

POL S 334 A - Lee McIntyre, The Scientific Attitude

[00:00:00.00] - Hello, and thank you everyone for tuning in to the Science Salon podcast. I'm your host, Michael Shermer. And I bring you this show from California once a week as part of the larger mission of the Skeptic Society to promote science and reason, and to ensure that sound, scientific viewpoints are heard worldwide. As a 501(c)(3) non-profit, we rely heavily on the ongoing and generous patronage of listeners like you. To pledge your support, please visit our website site at skeptic.com/donate. Thank you.

[00:00:34.38] My guest today is Lee McIntire. He's a philosopher of science, a research fellow at the Center for Philosophy and History of Science at Boston University. He's the author of *Dark Ages: The Case for a Science of Human Behavior and Post Truth*, both published by MIT Press.

[00:00:55.35] His new book, *The Scientific Attitude*, is subtitled *Defending Science from Denial, Fraud, and Pseudoscience*. This is a great conversation-- probably one of the best I've had in as much as that this is what I do at Skeptic-- that is, attempt to determine where to draw the line of demarcation between science and pseudoscience.

[00:01:16.83] And as you'll hear, it's not all that easy to do. The net can be too wide and you allow some fraudulent sciences in that are really pseudoscience. Or the net could be too tight, and you debunk claims that are actually legitimately scientific and turn out to be true. So this is always a problem fraught with errors because each case is different.

[00:01:40.84] So we spend a lot of time dealing with the problem of anomalies-- everything from the perturbations in the orbit of Mercury, that it was Einstein's general relativity that finally solved all the way up to my recent collision with Graham Hancock, and the anomalies he's found in the archaeological record that he thinks points to an advanced ancient civilization that most archaeologists reject.

[00:02:06.30] Are they wrong for rejecting that? Could he be right? Could outsiders be right? What is it about the scientific community that makes them not always so open-minded to outsiders? Why not? Why not just accept every claim as possibly true? OK?

[00:02:22.80] So we get into all that and the problems with that-- super interesting discussion of lots of very specific topics we've covered over the decades at Skeptic. But more generally, the problem of specifically climate denial and antivaccination comes up a lot. And we end by talking about how to talk to a denier-- that is, a climate denier, or a vaccine denier, evolution denier, Holocaust denier. But particularly the first two are politically pretty important-- climate change and vaccinations.

[00:02:54.70] You know, you can't just tell these people that they're idiots or that they're wrong. A wall goes up. They're not listening anymore. So we get into at the end about Lee's next book, which is going to be on basically how to talk to a denier. That is-- what are the strategies you can use to de-bias people to make them aware of their own biases, and our own for that matter, and then also how to change their minds using evidence. It can be done. We know it can be done, because it has been done. So what are the best strategies for that?

[00:03:27.15] So with that, I give you Lee McIntire.

[00:03:29.97] [MUSIC PLAYING]

[00:03:34.01] This is your host, Michael Shermer. And you're listening to Science Salon, a series of conversations with leading scientists, scholars, and thinkers about the most important issues of our time. Lee McIntire, welcome to the show. Thanks for coming on. Your new book is *The Scientific Attitude: Defending Science from Denial, Fraud, and Pseudoscience*. And you are the author of *Post Truth*, which I also read. That was a shorter book-- appropriate for our times, I would say, *Post Truth*.

[00:04:08.53] - Thanks so much.

[00:04:09.32] - But we can get into that later, maybe. But I really love this book in particular because really, this is what I've been doing for the last quarter century professionally is engaging in people about the demarcation line and in a way on a practical level, you know, where do you draw the line between science and pseudoscience, or science and non-science, science and nonsense, and so on.

[00:04:30.98] So I'll start with a quote from one of my favorite authors on this subject, Michael Gordon, who wrote a book called *The Pseudoscience Wars* about his encounters with the Velikovskians and that whole affair back in the '60s. And he makes the point that no one in the history the world has ever identified as a pseudo scientist, where they get up in the morning and go down to their pseudo-lab to collect some pseudo-data to support their pseudo-theory all the build their pseudoscience.

[00:05:00.68] Of course, everybody thinks they're doing something good-- real-- it's actual science, and so on. So maybe that's our entree into the problem. What is the problem of demarcation, given that no one thinks that they're on the other side of our line of demarcation?

[00:05:16.34] - Well, I mean, you bring up a great point, of course, which is that you're absolutely right. Nobody does ever want to identify us as a pseudoscientist. When I was at the Flat Earth International Conference in November 2018, they all consider themselves to be great scientists. They thought that they were the real skeptics, the real scientists. And you know, so you're right. Nobody identifies that way.

[00:05:40.05] But I think that's a great entree into the question of the problem of demarcation. Because demarcation is not really measured on a self-selective basis. That's measured by other people. It's measured through your behavior. And so, you know, my book is called *The Scientific Attitude*. But I don't want anybody to get confused and to think that whether you're scientific or not is just whether you consider yourself to be scientific or not, whether you think that you have this scientific attitude toward evidence.

[00:06:08.90] Because as I make clear in the book, the scientific attitude is really an ethos. It's really this creed that all scientists try to live by where they judge one another in one another's

work through their behaviors, through their actions. And so even if somebody would claim, you know, well, I'm not a pseudoscientist, I'm a real scientist. That's really not for them to judge.

[00:06:33.68] - Right. In other words, science is a social process. And what you're doing depends very much on what your colleagues and peers think, which is one argument I always make when people write me these letters about-- I call them theories of everything.

[00:06:49.63] - I do too.

[00:06:50.62] - I'm sure you do. You know, Galileo was wrong, and Newton was wrong, and Einstein was wrong, and Hawking was wrong. And I've been working this out. And I always ask them, have you gone down to the local high school physics teacher and just run some of these by? Oh, they would never accept it because they're all flat earthers and you know, I'm breaking through the extra dimensions or whatever. And that's the problem of working in isolation is that you can go way off the rails and have no idea, which is why you've got to have somebody to talk to.

[00:07:20.83] - Well, yeah. And it's not just working in isolation either. I mean, because these days, anybody can go to the internet and probably find confirmation in some social groups, some silo for whatever it is that they want to believe. So I mean, I want to be careful. There is a social aspect to science, but it's not completely social. Because the scientific attitude is really about caring about evidence and being willing to change your theory based on new evidence.

[00:07:50.17] So it really comes back to not just what your colleagues think, but what your colleagues think of your view in light of evidence. And so I think that's an important distinction to make. Because you know, to take their flat earther example again, they think that they have loads of evidence and that they have loads of support for their evidence. Because they can you know, watch YouTube videos or go to conventions and get confirmation for their views from other people who think like them.

[00:08:17.38] It doesn't mean they're right. And the reason they're not right is because they're not really designing any experiments, or if they are, they're not doing it in such a way that they're even possibly going to be wrong. So my friend [INAUDIBLE] calls these belief buddies. These are not people that you're running your ideas by to test them to see if they're right. They're people that you're reaching out to satisfy that confirmation bias, to see, you guys all agree with me so I must be right. But yeah, so it's a tough one.

[00:08:51.46] - So the ethos you speak of is the willingness to change your mind if you're confronted with contrary evidence. But how much contrary evidence? I mean, most people say, well yeah of course I'd be willing to change my mind. People show me contrary evidence and I reject it because they're wrong.

[00:09:08.94] - Yeah, I mean, that's the \$64 million dollar question going back to Thomas Kuhn and before. Because what for some people is compelling evidence, for other people is not compelling evidence. And that's really the hardest part of the book for me, was to figure out how

to talk about where that line is. Because it's really the line of rationality. It's really the line at which you're willing to say, you know, I might be wrong about this.

[00:09:36.82] And to me, that line is measured by other people. But also, the entire profession can be wrong occasionally as sometimes happens. So it's a very difficult question to know. And sometimes, you only know in hindsight when you've got the right amount of evidence.

[00:09:56.15] But the one thing that really drives me crazy-- and I'm sure it drives you crazy, too-- are the people who say, well compelling evidence just means that there's a possibility that they're right, that there's one chance out of a million that they're right. Because that's not rational. I mean, a good scientific attitude is when you look at the evidence and you assess the probabilities that you're correct based on what you're seeing, understanding that maybe it's misinterpreted or sometimes you're not looking at the data in the right way.

[00:10:28.48] But really, I mean, Kuhn even talked about this-- and Popper especially-- eventually, the field leaves people behind. If they're not willing to change their mind based on what everybody else considers to be compelling evidence, really in a sense, they're not scientists anymore.

[00:10:45.13] - Right, they're ideologues or they're doing something that's not science.

[00:10:48.39] - That's right.

[00:10:48.64] - Yeah So science requires that you kind of stay up with what the current debates are in science.

[00:10:54.25] - That's right.

[00:10:54.37] - I make the point with climate deniers that, you know, this idea of a climate consensus-- it's not like these scientists all meet on the weekends and vote. So it's not a democracy. There really is kind of an elitism to it. But there's a competitiveness within the community.

[00:11:13.75] - That's right.

[00:11:14.62] - Maybe you and I aren't professional climate scientists. And people send me these papers. And I really don't understand. They're pretty technical, all those computer models, and so on. But I kind of rely on the community itself debunking each other, that they all have their own lines of demarcation that if you go beyond it, they will rein you in if you're a professional climate scientist competing for grants, competing for a space for grants and publications and prestige journals. So by the time you and I read about it in the New York Times, presumably there's been a whole series of checks and balances there. The skepticism has already taken place.

[00:11:56.65] - That's absolutely right. I mean, scientists are some of the most competitive people in the world. I mean, this is what's so laughable about all of these conspiracy theories about climate change, or really about any scientific topic. Because scientists would jump at the

chance to refute one another and really do keep one another honest in that way through peer review. But I mean, there are other ways.

[00:12:20.80] It's important for people to realize that-- as you put it-- by the time something makes the Wall Street Journal, by the time we read about it, it's gone through so many levels of vetting that the process has been so rigorous that a layperson shouldn't be able to debunk it by just doing a quick Google search.

[00:12:41.98] You know, if you look at the antivaxxers, part of why they think that they are able to do that has to rely on the idea that the scientists are keeping the truth from them, that the scientists actually know the truth but they're holding it back. You know, that they're being paid off through grant money or that they're in such prestigious positions that they can't admit that they were wrong or something like that, which is really not to understand how science works. As you point out, scientists are fiercely skeptical and competitive with one another.

[00:13:17.98] - You have this great quote from Feynman-- one of my favorites. I actually show the video clip of him making this statement. I think it was at Cornell in '65. Everybody has on their coat and tie. And the women have their button down dresses and the big glasses. It's really funny to watch. So he's basically trying to explain what it is that scientists are doing when they're doing science.

[00:13:39.61] "In general, we look for a new law by the following process. First, we guess it." And then, everybody kind of laughs. He goes, "don't laugh." [LAUGHS] "Then we compute the consequences of the guess and see what it would imply. And then, we compare the computation results to nature. Or, we say compared to experiment or experience, compare it directly to observations we see if it works. If it disagrees with the experiment, it's wrong."

[00:14:04.36] - It's wrong, yeah.

[00:14:05.15] - "And that simple statement is the key to science." I love this part. "It doesn't make any difference how beautiful your guess is. It doesn't make any difference how smart you are, who made the guess, or what his name is. If it disagrees with the experiment, it's wrong. That's all there is to it."

[00:14:21.10] - I love that.

[00:14:22.31] - I know, I love that. But I do make the point that sometimes, it does matter what your name is. Because I remember-- I think it was the late 90s, early 2000s-- Thomas Gold published a book in which he claimed that oil is not a fossil fuel, that it's a result of the deep hot biosphere. That deep in the rocks are these bacterial grade level lifeforms that generate as a byproduct-- something we call oil. But it's not a fossil fuel, all right?

