cheaper if we just made the pilots so they didn't need pressurization up to 15,000 feet? Imagine how many more jobs we could have," right?

Brian: Right.

Dave: They developed the basic algorithms to do this.

Brian: Very cool. I'll be very interested in that because when I send my student down there, it's $1,000 a day per student. If you got 10 students there, that starts to add up into your research budget, and so making them hit the ground and the mountain running, that will be the worst couple thousand bucks for each student over the course of their career.

Dave: The other thing that would probably be profoundly effective, I haven't seen it studied specifically for acclimatization, but it's very similar, and this is a high intensity interval training for the oxygen receptors on yourselves. It affects how easily hemoglobin, the oxygen carrying molecules in your blood, how easily it let go of oxygen and when cells demand it. Essentially that's what's happening with acclimatization. There are some other things too but we do something that called, let's see, we call it high intensity intermittent hypoxic training in Santa Monica at Bulletproof Labs and the Beverly Hilton.

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Dave: What you're doing is you're writing an exercise like breathing air that has no oxygen, but now it's under load, the thing I talked about before was just sitting at a desk watching Netflix, sort of wanting to pass out. Now, you're under load and it changes things much more dramatically. You switch from no oxygen in the air you're breathing and then you switch to 100% oxygen. It takes about a half hour to do this and it is an intense workout. Just you're pouring sweat you don't even know what's going on.

Dave: You're dizzy but it forces yourselves to be able to react to more rapid changes more rapidly. That is a very potent mitochondria enhancement technology and we've measured that with some of the cure we have there. The funny thing is there's all kinds of things you can do that will affect high altitude. We've actually had one of the big organized camps climbing Everest sent photos of Bulletproof Coffee from basecamp because they're saying, "It turns out the Tibetans knew something when they're putting fat in liquid like that."

Brian: Right.

Dave: We also know-

Brian: They go up there without oxygen, right? They're up there without oxygen to live-

Dave: Yeah, no oxygen, no vegetables. What are you going to do? Oh, butter. There's also the fact that you need more glucose. It's easier to burn glucose than ketones in a little oxygen state. Maybe you want to be ketogenic before you go there. You want to put some brain octane in your stuff to get some ketones because it's nice to have them, but maybe you should have a little bit of honey, or switch to some more starch.

Dave: I don't know the full answer there, but it seems like people in the ketogenic state do very well at high altitude.

Brian: Yeah. All those ideas I think are really valuable. As I said, just practical cause to going up there. Then, so a really way these things to think about, I don't like to think about it, but there's a decent chance that someone will die building this experiment, simply just taking the tables for people that have died in the construction of other high altitude telescopes and that's not lost on me. Whether it's a car accident as recently happened in Chile on a telescope project, and usually it's an accident. It's not something that could have been foreseen.

Brian: Who's to say if it had a little bit extra brain boost that that could've avoided it? I'm not a medical doctor, although I do prescribe medication to certain people, but that's legal now in California. The thing is could you actually prevent of a loss of a life? That's really a way to think that I think about quite frequently.

Dave: Well, I believe that any time where in academia, if you can do something to make brains work better as much as something that's non-harmful that you're wasting your tuition if you're not doing it. In fact, I don't think I've ever talked about this. Back in 2003, I was at Wharton not long, long before Bulletproof. Bulletproof started as a blog basically in

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2012. I'm looking at this, what we would call a senior thesis for an MBA. It's not really a thesis but it's a big project.

Dave: I put mine together around this idea that I was going to create cognitive enhancement compounds, what we call smart drugs and nootropics today. I already knew how to do that. I took them to get through school, and I said, "No one markets these to parents of college students," saying, "You just spent $100,000 paying fees in school, you should send them a bottle of this stuff because their brains will actually work better." The name of that product was going to be Unfair Advantage, which is a name of one of the mitochondrial enhancers that Bullet-

Brian: You still have it. Yeah, you use it in the-

Dave: Yeah. The funny thing is my proposed ad campaign was, "It's good to cheat." I'm saying, "Hey, you take these drugs, maybe you don't have to study as hard." Not drugs, these herbal things.

Brian: Supplement.

Dave: The professors are like, "That's really good but we hate it. It's so bad. It's so dirty, like could you not say that?" That was my idea and I ended up not doing it because I decided I would go through a break up, and then go to Tibet, and learn meditation from the masters instead, which worked out all right.

Brian: Yeah. I think things turned out okay.

Dave: Yeah. Just with the idea that cognitive enhancement belongs in academia more than anywhere else, because I mean, the students, there are two things. When they're young, let's sort of have a healthy adult relationships and let's learn how to learn.