[00:14:46.96] I remember when we got this at the office, I thought, oh boy, this is huge. But I could tell it was published by a mainstream publishing house-- I think it was WW Norton. And Thomas Gold, I knew who he was. I mean, he's a giant in the field. So he did get a fair hearing

for a few weeks or a few months because of who his name was and that presumably, a major trade house would not have published a crank theory.

[00:15:13.00] - It's news.

[00:15:13.75] - It's news. There is a certain amount that an outsider could look and go, look at that. That guy has a big name, so he got a hearing. Why can't I get a hearing? So there is kind of - but what's going on there? I mean, because he is in the game of science, and people know who he is, and he's played by the rules, he gets a little more leeway to go out on the limb, whereas maybe the outsider doesn't.

[00:15:40.11] - Well, that's true. And as you note, he got about two weeks. I mean, he didn't get that long because as other people looked at his evidence, as other people consider the hypothesis, that happens. It reminds me of Freeman Dyson, who's not a climate scientist. But his comments on climate or are actually, the one it really reminds me of is the whole cold fusion fiasco where they made a very audacious claim.

[00:16:10.42] Now, they also did some things wrong, right? They didn't publish a peer reviewed paper-- at least not right off the bat. They didn't share their data. So you know, they violated some of the good norms of science. But even then-- even under those handicaps-- they only got two months. I mean as quickly as people could catch up, they did.

[00:16:30.70] And I mean, sometimes people are willing to say that something like that's an embarrassment to science. I don't think it's embarrassing at all. I think that's a virtue of science, that even when somebody makes a mistake or as Feynman said, no matter how big your name is, it will eventually be taken to task. I mean, notice Feynman said, it doesn't matter what your name is or how beautiful your theory, et cetera. Well, maybe it matters for a while. But it doesn't matter ultimately, which I think is his point.

[00:17:00.15] A lot of people like to say that science is self-correcting. I'm not sure I would go so far as to say that because there are too many times that it's gotten off track for decades at a time. But the beautiful part is that there is a process by which you can look at the evidence. And you can figure out and say, you know, no. I'm sorry, your theory is wrong.

[00:17:22.93] - Right. And that gets us into what science is, which is much of what your book is about. That is, using pseudoscience as a way of saying, well, that's not science. Well but then in that case, what is science? And that gets us into your field of philosophy of science and its importance because most scientists, they don't think about what it is they're doing. They're just doing their science.

[00:17:42.51] - That's right.

[00:17:42.78] - They don't have time to do all that. So professional philosophers of science try to articulate, in a way, what is it scientists are doing when they're doing science. So give us a little brief history through the 20th century and your entree into it with Karl Popper. And you wrote the great Popper a letter. And he wrote you back. That was super cool, love that story.

[00:18:00.79] - Yeah. I admire Karl Popper so much. It was his essay conjectures and refutations that really got me into the philosophy of science. I read it in my freshman year of college. And I mean, that was it ever since then. And it's because he, in that essay, was talking about his work that he did when he was a young man back in 1919 on the problem of demarcation.

[00:18:23.43] And I mean, that really set the agenda for the philosophy of science for 100 years to try to figure out, what's this criteria, so that you can get kind of all and only the sciences on one side of the ledger and all and only either the non-sciences or the pseudosciences on the other. The beauty of Popper's work is that he thinks that he's found a logical way to do this. He's found not just a methodological way, but a deductive logical way. And I mean, I think anybody who had discovered what he'd discovered would have wanted to make a career out of it because it was such a terrific idea.

[00:19:06.19] But as much as I admire his work, I think that ultimately, it's wrong. Because if you look at what happened after Popper-- if you look at the history of 20th century and up into 21st century philosophy of science-- they had a very, very good run to try to figure out what this criteria of demarcation was. And nobody was able to do it.

[00:19:28.89] And I mean, it's a very heavy lift you have to not miss any sciences on the correct side. You know, you've got to get evolutionary biology on the correct side. But you also can't allow any astrologies or dowsing in. It really goes back to signal detection theory in the war. You've got to shoot down every enemy plane, but never shoot down one of your friendly planes. But you've got to make sure to let all the friendly planes over and never let an enemy plane over and never make a mistake. Well, you know, philosophers are smart people. But that's very hard to do.

[00:20:07.17] Then about 30 years ago, a very eminent [INAUDIBLE] science named Larry Loudan had a theory where he said-- it was an essay called, The Demise of the Demarcation Problem-- where he talked about the fact that if this problem were going to be solved, it would have been solved by now. Because if you think about it, it would have had to identify the necessary and sufficient conditions for science.

[00:20:32.28] And to me, that is just not something that number one, I think is possible. Number two, the thing that really began to bother me about it is that that sort of search, that sort of fruitless search for all those years, meant that people like my hero, Richard Feynman, said things like, philosophy of science is useful to scientists as ornithology is to birds.

[00:20:57.06] - [LAUGHS]

[00:20:57.77] - You know, because we weren't helping them. Right? You said it yourself. They're not checking with philosophers of science. But we also weren't helping them to figure out anything that was useful. But these days, if you watch the way that scientists push back against science deniers, they really often don't push back. They walk away. And I think it's because they don't really know what to say.

[00:21:22.05] This is where you present somebody your evidence. They don't believe it. They question your integrity. You walk away. So I wrote *The Scientific Attitude* because I think that there is a better way. I think that there is a way to identify what's special about science without trying to make it a solution to the demarcation problem, without doing all the necessary and sufficient conditions. And it's to get rid of the logic and the method of science, which I don't think is going to work, is the appropriate way of making that distinction.

[00:21:54.16] But instead to say, you know, in its essence, what's really special about science is the attitude that scientists have toward evidence. It's this idea that-- as I said before-- they care about evidence but that they're also willing to change their mind based on new evidence. That's a deeply Popperian notion. And in fact, if you look back to Karl Popper, he said in his early work that we need the critical attitude.

[00:22:19.02] I think he made a mistake trying to turn that into a matter of logic. But I think he was absolutely dead right. And I mean, the idea goes back before him to Francis Bacon and back even earlier, probably. But I think that's the way to go, to try to not be so worried about the fact, value distinction and just realize that science is shot through with values. It is. Thomas Kuhn showed this. That doesn't mean that it's arbitrary. I mean, you have to have the right values. And I think the right value is the scientific attitude.

[00:22:53.05] Yeah, I think science is a three legged stool-- data, theory, and communication. And it's that last part-- and I don't mean just talking down to the hoi polloi because they pay taxes and that funds my research. No, I mean communicating to everybody in a clear way, exactly what it is you're doing and why you're coming to the conclusions you are. And if you can't do that, that's just as bad as if you have a bad theory or crappy data. You got to have all three of those.

[00:23:20.16] I got that idea, mostly, from the right from Steve Gould and Carl Sagan, who have embodied what my agent, John Brockwin calls it, third culture. You know, CP knows two cultures. And it's not just a lack of communication between the two cultures, the sciences and the humanities, but that there is something else in there that this knowledge is for all of us.

[00:23:42.29] And if you can't communicate that-- so I think of books like Dawkin's *The Selfish Gene* or Steve Pinker's *Better Angels* or Jared Diamond's *Guns, Germs, and Steel*. Those aren't pop versions of their technical papers. Those are the only versions available. And anybody can read them. And you see people reading these books on an airplane, in the airport stalls, or whatever. And that's what I mean by it's really for everybody.

[00:24:09.97] Now, let's get back to it to what Popper was pushing back against-- all ideas have to be for or against some point of view, as Darwin said, if they are to be of any use. So before Popper, the idea was that scientists were proving their theories. And he said, no. We can't prove a theory. We can only try to falsify it.

[00:24:30.08] - Yeah, that's correct.

[00:24:30.45] - And if you don't falsify it, it's not that it's proved. It's just not falsified. But kind of, that's a simplified version of that. Give us the philosopher of science explanation of that.

[00:24:40.06] - Yeah. So the thing that upset Popper, I think, was this idea given [INAUDIBLE] problem [INAUDIBLE], that you could never really take any finite set of data and use it to extrapolate to the larger world because there was always possibly some further experiment that you could do that would end up proving you wrong. So when people were talking about science in terms of proof, or certainty, or even the modality of confirmation, where you could take a theory and confirm it, well, look what happened to Newton.

[00:25:11.45] I mean, everybody thought that theory is about as well confirmed as it could be. But as it turned out, there were more data. There was a better theory out there. And it turned out to be wrong. So Popper had this idea that although you could never prove a theory right, you could prove it wrong. And that that was how science made progress. Science made progress by what he called-- the name of his essay that I read all those years ago-- conjectures and refutations.

[00:25:41.54] You made a conjecture. Your theory had a risky prediction. You would test that prediction against the evidence. If the prediction came out to be true, then your theory was corroborated. It lived to fight another day. But if it was false, then you had to give it up, just as Feynman said. And now again, that that's a beautiful account on paper. And the logic of it, there's no arguing with it. It just, it works.

[00:26:12.60] The problem is that if you look at the actual day-to-day practice of science-- and this was Kuhn's criticism of Popper-- it doesn't always work like that. Scientists don't-- for one thing, definitive experiments are hard to come by. I mean, you look at the Eddington experiment with Einstein. That's good work if you can get it. It doesn't all work like that.

[00:26:30.29] - Right.

[00:26:31.52] - Especially if you're in the biological sciences or geology or something like that.

[00:26:35.93] - It's messier.

[00:26:38.06] - But even so, the problem is that you can scientists don't always give up their theories. Now, if that goes on long enough, they stop being scientists. And in fact, Kuhn had this very funny line where he basically said that well, what happens with scientific revolutions is that the old guys die. And they take their pet theories with them. But the field moves on is the point.

[00:27:02.46] And Kuhn sometimes gets a bad rap that, you know, he's saying oh, it's all a matter of social norms. It's all a matter of aesthetics. No. He's just saying that evidence is not sufficient to change from one scientific theory to another. So he sort of was the first one to start-- well, not the first one. There was [INAUDIBLE]. There were some others before, starting to erode Popper's idea that it was all a matter of logic.

[00:27:28.52] Still, I admire Karl Popper's view and consider my view something of an offshoot of his. But I think that the logical context is the wrong one.

[00:27:39.62] - And what was, again, [? Loudan's ?] objection to Popper's argument, which does seem pretty solid?

[00:27:45.89] - Yeah. So [? Loudan's ?] objection was that if you're going to do the signal detection model that I was talking about before with the airplanes, you know, always shoot down all and only the correct airplanes, and never shoot down any of the incorrect ones. The formal way to say that in logic is that you need the necessary and sufficient conditions for science.

[00:28:11.15] So the necessary condition is where you say, well these features are essential to science. And if some field like astrology doesn't have this, then it's not scientific. But the sufficient conditions are the conditions whereby, you know, if you have these conditions, then that's all you need in order to have science. And the devil is that those to fight with one another. Right? You've got to get them both and they battle one another to get them both.

[00:28:43.46] To go back to signal detection, suppose that you said well, you know, I'm not going to let any planes over. I'm going to shoot down everything. Well yeah, but that doesn't work because then you're shooting down your friendly planes. But what if you said, OK, I'm not going to make that mistake again. I'm going to let everything through. But then you're letting through the enemy planes.

[00:28:59.87] So that's why they talk about the criteria of demarcation. Because you've got to get that line in exactly the right place. If I had a whiteboard here, we could do it. But I mean, there's a logical way to work this out so that philosophers use the phrase, necessary and sufficient in a technical way to mean that you've got to get it perfect every single time. And that's hard to do.

[00:29:23.54] And in fact, I spill a little ink in my book saying that scientific attitude doesn't need to solve that problem. And I put in a couple of pages there that maybe only the philosophers are going to read. I tried to write one of those books you're talking about-- a trade book-- just where it's not an alternative version. It's the version, but I'm as clear as possible. But for that couple of pages, I think I identified this section as-- I think I called it-- The Vexing Problem of Necessary and Sufficient Conditions because I'm not sure anybody but a philosopher would care about it.

[00:29:54.17] But it was kind of, for me, crucial to establish that I wasn't trying to solve the problem a demarcation there. What I was really saying was that the scientific attitude is the necessary criteria for science. It's the essential property of science.

[00:30:09.11] - But [? Loudan's ?] concern is that some claims to a scientific theory could slip through the net. And we could not say why it's not really scientific, and therefore it could go on for decades-- like psychoanalysis, I think, was one example Popper used.

[00:30:25.27] - Yep, that's it.

[00:30:25.88] - And that drug on through the 60s and 70s. And when it really wasn't until the 90s when everybody finally just gave up. It's just not science.

[00:30:34.76] - And there's the problem on the other side, too. People forget about this with Popper. He originally-- you know, for about 10 minutes-- said that evolutionary biology wasn't scientific.

[00:30:44.40] - Right, right.

[00:30:45.20] - Because it wasn't capable of making these risky predictions like Einstein was. Well, then I think he realized that wasn't a problem for biology. That was a problem for his model. And then, he modified his model and then had this famous retraction where he said, no, evolutionary biology was scientific. But I mean, this is the problem [? Loudan ?] identifies. You get your criteria in the wrong place. All of a sudden, you've got to say that biology isn't scientific. Or, you've got to say that astrology is scientific.

[00:31:17.93] I'll give you a better example. Search for Bigfoot. These guys go out and they look for clues. They look for great, big footprints. Somebody's got a hair on a branch or something or a piece of videotape. I mean, so they could say, oh, I'm being scientific. I'm looking for it. I mean, you don't want to say that that's scientific, I think. Right? So we've got to figure out a way for something like that not to get through.

[00:31:44.39] By the way, somebody could use that as a criticism of my theory, right? Because I'm saying, if you've got the scientific attitude-- well, do they care about evidence? Yes, searching for Bigfoot. They care about evidence. Here's the difference, though. Are they're willing to accept evidence that would prove their theory wrong?

[00:32:02.60] - Now, what would that be for Bigfoot?

[00:32:05.75] - For Bigfoot-- well, suppose somebody made the claim that they saw this great big footprint and they had some hair on a branch or something. But then, suppose you found out that there was some satellite that was over that tract of land at the same time and it proved through thermal imaging that it couldn't have been any creature that big. That in fact, maybe it was something smaller, or that there was nothing there at all, that the evidence was planted. I mean, so the idea is that really-- and this goes back to Popper-- you have to be able to say what your theory would rule out. So for the search for Bigfoot-- for them to say that their theory scientific-- they would have to say, if you found X, which my theory rules out, then I'm going to give up my theory. And they never do that.

[00:33:05.95] - They never do that, yeah. There's a famous example of the great alpinist Reinhold Messner. He summited Everest seven times without oxygen. He's the only person to do that. Anyway, he always had an interest in Bigfoot-- you know, Yeti in the Himalayas. And he always told his sherpas, if you ever see it, you know let, me know.

[00:33:24.47] So they pounded on his tent one morning, I guess. They said, Yeti's here. He's right over there. So they go around the bend and there's a big bear. And he's going, that's Yeti?

Yeah, that's Yeti. OK now, when I tell this story to Bigfoot people, they go, yeah, yeah, yeah, we know. But they're hiding somewhere else. They're in Canada or Oregon. No matter how many counterexamples you give-- it turns out the hair was from a dog or a bear or the grainy video turned out to be just shadows or something else-- they can always--

[00:33:55.69] - They just haven't found it yet.

[00:33:57.05] - It's a little bit like the SETI people. How would you falsify their claim? Because it's a vast universe. They've just been searching for half a century or three quarters of a century. We've just begun. You can't falsify it. It's just sort of an open-ended question. Keep searching. Now, how does that fit Popper's falsification idea?

[00:34:16.91] - Yeah, so I just got back from SETI. I just had a chance. I was just in San Jose and I had a chance to be on their radio program and meet him.

[00:34:24.47] - Oh, with Seth?

[00:34:25.94] - Yeah. And it was terrific. And he said, you know, that he gets these letters all the time-- same as you do, the same as I do. He gets the ones from people who claim that they've got evidence for extraterrestrial intelligence. And routinely, there's something wrong with them.

[00:34:45.23] But that doesn't mean-- I guess, you ask a really great question, which is when do you stop searching? When do you say, well, we don't have the evidence in yet, so we might as well stop searching. Because if you think about it the antivax person, for instance, could say the same thing. Or the climate change denier could say the same thing. You know, well, once this last shred of evidence comes in, then the whole theory is going to be disproven. Look at Galileo. Look at all these great pioneers who were right and the entire field was wrong. So you know, you just wait. You just wait.

[00:35:20.84] And the problem isn't that they're wrong. The problem isn't that it's impossible that there could be some future evidence. The problem is that it's irrational without any evidence of their own to believe in it. Yes it's irrational unless they have some sort of reason other than to say, it could be, to hold that out as a reasonable possibility.

[00:35:46.22] Now, I think of the folks at SETI as doing really important work because they're doing really what Sagan talks about where they're both skeptical and open-minded at the same time. Right? So they're open to new evidence. They're open to changing their mind based on new evidence. But they're scientists. They're incredibly skeptical of any sort of a claim unless it has evidence in its favor.

[00:36:13.31] And I think, you know like I said in the book, that's the same way I'd classify what happened at the Princeton Engineering Anomalies Research Lab. A lot of people wanted to say, you know, that's pseudoscience. And I get that. I really do. But it seemed to me that they were trying to gather evidence. They wanted it to be peer reviewed. They didn't get anybody to review their peer reviewed data. And they made some mistakes in their performing controlled experiments, which they should have fixed.

[00:36:47.03] But I can't really bring myself to say-- you know, maybe what they did was bad science. But I don't think that it was pseudoscience. Because I think that if you look at the result that they had after 20 some however years, they did have some tiny, tiny, infinitesimal shred of data that was beyond what would have been statistically significant.

[00:37:08.76] Now, maybe there's a way to end up dismissing that. And somebody said-- I forget who-- that what they really proved was that there was no such thing as a random number generator. Right? Maybe that was their discovery, not telekinesis. But you know, there are things like that where it seems to me that you do have to leave the door open a crack. But what did Sagan say? You've got to keep an open mind, but not so open your brains fall out. Right? So leave it open a crack. There's a possibility that there could be evidence, but assess it based on how likely it is, given the overwhelming evidence on the other side.

[00:37:45.49] - Yeah, this is the problem of anomalies. What do we do with anomalies? The mainstream theory doesn't account for them. The alternative theory maybe accounts for a few anomalies. But it doesn't account for all the other data that the mainstream theory does. What do you do with that? Now, outsiders feel like the elite scientists unfairly dismiss their anomalies or their alternative theories. The fact is, there's a practical matter of we only have so much time to spend on researching. So to the Bigfoot people or whatever, I say, you know, show me the body and I'll believe.

[00:38:18.96] But by the way, if somebody did find an actual bipedal primate with a different DNA-- and we know 100,000 years ago there were several bipedal primates running around. Maybe this is one of them. Now, that wouldn't not falsify. It would be positive evidence in favor of that theory. Right?

[00:38:37.07] - That's right.

[00:38:39.05] - That's slightly different than a Popperian conjecture and reputation. It's not just that no one's refuted me yet. It's that I actually a positive evidence for my claim.

[00:38:48.10] - But the interesting thing is that if you look at claims like that, they are usually first person accounts that are fraught with some sort of ideological underpinning. You know? I mean, why is it that most of the great evidence for UFOs are somebody who was out fishing, drunk with his brother? Right? I mean, this is not a reliable way to do the experiment.

[00:39:13.42] Now, I know that you just wrote a book not long ago, Heavens on Earth. And I also read the [INAUDIBLE] book where he was talking about this experiment, where they went around in that hospital to see if there were out of body-- people were reporting out of body experiences-- life after death, basically during surgery. The person clinically died and they rose up and they looked and saw, you know, the bald head of the nurse that she'd been trying to cover up. You know this literature much better than I do.

[00:39:45.71] But what I found fascinating was that they actually got a grant to put those little shelves up in the top of the operating room and put playing cards so that the next time somebody made the claim that, you know, oh, they were up there hovering at the ceiling and they could

watch their own body because their soul had left their body. Well, how come they didn't see the ace of spades? How come they didn't see the queen of diamonds or king of clubs? And they didn't.

[00:40:10.57] And so that's a kind of evidence too, right? Not just what the first person report is, but you know, if they were accurate about this one thing, shouldn't they have been accurate about this other thing that they weren't actually accurate about? So there are some sort of tests. And that's why I love all the skeptics, all the myth buster people who go around and test these claims. Because they always end up having something wrong with them.

[00:40:37.04] - Yeah. So back to the problem of anomalies, Freeman Dyson also wrote a piece in the New York Review of Books. He was reviewing a book on statistics and, sort of, the law of large numbers in which the author had debunked miracle claims by saying, you know, if we define a miracle as one in a million, then given the law of large numbers, three in a million Americans-- whatever-- billions of things happen every day. You're going to get miracles happening all the time.

[00:41:05.40] So he acknowledges that's true. And then, the last, like, page of the review, he says, you know, I'm a lifelong friends with James Randi. I know most of this stuff is all bullshit. But-- I think it was his sister or cousin who was a psychic and somehow managed to give things that no one could explain. So he says, so we have to keep an open mind. It's like, oh man, Freeman Dyson. First climate change and now psychics.

[00:41:30.57] - Yeah. I mean, the thing is, yes. If you look at a large enough data set, there are going to be anomalies. The question is this, though. I mean, there is a statistical way to test how many anomalies are going to be expected on a not a large enough sample set. I mean, if I flip a coin and it comes up heads 10 times in a row, you could say that's a miracle. But I could also say, well, no. That's just got a very low probability. But you know, it was possible. And if you do enough coin flipping, you're eventually going to get something like that.

[00:42:06.63] I think back to David Hume here on miracles. I forget what the exact line is, but it's something about how you have to ask yourself which is more likely-- that the miracle occurred, or that the person reporting the miracle didn't really have--

[00:42:24.07] - --misperceived--

[00:42:24.33] - Yeah, I forget what it is. Maybe you know the passage better than I do.

[00:42:27.70] - [INAUDIBLE] on miracles. No, it's a useful thing. Also proportioning your confidence in a belief to the that evidence.

[00:42:34.01] - That it. Proportioning your confidence to the evidence, that's the idea. And you know so look, one of the most famous anomalies of all time was the perturbation in the orbit of mercury around the sun. And so, this was an anomaly that Newtonian theory lived with for hundreds of years. So according to strict Popperian, they should have just abandoned Newton,

right, because they couldn't explain this. But of course, they didn't. And Kuhn makes some hay out of that.

[00:43:03.62] But they couldn't explain it. They couldn't explain what was happening. You know, some people thought well, maybe there's a hidden planet there, you know, that's got some gravitational pull on Mercury. Well as it turns out, Einstein's theory could explain it because it had to do with how close mercury was to the sun. And you know, Newtonian model-- I mean, it was tiny. It was a tiny, tiny perturbation.