Brian: Right.

Dave: Professors, I feel for you. For five years, I ran a program at University of California, teaching, working engineers how to build modern internet stuff.

Brian: Right, that's Santa Cruz, right?

Dave: Yeah, it kicks my ass. I mean, just the level of demand, I was exhausted after lecture. Do you get exhausted after a lecture like that?

Brian: Yeah. Although it also gives me energy as well because you're performing. You're a theatrical character, an actor, and how often do society get to do that? Professors aren't known for diminutive egos, right? We like to be up on stage but it is exhausting and you kind of come out of it a little bit drained from the day. I only do it later on the day. I don't like to use up all the kind of willpower in the morning, so to speak, and just I try to get some other productive work done. Then I put everything I have midday into teaching, and then try to wind down.

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Brian: That's really the hard part in that and I think in terms of lifestyle enhancement, well, first of all, I think a lot of the students would benefit from proper sleep, not more sleep as you always say, but kind of proper sleep. They're obviously getting rid of alcohol, would be a huge lose for most students. I also believe that they shouldn't just as they should delay gratification in some other ways. I think most college students, and I'm a professor saying this against my own financial interest, but they benefit from not going to college for a little bit and actually working in there.

Dave: Yeah.

Brian: Because think of how much you having experience in the business world then also academia, then back in the business. You might not have appreciated it if you went straight through to your MBA right after college or whatever. You might not be where you're at necessarily. Maybe you would. I think kind of they say the human brain isn't really fully matured until age 25 which is why you can't rent a car in most places until you're 25, because they expect your brain needs to be fully mature before you can drive a used 1999 Hyundai, I guess.

Brian: In any case, the maturity level that you approach college students with, and I've noticed this, because I'm teaching something called the Osher Lifelong Learning Institute, which is found at many universities around the world. Any of your listeners over age 50 should take advantage of this if there is one locally. They have professors like me who come in and give either a series of five classes or maybe just one class called the master class. We teach about a subject that we're really passionate about, try to cram an entire semester's worth of learning into four weeks or one week, depending on how long the classes are.

Brian: I get 190 elderly people, from 50 on up. I don't think 50 is elderly, but anyway, that's the cut off. They appreciate it so much more and they're like, "I wish I had you when I was a kid, an 18 year old." I think, well, you probably would have not benefitted just as my 18 year old stuff that I care about. We just appreciate so much more later when you look back at the life of the mind and just how much of a privilege it is to be an academia as I am to dedicate my life to learning and teaching.

Brian: It's interesting, the word in Russian, you mentioned Russian scientist earlier on, the word scientist in Russian means someone who is taught. It means that basically this person was taught by somebody else. From that etymology, what did we learn? It means that science is kind of an oral tradition that passed on, received wisdom tradition, that also requires that you pass it on in the future to pay back the debt of the people that passed it on to you. I feel very honored to play a very small role in that way.

Brian: In my course of my research, I've been honored to create 10 PhD students and I've got another nine in the tank now who would get their PhDs in the next few years. One of my students when she graduated, she made a plaque for me and I have it a replica in my book, and it shows my genealogy going back to the 1500s. It's just so amazing to think about like I'm just this one person in this 17, 18 generation long, 23 in me kind of

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version for academia. It's an awesome privilege and it's a wonderful experience to have as well.

Dave: That goes back to your thematic perspective on the pocket full of dust.

Brian: Yeah.

Dave: Yeah. There's a lot of stuff that feels like it really matters in overall scheme of things. I had someone at interviews done it like, "What do you want your legacy to be?" I haven't thought about that. Do you? Do you know what you want your legacy to be?

Brian: Yeah. Yeah. I've thought about this a lot. For me, I have a lot of children, thank God, and I've got a lot of students. I think they're basically the same, be it your student. Teaching somebody is an act of love. It's an act of trust. It's an act of vulnerability and it's an awesome responsibility, especially in this day and age. I do feel like that is my mission in life, is to create souls, so to speak, or lives, and to help people become … My goal is for them to all be more successful than me.

Brian: I mean, who looks at their kid and says, "I hope they're not as good as I am. I want them to have a worst life than I had." No, you never say that. You want them to have a better life than you have. Not only does that apply to my biological children but applies to my ideological children. I want to create as many souls, as many lives as possible, and I want them to surpass me every which way that they can and be that force multiplier. If you think about it, let's say you have … I don't how many employees you have.

Brian: If you spend a little bit of time teaching them this act of love and it increases their throughput, their efficiency, 10%, it might take you two hours and that's a lot of time. If they work 2,000 hours a year, you're going to be adding thousands of hours over the course of time just from you investing a tiny bit of energy into the teaching process. Imagine that biologically for your own children and for your ideological children, the people that you work with. That's my goal. That's my legacy. I hope that I create a lot of children.