[00:43:25.86] So sometimes, those anomalies end up-- you pull the thread and the whole sleeve falls off. So you've got to leave the door open for something like that. But I still am one of those people who think that pre-Einstein, it would have been irrational to give up the Newtonian model just because of the perturbation of the orbit of Mercury. Einstein was right. It was a burr under his saddle, you know, to think about it. Can my theory, you know, explain this? That's good.

[00:43:58.59] But you know, the whole idea that science has to be perfect, that it has to get absolutely everything right before the theories are believable or whether they're good science, is just not how science works. It's based on warrant, given the evidence. Newtonian theory had so much warrant, it was ridiculous. It was rational to believe it. But then after Einstein's theory came along, he had a better explanation for the perturbation of the orbit of Mercury-- not anymore.

[00:44:26.62] - Another one of my favorite quotes-- this one from Isaac Asimov-- he wrote an essay called The Relativity of Wrong, which he says, "when they thought the earth was flat, they were wrong. When they thought that the earth was a perfect sphere, they were wrong. But if you think that thinking the earth is a sphere is just as wrong as thinking the earth is flat, then you're wronger than both of them put together." You know, it's an obloid spheroid and so on.

[00:44:48.73] - Yeah, that's correct.

[00:44:49.38] - We do make progress. And it's not like, you have two equal sides and therefore, the truth is in between or anything like that. So it's not that Newton was wrong. It's just that his theory accounted for this much, but Einstein expanded it to account for these little anomalies out here. And so science is cumulative in that sense, building upon theories. It's not that theories are always falsified and therefore thrown in the junk heap and we have a new theory. They build on one another.

[00:45:18.40] - Yeah, I think that's right. And this is the line that you get from the flat earthers. You get, well, you know, unless you can explain everything and unless your theory is 100% proven, then mine is just as likely to be true as yours. No, it's not. I think I said in Post Truth-- I didn't make this up-- that the halfway point between the truth and a lie is still a lie.

[00:45:38.75] - [LAUGHS] Right.

[00:45:39.29] - I mean, it's not that until you can prove it, every possibility is equivalent. And by the way, given the scarce resources of science, it doesn't mean that any yahoo should be able to

kick in the door, share their evidence, and have science come to a grinding halt until they refute that evidence. It just doesn't work like that.

[00:46:00.29] - My favorite example of that is if you had a young earth creationist that says, the earth is 10,000 years old and you have a geologist that says, it's 4.6 billion years old, you don't add the two up and divide by two to get the correct answer. One of them is simply wrong.

[00:46:15.62] - Yeah that's the right way to look at it. And you know, I think that one reason people miss that is because I think that a lot of lay people have the wrong conception of what science is. I think that they don't understand probability. One of the biggest myths of science, I think, is that it's based on proof and certainty.

[00:46:36.90] And you know, scientists understand that there's always some uncertainty to any scientific hypothesis. But you know the minute you say that to a science denier, then they're going to say, oh well then, my theory's possibly true-- you know, one out of a trillion chance. But therefore, you've got to take it seriously. Like what the intelligent designers did all those years ago, trying to get it taught in the public schools, oh, here's an alternative theory. We don't have any evidence for it, but we're going to kick in the door and now you've got to teach it in the biology classroom. It just doesn't work like that.

[00:47:17.24] One reason that I wrote Scientific Attitude is because I wish that scientists would say more about probability. I wish they'd say more about the rigor with which their hypotheses are tested, just all the work that they go to. Because the way science is taught-- I mean, I remember how I learned science in elementary school-- here are the findings. Look at all these geniuses. Look at all the idiots who were against them. You know, aren't you late to have been born in the age in which all truth was discovered?

[00:47:46.24] - [LAUGHS] Right.

[00:47:47.81] - But that didn't teach me any science. I mean, that taught me the results for that time, but some of those things I learned have now been overthrown. I wish that they had taught me more about the process of science. And I think that's really how to talk to a science denier. I think that the way we're going to get ahead of this problem of science denial is when scientists-- who are really the only people who can speak for it-- start engaging and taking some of these claims seriously, as frustrating as it is.

[00:48:19.37] One example that I read about recently was the antivax crisis in Clark County, Washington, where they sent out public health officials to have these workshops-- sometimes one on one-- with antivaxxers. And they convinced some of them. And they reported later, you know, this was the first time anybody ever really sat down and listened to me and heard with my objections were. Sometimes, it takes two hours with a whiteboard. But they're able to do it.

[00:48:45.07] Some denialists are too far gone. You can never convince them. But some of them, I think you can convince. And I think that scientists shouldn't give up on the idea that if we don't fight back, if we don't talk about scientific values, and we don't talk about how rigorous science

is, then the only people that have that microphone are the science deniers. And they're the ones whose voices are being heard.

[00:49:09.24] And to prove that case, look look at Congress. Look at the White House. I mean, climate change policy has come to a grinding halt because we've got enough science deniers in government who are responding to the science deniers in our society that we can't get anything done. It's appalling.

[00:49:30.02] - Yeah. That's why I like the cover of your book, here. You've got the see no evil, hear no evil, speak no evil, and then the guy with the microscope. So I just think in a word, the scientific attitude is the willingness to change your mind, to really be falsified. If I were to ask you, what would it take to change your mind? I mean, this is one of my favorite-- how to talk to a denier-- what would it take to change your mind?

[00:49:53.71] Well, they throw it back at me. And I give examples. Like in case of evolution, you know, I just quote Haldane's famous quip, you know, fossil rabbits in the Precambrian.

[00:50:03.11] - Precambrian, yeah.

[00:50:05.15] - It is falsifiable. There was a crazy meme going around for a while that natural selection was a tautology. The survival of the fittest, who are those that are fittest? Those that survive. Why did they survive? Because they're fit. Well, this is a kind of a boo phrase. It's just not true.

[00:50:22.53] - Yeah.

[00:50:23.16] - Now, it's true that there could be anomalies in studies that seem to contradict evolution by natural selection. The problem is now after a century and a half, we have so much evidence in favor of it.

[00:50:38.04] - That's right.

[00:50:38.76] - If scientists were confronted with an experiment or an paleontological dig that seemed to contradict it, they wouldn't just abandon Darwin's theory. They might say something like, well, let's go dig some more there because that is a weird anomaly.

[00:50:54.03] - That's right. It's like Newt.

[00:50:54.79] - This is brought back to the problem of anomalies. At this point, one anomaly is not going to overthrow Newton or, I should say, Einstein or Darwin.

[00:51:02.34] - That's right.

[00:51:04.00] - It would take a lot. It would take a lot to change it.

[00:51:06.58] - Yeah. Newtonian theory is now in the spot where-- I'm sorry-- Darwinian theory is now in a spot where Newtonian theory was where they would have to have together more evidence. But I think that's appropriate. Right? So despite what Popper said about no amount of positive evidence ever being able to confirm a theory, it does count toward the likelihood that that theory is true. And so you know, you wouldn't just shovel it all out the window because you found one anomaly. You'd want to discover more.

[00:51:40.20] And you know, the phrase that you used there, I love that phrase about what would it take to show that you were wrong. I mean, it goes back to Popper. That was the one that I used at the Flat Earth Convention. So I went to this convention understanding that they had rejected 2,300 years of evidence. So there was nothing I could show them that was going to either surprise them or convince them. But I also didn't want to just let them talk about their evidence. Because you know, it's flawed. That's sort of a power thing. They make you respond to their latest thing.

[00:52:16.35] - Right.

[00:52:16.89] - So instead-- and I'm not a scientist, so I didn't want to go in there and talk to them about the evidence for and against flat earth. Instead, I trotted out Popper's question. , And I said OK so you claim this debate is not about faith. It's about evidence. What evidence would it take to show that you were wrong? They couldn't answer that.

[00:52:38.10] - Really?

[00:52:40.56] - It was shocking. I don't think they'd ever heard that question before. And I had two conversations with speakers who had been on the main stage talking about all the evidence for flat earth. One of them, I just wrote about. I just had a story in Newsweek called, The Earth is Round. And it was one of these conversations that I had with one of the flat earthers where I talked about what it would take to convince him that he was wrong. And they really will not pin it down.

[00:53:14.20] And I think it's because in the back of their mind, they're a little bit afraid that the second they say something like Haldane did, you know, rabbits in the Precambrian. If they say, well, if you could show me X and such and then you show it, they'd have to give up their views. And they don't want to give up their views. And it's because they weren't based on evidence in the first place. You can't refute somebody's views with evidence if their views aren't based on evidence.

[00:53:38.10] - We call that moving the goalposts like with the antivaxxers. The antivaxxers, they first said, well, it's because of the mercury in the vaccine. OK well, there hasn't been mercury in the vaccines since-- OK, no, no, no. It's not the mercury. It's the number of-- so they're spaced out. OK, no, no it's not the number. It's the timing. They just keep changing the goalpost. They're never going to say vaccinations are OK.

[00:53:58.56] - Well, and the latest claim in the antivax movement-- in fact, I'm sure you've heard this-- is that we're all affected by this, that 50% of the human population has been hurt by vaccines. We just don't know it yet.

[00:54:12.40] - Oh, no. I haven't heard this one.

[00:54:14.76] - Yeah, this is their latest thing. Their latest thing is that the people with autism and, you know, the other vaccine injuries that are obvious are the ones that we've seen. But all of us, you know, who are dying of cancer, who have all sorts of issues later in our life, it's a delayed reaction to childhood vaccines.

[00:54:36.61] - Oh, you mean like Alzheimer's or something like that?

[00:54:39.08] - Yeah. Or really, anything you want. Now, talk about an un-falsifiable claim. Right? If you've got 30 years out, like it's mesothelioma or something, right? If you've got 30 years out and you could say, no, that was due to a childhood vaccine. This was something that Robert F Kennedy Junior was saying recently at one of the antivax conventions, he was making this claim getting wild applause from the audience. Again, moving the goalposts, absolutely.

[00:55:05.49] - Now, he's getting wild applause. Why? Because they're anti bit business, anti big pharma? Is it political like that, or?

[00:55:15.60] - It's heartbreaking to me, because I've known some antivaxxers and they love their children just as much as I do.

[00:55:23.74] - Of course.

[00:55:24.10] - Right? I mean, they're afraid. And they think that they're harming their child. They're just radically misinformed. And I think that one reason that they're misinformed is because there are all of the charlatans out there giving them the misinformation. And there aren't enough voices on the other side. So I mean, for the people who claim that science is based on money-- some people claim that science denial is also based on money.

[00:55:51.22] You know, look back to the anti-smoking, to the lung cancer thing in the '50s that [INAUDIBLE] and Conway talk about. All that resistance was fueled by big tobacco money. Look at climate change today. I can't-- so far as I can tell-- see that antivax has got financial interests behind it. It might. I mean, we know that Wakefield, at least way back when, had some small financial interest in it. But it's now grown to the point. I mean, I don't know. I don't know the psychology of it other than it sure looks like fear to me. It sure looks like they're just deathly afraid that they're going to be responsible for doing something to hurt their child.

[00:56:32.23] And I get that. I understand that they are afraid. It's just that they don't have enough confidence-- for whatever reason-- in the authority of science anymore. They don't trust scientists as experts. It's gone down that conspiracy theory rabbit hole.

[00:56:49.96] It's pretty clear to me-- I mean, I have this new theory that I'm working on for my next book that I'm out there on the road trying to test, which is that all science denial is the same. Flat earth, climate change, anti-evolution, antivax, that they all use the same basic reasoning strategy.