Dave: That's a beautiful answer. Mine was I actually don't care if anyone knows my name other than my close friends and family after I'm dead. It's not what it's about but I do care very deeply about making the world a better place, but it's not so I'll be remembered. It's because it's what makes me happy, like I see the system and I want to hack it, and so that's what I'm going to do.

Brian: Right, yeah, exactly. I look at it and I say, "Yeah, I could change the Russian language term from scientist hacker could be a one who was hacked," and you hacked your biology, I think it's a worthy goal to take on.

Dave: All right. One more weighty question for you before we get up on the end of the show, and it's okay if you want to skip the answer. We touched on human consciousness. We touched on the beginning of the Big Bang. We touched on your Jewish heritage. Atheism, science, belief in God, can they coexist or not?

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Brian: It's one of my favorite subjects to talk about actually. I have sort of this annoying aspect of my personality that I like to be-

Dave: You're a physicist. You have many.

Brian: That's right. I was going to say infinite, denumerably infinite. One of those is that I like to give grief to people on both sides of the religion, science debate. I like to say that in my own personal opinion, although I do practice Judaism, I attend a synagogue, my kind of guiding philosophy is Judaism. I've had this conversation with Freeman Dyson who is one of the greatest physicists of all time and as I said, Sir Roger Penrose, and they agree with me that the most native state for a scientist, someone who is a curious researcher scholar, is to be an agnostic.

Brian: Now, most people think of agnostic as, "I just don't know and I'm kind of wishy-washy," but really those are atheists. They just don't have either the courage or the inclination to call themselves atheists, right? Because they're not going to the same church that Richard Dawkins doesn't go to either. It's like you can't tell the difference between most agnostic. They're not really agnostic because they're not actually learning or studying, or really participating in this theological tradition.

Brian: Now, do I raise my kids that they should stone an adulterer? No, but I also don't think of it as sophistically and as simply as, look, these are different things. The word science itself, not in Russian but in Greek, science means knowledge. It does not mean as wisdom. When I read a book by the late great Stephen Hawking, I get a lot of knowledge and I learn new things, and I learn about science and it stimulates my brain. What I don't get is wisdom. It's not a textbook of brief history of time.

Brian: It's not something I'm going to use to raise my children. I'm not going to use it for teachable moments and lessons in parables the way I would use it. You're talking about your legacy. One author I heard once, that I would trade a hundred readers a year from now for one reader a hundred years from now. In other words, I hope my book is completely outdated in most realm, so scientific content, in a hundred years. I hope the wisdom within it is permanent and sort of endures, and so too if you look at the Bible.

Brian: The Bible is the best … I wish I had 1% of God's sales numbers, right? That's selling book of all time and there's a reason for that. It has a depth of wisdom, which I don't think is available, that the psalms say, "The beginning of wisdom comes from the belief in God," but I also feel like people put a little too much faith in God. My really religious friends will say when it's raining, they will say, "God makes it rain." No, He didn't. It's caused by the condensation that occurred on nucleation on the screen that causes … Where did the water come from?

Brian: "Oh, God made the water." No, not exactly. I mean, God made … You could say hydrogen and oxygen make water. I keep pushing that chain of logic back, and I say at the ultimate, you'll get to a question, the question why, the answer will be because and we just don't know. That doesn't mean we should stop thinking and that's what makes us so nice. I can be agnostic but I'm a practicing agnostic. I'm a devout agnostic to really

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answer your question. I can hold my own with either side of the debate and I don't really feel like it's so much of the debate.

Brian: After all, I think that kind of sells in this little sizzle in that. Ultimately, both things, science and religion, are quest to find ultimate answers, but they don't overlap each other. They're not necessarily related to one another. For that reason, they can certainly coexist the same way you can be interested in meteorology and the history of the National Basketball Association.

Dave: That's a very beautiful and nuance answer. I stand with you there. If you think you know the answer 100% on either side of that, well, any signs just will tell you, you can't really prove the lack of anything.

Brian: That statement takes faith. It takes a lot of faith to make the statement that-

Dave: It sure does. If you're a scientist who is on either side of that, really, I like to stop using the small S in science and use a big S like you do for a religion because you're practicing a religion. The bottom line is we're pretty darn sure that this is the nature of reality one way or the other, but once you stop being curious about it, you stop the first step of the scientific method, which is observation.

Brian: Yeah, yeah, right.