[00:57:11.27] And I think that belief and conspiracy theories are a huge part of that, and that that's really sort of taken over with antivax. Antivax goes back 20 or more years, you know, back to Wakefield, which I think was '98 or something like that. I don't remember the exact date. But I mean, it sort of fell off there for a while, at least in the media. But now, it's raging again. And somehow, the conspiracy theories went rampant. And then now the measles cases erupt, so maybe it'll go back dormant again. But it's really shocking.

[00:57:43.72] - It's almost like they all went to the same school of how to doubt mainstream science.

[00:57:49.89] - But that's it. They do go to the same school.

[00:57:52.06] - Say the jury s still out. Say we demand more experience.

[00:57:54.45] - Yeah. It's the University of Google. They're going to the same school.

[00:58:00.04] - It could be although, before Google when we first started Skeptic, we did an issue on the Holocaust deniers. I ended up writing a whole book about this. And I had already known a lot about creationism. And I noticed very distinct similarities in their strategies, like never say anything positive about your own position. Just chip away at the mainstream theory on the other side, looking at anomaly-- again, anomaly hunting-- you know, quote people out of context.

[00:58:24.24] You know, they've made a big deal like how none of the Holocaust scholars agree on exactly how many Jews were murdered. You know, some of them say 5.7, some say 6.3, some say 5.9. Look, they can't get their story straight. You know, maybe no one was murdered. You know, that kind of thing.

[00:58:40.31] - It's that kind of conclusion to come from it. The latest one I heard was the size of the windows in the death camps wouldn't have allowed the gas to dissipate quickly enough for them to get the bodies out before they brought-- I mean, these crazy made up, fraudulent claims that then they get this whole nutty conclusion from. It's heartbreaking.

[00:59:05.08] - David Irving's libel trial in England, his supporters had a t-shirt that said, "no holes, no Holocaust." Now, very few people knew what that meant, but I had already written about that. And I met David. And his claim was that at [INAUDIBLE] two and three, which you can see on aerial photographs, these four little dots-- shadows-- on top of the subterranean gas chambers, which is where eyewitnesses say the SS guards poured the Zyklon B pellets into these wire mesh columns. And the prisoners were stuck down there.

[00:59:35.42] So if you go there to Auschwitz, you don't see any holes. Well so, I went there. And it's like, well, they dynamited the gas chambers. It's just rubble, so of course, there's no holes. But you could see that line of thinking. Well if there's no holes, that means they lied about the gassing at [INAUDIBLE] two and three, which means they lied about the gassing in Auschwitz, which means they lied about gassing at all camps, which means the Nazis were not gassing anybody, which means they weren't killing anybody. And it's just this insane thing from one tiny, little anomaly, which is explicable to a grand theory.

[01:00:06.73] - Yes.

[01:00:07.09] - This thing with anomalies just drives me crazy, because people glom onto them for other reasons and then turn that into a whole new theory.

[01:00:14.69] - I wonder if you'd let me ask you a question that I got the other day.

[01:00:17.60] - Yeah, of course. Yeah.

[01:00:19.08] - So I got asked a question about this exact parallel that you were just talking about. So my one conclusion that I argue for in my book is that we need more engagement with science deniers. We need to get out there in the anti-evolution people, the antivax, and climate change, you know, we need to engage them. I mean, heck, I went to the Flat Earth Convention. Right? I'm looking for these people.

[01:00:42.02] But where is the line? But I also understand on the other side that there are people who say that they will not debate with a Holocaust denier, because they don't want to give them the platform. They don't want to give them the oxygen to get their theory out there for people to hear it.

[01:01:00.08] And the only way I could answer that was to think that if the theory is so discredited and such a small number of people believe it that you can basically keep it from spreading by just not talking about it, that's the way to go. But if it's already out there, causing other people to convert to that wrong view, then you have to address it. I was not comfortable with my answer. And you're somebody who studied both. And I wonder how you handle-- I'm sorry to turn the tables on you, there.

[01:01:34.01] - Oh, no, no.

[01:01:35.39] - I would love to hear how you would have answered that question.

[01:01:39.77] - Yeah. I think it's an important topic I wanted to discuss anyway because I don't think, like, what is science? There's not a simple answer to the question. It depends on the context. So you nailed it perfectly with to what extent is the public aware of this, such that ignoring it A, doesn't help, B, it doesn't provide the public with viable responses or answers in their own head.

[01:02:03.50] To me, when Montel Williams had on a couple of these Holocaust deniers in '92, '93, or so, I thought, OK. And then, Schindler's List came out and they were making a big deal about that. And I thought, OK there's a lot of buzz in pop culture. Therefore, it's our duty to respond.

[01:02:20.72] Now the flat earthers, the last guy died back in the 90s of the flat earth society. And I thought, well, we never need to do anything about this again in Skeptic. Well, the next issue, we have a cover story on the flat earthers. Here are their claims. Here is the proper response. Because as you know, you know they're not idiots. They have arguments. They've heard everything.

[01:02:40.89] Well, if I go up in an airplane at 35,000 feet, it looks like I can kind of see the curvature of the earth. If anything, I can see further. Oh no, it's because the windows are curved. You know, they have a counter to anything the average person could come up with. So you can't just say, they're idiots or they're anti-Semites or whatever. We really need to address, here's the answer to that particular claim.

[01:03:03.77] The sun is causing global warming. Well no, sunspot activity, it's actually-- I forget what it is-- decreased, therefore the sun's radiation is decreased. I forget what it is, but it's not the sun and here's the reason why, and so on. So that's one of the things we do.

[01:03:19.61] In terms of like, a public debate-- now, this gets to the issue of de-platforming speakers at college campuses and all that-- now first of all, colleges are not required to host everybody that wants to come on campus and do a debate or a talk. So it's not really a free speech government, free speech first amendment issue. You can't invite everybody. OK? So there is some selective processing going on there.

[01:03:42.40] Do you invite Richard Spencer, who is a noted flaming anti-Semite racist? No, I wouldn't do that. I would maybe write an article in which I would refute his arguments, and maybe even quote him. I might even call him up and say, are you really claiming that blacks are less intelligent than whites, and exactly why? Something like that. But yeah, I think giving somebody like that a platform.

[01:04:06.89] The creationists are so huge in America, I think we've got to confront them. I was not only OK with Bill Nye debating Ken Ham, he came up to my house and sat down with Don Prothrow, a geologist, who walked him through exactly what his arguments were going to be.

[01:04:22.70] - Yeah, a reality.

[01:04:23.45] - And Bill really nailed it. And a lot of people saw that. And of course, the fundamentalists aren't going to change their mind. They weren't going to. But we're after the undecided voters, the people who just don't know that much about it. They've never heard a good argument from our side. So I'm pretty much a strong proponent of free speech, open inquiry, give everybody their say.

[01:04:42.71] I had a recent example of this with I went on Joe Rogan about a year and a half ago with Graham Hancock. Now, Graham Hancock is one of these alternative archaeologists, as they're called. And now, he's a journalist, super smart guy. And he's traveled all over the world. He's written a lot of books on this subject.

[01:04:59.30] His thesis is that-- not ancient aliens, but-- ancient advanced civilizations, something like Atlantis 20,000, 30,000 years ago is when the pyramids were built and the Sphinx and so on. And his whole line of thinking is based on-- again, anomalies-- how do you mainstream archaeologists explain this one little rock right here that has this erosion? It doesn't seem to fit. From there, he spins a whole world view. That was one of my points.

[01:05:28.52] But I thought it was fine to have Joe on there. He had me on and we went at it. A lot of listeners thought he just cleaned my clock because I didn't have an answer for every single anomaly. And this is the problem with people like you and I that want to go out and confront them. You know, the flat earthers could come up with something you have just not heard of or some weird little thing that no one has an answer for. And you end up looking like, oh boy, see? Those guys, they can't explain it. Therefore, these alternative people are onto something.

[01:06:01.19] - And that's exactly what they will claim. I just watched a debate because I had a flat earther challenge me to a debate, recently. I was thinking, do I want to do this? So I looked up his previous debate. And the guy just slaughtered the flat earther, I mean, of course. But to listen to the flat earther, he claimed, oh he won that debate.

[01:06:19.40] - Was that with Mick West? Mick West is kind of the big--

[01:06:22.97] - The guy's-- The guy's name-- are you talking about the flat earther?

[01:06:27.50] - No.

[01:06:28.10] - The guy he debated named Reds Rhetoric? Stage name, I can't remember.

[01:06:35.76] - Mick West is the guy on the flat earth. He's great. He has a book called Escaping the Rabbit Hole. And he goes into the flat earthers and they chem trail people and all this, 9/11 truthers. He's got a great argument about the line of demarcation that within the conspiracy theories are alternative theories, themselves. They have their own line of demarcation.

[01:06:55.94] So for example, there are within 9/11 truthers, no planers-- the people that say, yes the explosive devices, but there were no airplanes at all. It was all holograms or whatever. Now, the normal 9/11 truthers who you and I would think are off the wall and off the rails, they look at them go, oh those no planers, they're completely crazy.

[01:07:14.72] Look, here's why their arguments are wrong. And so Mick points out that they actually do a lot of the debunking for us because they're sort of competing within.

[01:07:22.80] - That's good.

[01:07:23.12] - Yeah. It's a crazy [INAUDIBLE].

[01:07:24.23] - I've got the book right over here on my shelf. You know, I heard a similar thing happen at the Flat Earth Convention. So the one I went to is called Flat Earth International Conference. This is not the Flat Earth Society. They're different. It's like in Life of Brian, The People's Front of Judy and the Judy in People's Front.

[01:07:38.64] - Right.

[01:07:39.42] - And I remember one of the speakers from the stage saying-- he put up a picture-- and he said, this model is wrong. This is from the Flat Earth Society. We're not a flying pizza in space. These people are idiots. And I mean, it was comedy. There was some media there looking at it. But I mean, it was just what you were describing. I haven't read the book yet, but I've got it on my shelf here behind me. I've got to get to it now, because that sounds like a great argument.

[01:08:09.32] - It is. No, it's really quite good. And again, what do we do with anomalies? I answered, nothing. You don't have to do anything with them. Assign a graduate student to figure it out. I mean, that's what they're for. I mean, that's what science is all about-- excuse me-- is trying to answer anomalies, figure them out. And maybe it takes a few decades until we figure it out. Who knows?

[01:08:26.30] - [INAUDIBLE] said.

[01:08:27.87] - Yeah. Maybe multiple generations. But in the meantime, you don't have to abandon all of science. Now, Graham makes the point that I think is good, that the filter in mainstream science is maybe a little too tight. And it doesn't allow in enough of these alternative explanations that could be right. So his favorite example is Gobekli Tepe, an archaeological site in northern Turkey, that has these monumental architecture. It has these T-shaped stones that are like, 20, 30 tons. But it's been dated at about 11,000 years, so you know, 5,000, 6,000 years before anyone was making any monumental architecture anywhere on Earth.

[01:09:15.38] So these were hunter gatherers. There was no agricultural civilizations 11,000 years ago. How did this get made? So he points this out, of course, with his thesis saying, you see, if you mainstream archaeologists claim that no hunter gatherer community of a couple dozen people could possibly have erected massive monuments like this, explain that one.

[01:09:39.26] And this is a good point. So I mean to me, it's like well, apparently hunter gatherers are able to do more than we thought they could. And to which he says, yeah, but that's not what you said before. You said they couldn't do it-- not me, mainstream archaeologists.

[01:09:51.17] - I was going to say, that that's an ad hoc modification of your theory, he's going to say. Yeah.

[01:09:56.00] - Yeah, that's right. It's like, OK. I follow him on Twitter. He's like, things keep getting older. He just plucks out papers from Nature and Science, and so on, mainstream journals, saying, uh-oh this was a lot older than we thought.