Dave: If you believe in your hypothesis so fervently, you will ignore your observations. You're doing science wrong and that's why I'm-

Brian: Yeah, I agree completely. I mean, when you suffer from kind of this bias towards authority and you will worship the great atheist, it comes to me, and for me it was the worship of the Nobel Prize, which came down to basically an idolatrous quest to get a tiny golden engraved image as a way to validate my self-worth as a scientist. I realize it had a very destructive effect that my soul and another young scientist says, "And so, I came to see the pursuit of the Nobel Prize as a religion of its own, except its adherence are mostly atheist when it comes to form of a religion."

Dave: Where does your self-worth come from now that you've seen the fallacy of chasing a price that probably won't make you happy even if you get it?

Brian: I realize that the thing that I like to do the most, it's kind of like with your kids. When they saw the jigsaw puzzle or they do a Rubik's cube, and then they'll do it again. It's like, "Why do they have to do it again? They already did it." They'll do it again because every time they do it, they get a tiny little spark of that excitement that they felt when they solved it the first time. When you solve a puzzle on your lab, it's like when I solve a puzzle in my lab. It gives me a taste of solving a puzzle.

Brian: Of finishing that crossword puzzle. You don't just stop. That's not the end of it, I keep doing it, and that to me is addictive and I'm unapologetic about it. I think it's the healthy addiction to have, to want to increase this. It was called by John Archibald Wheeler, one

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of the greatest scientists of the 20th century, he called science as basically a battle. If you're living on an island and the island is called knowledge, and the ocean that surrounds the island is called ignorance. As you expand the island, the size of the island gets bigger.

Brian: The coastline that divides the ocean of ignorance, that boundary gets bigger too, but the area increases faster than the circumference, so to speak. What he said, it's our job to figure out as many puzzles as possible, and I like to do that as well, and I think it's a very healthy thing to want to solve. That's my motivation as a scientist and then of course that's the only part of my overall identity. I think a lot of what I see in myself as now as sort of getting older as a scientist, is to be a role model in the sense of making sure people are doing science for the right reason. As I said, not for the pursuit of this very capricious goal.

Dave: Brian, final question on the show. I have been asking people the question that became the game changers, and really my quest for wisdom from many, many people and distilling it down, but I changed the question because I've been running an anti-aging group. You know my number is at least 180?

Brian: Yeah.

Dave: How long do you think you're going to live?

Brian: Well, I don't know how long I think I'm going to live. I often think about what I want to know the day I'm going to die, like do you want to know that? You might want to because you might want to change that.

Dave: I would just hack it. Sure, tell me. You're wrong. Anyway.

Brian: I would like to live as long as possible and that could be the upper limit of even longevity. I would say, if I delude myself, I could live to 112 because I think that's one of the oldest lifetimes with quality of life. I think you could probably make some of the vegetable and make and live pretty long. I would say quality of life than having intellectual capacity to appreciate it. I'd want to see all the scientific discoveries that are coming in the future, not just from what I do, but from the infinite ray of brilliant people around the world that are just as driven, motivated and passionate as I am.

Brian: I want to see what they come up with because it's not at all obvious to me and this might be a topic for another time, that there is even life that exists throughout the universe besides us. This might be the only planet, not only that has life. this might be the only planet where life has ever existed in the 14 billion year history of the universe and that to me is not terrifying. It's actually very inspiring because it makes me want to live forever, in a sense, and learn as much as possible during the time of quality of life that I hope to have.

Dave: Beautiful answer. Brian, thanks for being on the show. Your book is *Losing the Nobel Prize*, and it's actually worth reading for that wisdom thing we talked about, and it's also

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worth reading if you're in business or academia, or science, and you just don't understand why dumb stuff happens in science. I think there's a pretty good explanation of what's going on behind the scenes before something hits PubMed, before something hits Science Daily, or any of the websites you probably go to, at least on occasion if you listen to the show.

Dave: There's so much going on and I get to peek into that, and I'm not a full-time academic by a long shot, so talking to Brian here today has been illuminating for me, and reading his book, *Losing the Nobel Prize*, it's worth your time. It's an easy read and it's exciting, and you just wouldn't believe that the world is the way it is, and well, from a cosmology perspectives, but also from here's what's happening when you're not looking perspective. Thanks for your work, Brian.

Brian: Thank you so much, Dave.

Dave: If you like today's episode, there's something easy you can do to say thanks. You can leave a review on iTunes for the book, for the show, and pick up a copy of Brian Keating's book, *Losing the Nobel Prize*. If this episode appealed to you because a reading or listening to a book like that is one of the fastest ways to put good stuff in your brain instead of junk. Have an awesome day.

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