[01:10:10.73] A discovery made just the week before he and I went on the show was a paper published in Nature of a mammoth tooth and a couple of bones in San Diego area that some construction workers had encountered. They were plowing a new interstate or whatever. And so either the plowing machines cracked the bones, or-- the scientists claim-- they were cracked lengthwise to get the marrow out. And there were some kind of big stones that could have been tools. Maybe not, they were kind of in between. Is it random, or is it you directional, or is it design tools?

[01:10:50.30] But the problem was the thing is dated at 130,000 years ago in America, in San Diego, when allegedly the oldest people here is 13,000 years ago. That's 10 times older. Explain that, Shermer. In Nature-- it was published in Nature. I'm like, oh crap.

[01:11:10.75] So I called Jared Diamond before because I knew he was going to bring this up. And Jared says, oh it's the semi-annual claim for pre-Clovis that has a shelf life of, you know, three weeks. And sure enough, no one's ever been able to replicate it. You know, there was another paper published saying, it's more likely that the bones were cracked in this way because they were laid out and the big machinery cracked it when it rolled over it. And so the debate continues.

[01:11:37.55] But my point to Graham was, you don't have to overthrow the entire Clovis first or even-- it's not Clovis first, maybe it was 15,000 or 18,000 years ago. But you don't have to go to 130,000 years ago, which would overturn everything about prehistory based on one single dig in one location with some kind of quasi, fuzzy, can't quite tell what it is.

[01:11:59.69] - And I think that's a good lesson, what you just described there, in the importance of how scientists reason on the basis of evidence. So it's not just a matter of considering evidence. It's a matter of how you consider [INAUDIBLE] what can be drawn off from it.

[01:12:19.19] I mean, climate change deniers will cherry pick. There's another example of what science deniers do of course, the conspiracy theorists cherry pick. There are others. But I mean, they'll cherry pick out-- as you said-- the one thing that they think makes their case. But a very interesting thing happens. Even if you can explain that, then well, oh, but have you thought about this? They'll move onto another.

[01:12:43.81] Not that many years ago-- I don't know, maybe they're still making the claim-- I talk about it in the book. Ted Cruz was claiming that 1998 was this incredibly warm year, which showed that the trend wasn't up in global temperature. Because if you use '98 as your baseline, then the graph looked much less impressive for climate change. Well '98 was an El Niño. And so you know, he cherry picked out that one year because that was the one that he thought was going to make his case.

[01:13:14.33] And so I think the interesting thing to draw from that is that's not the way that scientists reason on the basis of evidence. Yes, they're concerned with anomalies. But they're concerned with the whole corpus of evidence. And this is a really important point about probability. Unlikely things occur. In a large enough sample set, sometimes you'll get a

statistically significant correlation that's bogus. It's based on nothing. I mean, it's a naive correlation.

[01:13:45.98] And you know, you can maybe get a publishable paper out of it. You know, people do pea hacking and they find these correlations because they know, oh, this rises to the level. And they can go ahead and publish the paper. But it's complete under statistics. It's completely predictable that in a large enough sample size, you're going to have some correlations like that.

[01:14:05.36] So it means that scientists have to take evidence seriously. And you know, they have to run these hypotheses to ground when it seems like it's a big enough anomaly, or there's enough evidence in its favor. But it doesn't mean that they just have to lay down their tools and just work on that problem, or abandon their theory until they can solve that problem. The Newtonians contended with the perihelion advance of mercury for hundreds of years.

[01:14:37.65] Now, you could make an argument, well, maybe they shouldn't have. But I think that it's because they did that led to Einstein, that led to this ability to finally explain it. Because you know, by trying out all the other ways to explain it, maybe there's a planet Vulcan. You know, maybe there's-- I forget some of the other reasons why they thought that it might be happening. You know, people assess those various theories. Some seem to have more evidence than others. Some of them are ruled out. Or they're likely improbable. And then we eventually get on the right explanation.

[01:15:13.46] So it is a matter, I think, of having enough confidence in science to say, you know what? We may not be able to explain these-- I forget what you called them-- the kind of upright rocks in Turkey. But that doesn't mean that the very best explanation is that all science is wrong. It's that we don't know everything yet and we haven't found the explanation.

[01:15:36.98] Now, that drives science deniers crazy. Because as you said, they think that unless you can explain that one thing, you know, what? Well, does it mean if the conclusion they draw is that you've got more explaining to do, OK. But why is their conclusion always, therefore my crazy theory-- which doesn't have any evidence-- is correct? That's the problem. It's how they reason on the basis of evidence, how they assess probability given the evidence. That's the real problem.

[01:16:06.21] - I remember in the 1990s, there was some study published that showed the age of the oldest stars was older than the universe-- the estimated age of the universe. And this was sent to me by these people that were skeptical of the big bang-- call them big bang skeptics. And they had a little toehold for a while, there.

[01:16:24.90] And so I called Kip Thorne at Caltech who was a friend of mine and said, is this a story Kip? I mean, should we do something in Skeptic, you know, that there's something deeply wrong with the big-- no, no, no. Don't worry about it. Big bang is fine. It's the error measurements, you know, we just have to calibrate them. We have to have better measurements. Just wait a few years. This will all get sorted out.

[01:16:44.30] This is how science works. It's just kind of a messy process. You know, the measurements are not always perfect. Different people get different measurements. And eventually, it did get sorted out. And the oldest stars are younger than the best estimate for the age of the universe, and so on. And that's kind of how it works. You have this little anomaly. You don't have to do anything with it. Just calm down. Just wait. This let's see what happens.

[01:17:05.73] So then let's talk about, much of philosophy of science was based initially on the physical sciences. You talk about the social sciences and pea hacking and the messiness of say, social psychology, and these experiments. To what extent is Popperian philosophy of science apply to the social sciences? And particularly, maybe address for us the replication problem.

[01:17:33.58] - Yeah, it's interesting. I did some of my undergraduate work and then right through into graduate school kind of after I read Popper fascinated with this question of what philosophers of science had to say about the social sciences. Because the social sciences just didn't seem to measure up. And I wondered, how could they be more scientific? How could they do a better job?

[01:17:56.27] And so I spent a lot of years thinking about the mythological and logical issues. And ultimately-- and I wrote about this a little bit in the book-- it seems to me that the problem with the social sciences is, again, this problem of their relationship toward evidence. I think that a lot of the social sciences have been infected with ideological thinking so that you know for instance, you can pretty much predict which researchers at which think tanks have come up with the data set to show that immigration is a net drag on the economy, and which researchers are going to show that no, immigrants are in fact a net boon to the economy.

[01:18:39.03] Now, we wouldn't tolerate that in physics, right? But in the social sciences, this is sort of par for the course. And I think that this is an embarrassment. Now there are all sorts of barriers to doing controlled experiments and the perfect way that you'd like to do them in the social sciences. And again, I have tried to think a lot in my career about what these barriers are and how to overcome them. And you know as I've gotten older, I've finally determined that really, the missing ingredient was the desire to learn from your data, the desire not just to have the math work out like neoclassical economics, but to be able to say, we run this experiment and we found something interesting.

[01:19:24.52] In the book, I talk a little bit about [INAUDIBLE] work on the paradox of choice, which I think is just a brilliant example of where you can do an experiment, where you think, oh, this is too messy. We can't do an experiment. But she did an experiment where she went into a grocery store and worked with displays of jam and found that if you have 30 different jams and you offer people the taste from whichever ones they want and then you give them a coupon to buy, they buy many, many, many fewer jars of jam than if you have a display of five jars of jam and you let them choose.

[01:19:59.86] And I mean, it was just this huge result. It was something like 4% versus 40%. I forget the exact number, but I mean, it was enormous. And so, one of the great ideas behind neoclassical economics is more is better. Well, not when it comes to choice for jam, it's not. And that can be shown experimentally.

[01:20:19.58] So I think that was a great demonstration of the scientific attitude where the social sciences can do better. The example that I love is medicine. It seemed to me that it wasn't that many years ago that Western medicine was not scientific. You look back at mid-19th century, they were as likely to kill the patient as to save them. And it just seems to me that for all the bench work, the lab work, it didn't really make its way to clinical practice for quite some time. But then when it did, there was a revolution.

[01:20:59.74] And it seems to me that was-- the scientific revolution that happened in medicine-- it really reminds you of the social sciences. You know, it's normative. It's subjective. You know, you can't claim that doctors are indifferent between health and disease or life and death. They care very much. And they know there's a placebo effect. So what do they do? They have double blind controlled experiments. We could do that sort of thing-- maybe not that exact example where we can't. But you know, there are methodologies that we could employ in the social sciences if we had the right attitude where we could learn. But we don't.

[01:21:39.43] I defy people to look at the data sets on the relationship between guns and violence, the death penalty, immigration. They're just shot through with ideology. And in fact, in some cases, you can't even get money anymore to do good work on it. One of my favorite studies here was done by Gary Clark, who is a very well-respected gun researcher at Florida State who found that there was something he called a defensive gun use, which was that you don't measure how effective guns are deterring crime by looking at the number of dead criminals. You look at the number of crimes that were deterred where the person probably didn't call the cops because they might have had an illegal gun.

[01:22:23.23] Now, that's not a ridiculous hypothesis. It's in fact a very interesting hypothesis. But you have to figure out how to measure it. And he wrote this a terrific book called Point Blank. And you know, it's chock full of examples and theory. And he won an award from the American Sociological Association. And it was just hammered by ideologues-- on both sides, by the way.

[01:22:45.75] The liberals hated him and the conservatives hated him because, toward the end of the book, he was making the claim that given what he had found, that it was compatible with certain forms of gun control. So you know, everybody found something to hate there. But he was making the case that this was a good example that empirical social science needed to just be straight down the middle and not be infected with ideology. And it just drove people insane.

[01:23:11.47] - Very difficult, I did a whole issue of Skeptic on gun control. What a mess. I just drove right into data sets. I read John Lott's book, More Guns, Less Crime. It was 300 pages of all the studies that show it's good to have a gun in your house. And then, I went to the other and read a bunch of other books. No, no, no. Actually, you're 11 times-- what was it-- 22 times more likely to shoot yourself, your spouse, your kids will find the guns, accidental, and so on, then you will kill a bad guy.

[01:23:39.64] - It's cherry picking on both sides there for that example. We can have values disputes, but we shouldn't be able to have empirical disputes over if the data are gathered well. Maybe over what they show, but the problem with those data sets that you're talking about is that

they're cherry picking. They're going through and they're taking out the data sets that show their point of view because they already know before they start what they want to show. You know? They already have their political views. And now they're going to go shopping for data to show it.

[01:24:19.54] And for me, say you wanted to do something about crime so you were interested in the death penalty. So we could have a values debate about even if the death penalty deterred crime, we still thought it was immoral, et cetera. But you know, if we're going to have an empirical debate, we really should get the data right. And it just seems to me that it's just so infected with ideology that it's a problem.

[01:24:46.03] And if you look at that, people now claim-- I mean, they're making the same sorts of claims about the natural sciences-- which has come back to bite us about climate change. You've seen the bumper sticker, science it's not a liberal conspiracy. I mean, people make the claim that all of these climate scientists are really just liberal political ideologues who are protecting their grant money and protecting their position and they want a big government takeover, which is to slander the sciences that they're being ideological when I don't think they are.

[01:25:18.74] And yet, you've got the example of the social sciences where I think it is shot through with ideology. And they don't seem as concerned as they need to be. That's why I love [INAUDIBLE] work and people like her. It is just terrific work.

[01:25:31.42] - You probably know about Jonathan Height's story of going to that social psych conference. You know, he's a professional social psychologist. And he pointed out at this conference, like 95% of us here vote liberal. We voted for Obama. Do you think that has any influence? Oh, no. No, no, not at all. Now, wait a minute guys. And you know, he's still a liberal-- I think maybe slightly more centrist now-- but he's really pushed back against this idea of the infiltration of politics into social psychology, which I think is the case.

[01:26:02.65] If you look at someone like John Jost's work on the conservative mindset-- so I've read his papers. I wrote about this in *The Believing Brain* and he was very critical of my criticism. But you know, the problem is operationally defining what you mean by a particular characteristic. So you can spin doctor that a little bit, like conservatives are very high in conscientiousness, low on openness to experience, see they don't like immigrants. They don't like travel, and so on.

[01:26:34.38] It's like, wait a minute. You know, you could just as easily argue that liberals are too open-minded. And they don't see the real very real threats in the world. You know, we live in a world with walls and on those walls are men with guns, and so on. My favorite quote from *A Few Good Men* when Jack Nicholson is schooling Tom Cruise about how the world really works. You know, some conservative values are good and it's easy to spin it to show that they're all bad. And of course, conservatives can just watch Fox News as Obama himself said, "I wouldn't vote for me if I only watched Fox New."

[01:27:10.51] - You know, I wrote about this a little bit in my earlier book, *Post Truth, You know* just kind of false equivalence. But also, this idea that one of the best ways to fight back against post truth is to fight it in ourselves, just to fight this idea. I mean, because it's easy to identify other people's cognitive biases. And people don't like to admit that we all have cognitive biases.

[01:27:33.77] And it's even true of science denial. If you look at antivax, that's not political. I mean, push back against climate change-- that tends to skew conservative. But as nearly as I can tell-- unless it's changed quite recently-- antivax is equal liberal, conservative.

[01:27:52.96] - Yeah, left and right.

[01:27:54.20] - Anti-GMO, I think that's actually probably skewed more liberal. So I mean, even as a skeptic-- and you know this better than anyone-- you can get yourself in trouble talking about things like that. But the important point that I like to make in my work is I don't like ideology of any type, right or left, if it influences the gathering of data, if it influences our cherry picking or if it causes us to believe one side more than another. It should be based on the data. Values are important. And we can have values disputes. And you know, I'm a liberal and I understand that.

[01:28:35.25] But what bothers me is when any ideology, right or left, influences the gathering of data. Because I think that that's when we're most likely to make a mistake, when we're feeding that confirmation bias. And we're just hearing what we want to hear, that's when we're going to make a mistake.

[01:28:52.15] - Yeah. And Jonathan Height's moral foundations theory, he has those five foundations-- you know, care, harm, you know, equality, and fairness, and so on versus these respect for authority and hierarchy. And the last one is purity and sanctity.

[01:29:09.26] Now, this always gets glommed on by liberals to accuse conservatives of being obsessed with sex and controlling women's reproductive rights because they have this moral foundations theory dialed up to 11 that the purity and sanctity of the body is super important.

[01:29:26.24] Well, but I see that in liberals in their concern for food-- so they're anti-GMO-- the environment, water, clean air, and so on. To liberals, I see that purity sanctity dialed up to 11 not over the body and women's sexual reproductive rights and so on, but over the environment. And they're just as passionate in that direction. And that fuels anti-GMO, anti-nuclear, and so on.

[01:29:52.38] So again, you can take an operationally defined-- some particular group-- and then get really quantitative data on it. But what does that definition really mean? And could it be applied in other areas?

[01:30:06.15] - It's fascinating. I mean, I've read a little bit. You probably can school me a little bit on this and other things. But I've read a little bit of the neuroscientists who are working on this, the neuroscientists who are working on the nature of belief and which part of the brain lights

up when your beliefs are contradicted. I mean, this is just still in its infancy-- all this fMRI work-- that I find absolutely fascinating.

[01:30:33.51] Because you know, there are cognitive biases built in. And it's probably built in for a very good evolutionary reason. But there are also differences in our brain that are built in. And I wish I knew more about that. I'd love to read the papers like the [INAUDIBLE] brothers and Cook and Lewandowski, and these people who talk about the common threads of science denial.

[01:31:01.03] I know we've talked about a couple of them, the belief in conspiracy theories, and cherry picking, and touting fake experts, and having impossibly high standards, and making logical mistakes. I think those are the five. What I've never read is the neurological basis. And I I'd really be interested to read this. I mean, I've read Brendan [INAUDIBLE] work on the backfire effect.

[01:31:27.03] - Right.

[01:31:27.85] - And I've read David Redlawsk and James Kuklinski and people like this who are political scientists. But I'd really like to know the biological basis if there is one.

[01:31:38.10] - There's been some recent papers unable to replicate the backfire effect, which would be good news. You can actually talk people out of their beliefs by giving them better facts. They do change their mind.

[01:31:51.85] - Well, Redlawsk showed this.

[01:31:54.09] - Oh, OK.

[01:31:54.48] - I mean James Kuklinski. But you have to do it in the right way.

[01:31:58.32] - OK, right.

[01:31:59.85] - You can't just get in their face.

[01:32:01.44] - That's right.

[01:32:02.15] - You know, you can't make them angry. Right? So there's a whole context. Some of the citations if you haven't seen these papers are in Post Truth. But I found these papers just absolutely fascinating to see, can people ever respond to evidence? And in some cases, they can. But boy, do you have to be ginger in the way that you do it.

[01:32:24.33] - Yeah. Well, I think there is a strategy to do that. You know, there's a time and a place to talk about politics and religion. You know, the baseball game is maybe-- or the family dinner is maybe not the place to do it. You know, do they bring it up? You know, there are certain rules of debate, like can you articulate the other person's position well enough that they go, yes, I wish I would have said it. That's really hard to do. We now call that steel manning the other guy's argument. I think that's important.

[01:32:53.72] - Oh, instead of straw man. I like that.

[01:32:55.22] - Yeah. But it shows respect. Like, OK you actually did listen to me. That brings down the cognitive dissonance wall a little bit. And so then by the time you get around to say-- and you don't just say, you're wrong. You say, hey, I used to believe like you believe. Then I read this paper and tell me what you think about this. Something like that.

[01:33:17.74] - I used that exact technique. I didn't know what it was called, but I used that exact technique when I was at the Flat Earth Convention. I was respectful. I was calm. I spent most of my time listening. But then when I engaged, I would reflect their argument back to them, see if they agreed, and then show what was wrong with it. They really didn't like it. They really didn't.

[01:33:37.77] There Was this one guy. I tried to get him to agree. So I asked him this question about what would it to give you to give up flat earth? What would be the evidence that would make you give it up? And he said, you know, flying in a spaceship and know that it might be curved. You know, when it might be curved, et cetera. And I said, what about a flight over Antarctica? You know, because they think that Antarctica is spread out in a mountain range along the perimeter. What about if we flew over Antarctica? And he said, there aren't any flights.

[01:34:06.66] And I pulled out of my back pocket a flight that went over Antarctica and said, what about this flight? And he said, have you ever been on that flight? I said, no. Do you want to go? Because I bet I could crowd fund our tickets amongst my science buddies and we could go on this flight.

[01:34:22.00] - That's a great idea.

[01:34:22.59] - And he reached out his hand and he shook my hand on this. And I thought, oh boy. Because I was going to call you and Robert Wright and all these other people. And I was going to crowd fund.

[01:34:30.67] - I'm in.

[01:34:31.59] - Right? I mean, how much would you pay for that? But I knew who I was dealing with. And so I said, OK so, look. What we've got to do now is we've got to agree on a criteria to measure this. And the criteria should be that if you're right, Antarctica 20 some thousand miles long. And if I'm right, it's 3,000 or 4,000 miles, which means that we should be able to get there without refueling. So how about if we have to stop to refuel, you're right. If we don't have to stop to refuel, I'm right. And we shook again. Two minutes later, he took it back

[01:35:06.83] - He did?

[01:35:07.51] - And he took it back because he said, what if the entire history of aviation has been a hoax to convince us that airplanes actually had to stop to refuel when in actual fact, they could get anywhere they wanted around the world-- he didn't say around the globe-- around the world on a single tank of gas? And this is what I said to him. I said, so what you're telling me is that before you and I were even born, planes were stopping and landing in locations that we've

never even heard of. Against the day when you and I, right here tonight, we're having this dinner, talking, just the two of us here, so that it would convince you to make a false bet with me. And he said, that's right.

[01:35:59.87] - Oh my god. That's incredible.

[01:36:02.18] - He said that's right.

[01:36:03.47] - Wow.

[01:36:03.87] - And I mean, at that point in his eyes, I think I kind of became the devil. Because one of their claims was that this great conspiracy, this great hoax of flat Earth is created by the devil. And I think that he was afraid that what I was proposing to him was a sort of a devil's bargain.

[01:36:25.84] - Oh, so he--

[01:36:26.36] - But I reflected it back to him, and he had no choice but to say, that's right.

[01:36:32.22] - How many of them would you say are motivated religiously, like this guy?

[01:36:37.28] - Quite a number. I did meet some. I came away with the theory that they were virtually all conspiracy theorists and that most of them were evangelical Christians. And now of course, I always have to be careful to say that it's not to say if you're evangelical Christian, you're a flat Earther.

[01:36:55.39] - Yeah, of course, right.

[01:36:56.24] - But it's to say that most of the flat Earthers were evangelical Christians. One guy said that he thought that it was the only account that made sense of Noah's flood. Now, there's no place in the Bible that it says that the Earth is flat or that it's round. I mean, this is all inferred. But quite a number of them will quote scripture against it. I did meet a few secular flat Earthers.

[01:37:22.37] One was interesting. She said that-- I asked her, was she a Christian? And she said, no. And I said, well, that's very interesting. Why are you a flat Earther? And she gave me this big argument. And I said, well, but OK, so why aren't you a Christian? And she said, well, I'm not a Christian because I myself am God.

[01:37:39.12] - Oh my god. Right.

[01:37:40.31] - So people have their own motivations. And so I mean, there's a diversity of views within the community and a diversity of things that they take as evidence. But the thing that they have in common is conspiracy theories, cherry picking, fake experts, impossibly high standards for science, and logical mistakes. Those were the things, just as the [INAUDIBLE] brothers originally said.

[01:38:06.41] - Were you speaking there?

[01:38:08.57] - No, I went undercover. I went the first day. I bought the little badge. And the first day, I kept my mouth shut. And the second day, I just came out and told him who I was. And I got one of the speakers off the stage and engaged him in debate about some crazy experiment that he had alleged to have evidence for about being out in Lake Michigan and still being able to see the city of Chicago, which is perfectly explained by physics. But he didn't buy it, and so I engaged him.

[01:38:45.38] But the guy I was just telling you about, the one over dinner, I got him after he was on stage. He was running a seminar on how to talk to your family and friends on flat Earth, how to recruit new people, how to go out with the signs and recruit people, because they're proselytizing. And after he came off stage, I said, please have dinner with me. I'll pay. Let's go to dinner.

[01:39:09.59] - Wow, right.

[01:39:09.95] - And to his credit, he did. And he was very articulate. He was a very intelligent guy. I mean, he was a worthy debating partner. We spent two hours over dinner, talking-- no notes, no tape. He asked if I wanted to tape it, and I said it'll change how we talk. Let's not do it. And but I mean, he gave me the best that he had. And I gave him the best I had. But the climax of the argument was the one that I just made because I saved that question until the very end.

[01:39:41.00] - Right.

[01:39:41.66] - What would it take to prove that you were wrong.

[01:39:43.39] - What did he say?

[01:39:45.08] - Well, it was this claim about the--

[01:39:47.53] - Oh, yeah.

[01:39:48.44] - Yeah, about the flight over Antarctica, which he then took back, and I figured drop the mic, walk out, it's over at that point. Right.

[01:39:58.13] - I do find having dinner, particularly drinks, with some of these fringers kind of opens them up and you find out what's really going on.

[01:40:06.02] - You do?

[01:40:06.62] - I did that with David Irving and Mark Weber at the Institute for Historical Review, just to find out what they're really thinking about the Holocaust. And sure enough, at some point, the Jews comes up a lot. But OK, so I can see where they're coming from.

[01:40:21.48] But I've gotten to know some of the intelligent design guys, like Bill Dembski and Paul Meyers. And so even there, there's that line of demarcation. Bill Dembski really doesn't like the young Earth creationists, people like Duane Gish and Ken Ham. To them, these guys are an embarrassment. They're kind of local yokels. They're uneducated. They don't have good training in science, philosophy, and math.

[01:40:49.28] And the whole point of the intelligent design theory movement was, let's break away from those guys because they are a bad black eye on our movement. We are Christians. They're Christians. That aside, if we want to push our agenda-- and that's where they came up with this whole, the wedge strategy-- we're going to come at this from a philosophy of science.

[01:41:08.42] That methodological naturalism has wedged its way into Western culture, and that's chipping away at the moral foundation of civilization. So we're going to come at it, and we're going to attack the core of it, which is that methodological naturalism thing. So their arguments are way more sophisticated than, say, Duane Gish's. But there's that line of demarcation again.

[01:41:29.09] - No, you're right. And that comes in. I'll look for that. I'm going back in November to Flat Earth again to see now. They're probably not going to talk to me because I have the Newsweek thing, and they all know who I am now.

[01:41:40.78] - Uh-oh. You've been outed.

[01:41:42.62] - But I am going to go back. But I mean, if they are interested in evidence-- and I was respectful to them. I mean, I was not-- there was only one moment when I really got angry, and I held it back, which was at dinner with this fellow, when he started to talk about the Parkland massacre.

[01:42:06.56] - Oh.

[01:42:08.12] - He was talking about coincidences.

[01:42:09.76] - Oh, boy. Oh, right.

[01:42:10.82] - And he was talking about, don't you think that it's a little bit of a coincidence that one of the women afterwards said, I don't want your thoughts and prayers. I just want gun control. And he was talking about crisis actors and such. And I have a close friend whose sister lost a child in Sandy Hook. So that was very hard to sit through. And I just wanted to-- if I chased him there, we were both going to get angry.

[01:42:36.41] And then so I pushed it in a different way, but yeah, it's hard to sit down and not only to have a conversation sometimes, but not to get your emotions to run away with you in something like that. It's tough.

[01:42:52.04] - I just wrote a Teaching Company Great Courses course on conspiracies and conspiracy theories, 12 30-minute lectures. So I have one on JFK, and boy, you go down the rabbit hole with that. Again, there's really nothing that will change their mind.

[01:43:05.92] - No.

[01:43:06.15] - I even found a little editorial cartoon joke where a JFK assassination conspiracist dies and goes to heaven. And God says to him, you've been such a good fellow, I will answer any question truthfully that you want to know. He says, all right, who killed JFK? And God says, Lee Harvey Oswald acting alone using his own [INAUDIBLE] M-91 rifle. And the conspiracist says, this goes even higher than I thought.

[01:43:31.77] [LAUGHTER]

[01:43:32.74] - Yeah. Yeah, that's right. Everything is evidence for the conspiracy. That's exactly it.

[01:43:37.87] - And that's the scientific attitude, is the willingness to change your mind, you falsify and so on. Defending science from denial fraud and pseudoscience, it's a great, great work, Lee. I really appreciate you coming on. We covered a lot of material. Your next book--

[01:43:53.08] - We did.

[01:43:53.55] - --you just started. This is How to Have a Conversation with a Denialist or something like that?

[01:43:58.05] - Yeah, my next book-- so in The Scientific Attitude, I'm recommending that scientists go out and talk about their values, talk about the process of science, and engage with science deniers. And when this book was in proofs and I couldn't make any more changes to it, I thought, well, I'm going to take some of my own medicine. This is when I went for Flat Earth Convention.

[01:44:19.53] But after that, I thought, I could keep doing this. And so I went out to the Maldives to see climate change for myself, just so that I would be ready when somebody there said--

[01:44:29.03] - You did, wow.

[01:44:30.63] - --have you been there? Have you seen it? And I worked with the Marine biologists there and went snorkeling. And I'm not a strong swimmer, so I had to have him with me, but I went snorkeling in the middle of the Indian Ocean on a coral reef that was dying and really found out some of the evidence and talked to some of the local folks.

[01:44:50.10] Next, I'm going to go out to rural Pennsylvania and interview some coal miners. And I don't presume that they're climate change deniers. I'm going to see. But I want to talk to them and see. The part of the research for the new book that I'm the most excited about-- I don't have this trip set up yet, so I probably shouldn't say anything about it.

[01:45:11.58] But I'm going to. I was doing a podcast a few months back for Post Truth, and my interviewer was a Mormon. And he said, you think it's hard to convince people to change their mind about climate change, try to convince them to become a Mormon. And I said, well, how do you do it? This was all off air. I said, how do you do it? And he said, well, we have a school in Provo, Utah. We have a missionary training school. And apparently, they teach techniques persuading people. And I'm going to go.

[01:45:48.21] - Oh, that's great.

[01:45:48.77] - I'm going to go. I'm going to go learn how they do it. Now, I'm not a religious person. And I made sure that he knew that I wasn't because I don't want to go in under false pretenses. I don't want them to think that I'm pulling a fast one on them. And it's a 12 or 13 week course. I mean, you'd expect a lot of religious training. I'm going to do a piece of it. I'm going to do-- I'm going to come on the day when they do, I hope-- again, it's not set up yet.

[01:46:14.10] What I'm trying to angle for is just for me to drop in or interview somebody. I don't know how it's going to be. But I want to learn what their persuasive techniques are because it's one thing to study it in the lab. It's another thing to go on a two-year mission and learn how to do this.

[01:46:31.29] And so to me, just from the psychological point of view, it's fascinating that they know how to do this. Irrespective of the content-- which would drive them crazy that I've said that-- but irrespective of what they're trying to convince them of, they have firsthand knowledge of how to convince people, the techniques that work and the techniques that don't. And I want to learn those--

[01:46:55.89] - I wonder if they--

[01:46:56.37] - --and then go out and talk to science deniers.

[01:46:58.02] - I wonder if they do work. That is, the conversion rates for the Mormon boys on their missions I've heard is very low. But I don't know if anyone has any real data.

[01:47:07.32] - It is low. I asked him that, and he said that the average conversion rate is a half a person a year per missionary.

[01:47:15.75] - Wow, OK. Oh, well, so--

[01:47:17.89] - But his personal conversion rate was 22.

[01:47:20.84] - Really? 22.

[01:47:22.29] - Yeah. 22.

[01:47:23.07] - I wonder if they follow up.

[01:47:24.54] - He's a persuasive guy.

[01:47:25.62] - I wonder if they follow up, like, years later to see.

[01:47:27.58] - I don't know. I don't know. But I mean, I've got some family members who are related to the whole branch. The family are Mormon people, and I've known a little bit about it for a while. And I'm just kind of fascinated with their commitment and what they do. And so I jumped at the chance to do that. And as I've said--

[01:47:49.01] - Well--

[01:47:49.26] - --I haven't got this set up, so don't tell anybody.

[01:47:51.17] - Yeah.

[01:47:52.44] - Right.

[01:47:52.86] - Well, it'd be interesting-- actually, you should also--

[01:47:54.98] - That's what I'm going to write about.

[01:47:55.77] - You should also do a chapter on atheism, secularism, and to what extent we're able to convert religious people to be non-religious.

[01:48:03.62] - Yeah.

[01:48:04.98] - There's a big debate amongst atheist circles, particularly since Richard Dawkins' book in 2006, *The God Delusion*. It kind of splintered the field, as it were, the community, whatever you want to call it, into sort of antitheist-- we're going to go after them like a hitch slap. Dawkins, Hitchens, we're going for the jugular, and we're going to show them what idiots they are to believe this stuff. And we're going to convert them that way.

[01:48:29.75] And then you have the old camp, which is we just teach them science and critical thinking and hope they get there. But hope? I mean, maybe there's some in-between strategy, or maybe there's not one strategy. Maybe--

[01:48:41.09] - I don't know. I'll see what I find. Maybe I'll get a whole other book out of it, but I mean, I'm kind of fascinated to go-- and I'm going to do something on GMOs as well. Because that's really been underreported in the science denial literature. Everybody writes about anti-vax and climate change. And those are important topics.

[01:49:01.79] The one I'm most worried about these days is climate change, but I think that GMO is important because if you look at the bifurcation between what the scientists think and what the public thinks, that that distance is just as great on GMOs as it is on climate change. And the beauty there is to do the research, I don't have to go to the Maldives. I just got to go to my local Whole Foods.

[01:49:27.89] - Right.

[01:49:28.49] - Right? I mean, I can just go talk to people and see. But this is something that I'm learning a lot about this summer and getting ready for my fall trips.

[01:49:40.44] - Yeah. Whole Foods, I know John Mackey, the CEO. And--

[01:49:45.25] - Ah.

[01:49:47.39] - By the way, if you want to sit down with him, he's a good friend.

[01:49:49.90] - Oh, that-- Just as long as I don't get kicked out.

[01:49:52.90] - But people going into Whole Foods-- when you go into a Whole Foods, it's like a church for liberals or whoever, these kind of high purity people about their food and drinks and so on. And they're willing to pay that extra--

[01:50:05.88] - Yes.

[01:50:06.62] - --fee for that purity.

[01:50:07.08] - --and willing to talk, too, I hope. Again, this is my hope that I don't get kicked out when I'm asking. But I just want to ask a few questions and see. And I mean, there--

[01:50:16.91] - You could be like Colombo. You can be like Colombo.

[01:50:18.92] - Yeah, I just have a few questions.

[01:50:19.76] - I just have one more question, just one more. You might also look into nukes, nuclear power. I'm really worried about this. This was, to me, is the solution to the fossil fuel problem. But so many people are afraid of what they can't see taste, smell, and so on. It's almost like a--

[01:50:36.35] - Here, I almost think there's a values thing with that too, though, based on human error. And I mean, you get that with the vaccines, and you also get it with the anti GMOs.

[01:50:48.14] - If there's one bad thing to happen--

[01:50:48.91] - But you gotta decide how much do you trust people? Some of the anti-GMO is because they don't trust Monsanto.

[01:50:55.65] - Right, yes.

[01:50:56.18] - Right?

[01:50:56.29] - That's right, yeah.

[01:50:56.87] - And maybe they have reason not to trust Monsanto based on some of their corporate history and some of the other things that they've done. But that's not necessarily-- as one guy put it, that's like being against Office software because you're against Microsoft, right? Maybe somebody else is doing it.

[01:51:13.04] So I've got to work this out, but this caught my attention because the more I read about GMOs, the more I got interested in the-- there were some cute stories. One was about the number of people who, when they interviewed them, said that all foods with DNA should be labeled. You know?

[01:51:34.55] - Right.

[01:51:35.12] - 80% of people said that all foods should-- but this is the one that really got me, that I saw a shaker of salt that said no GMOs. Now, salt's a mineral. It doesn't have any-- there's no DNA in it, right?

[01:51:50.03] - Like, this water has no GMO, right.

[01:51:51.93] - Yeah, no GMO. So it was just-- so I mean, so there's something going on there. There's some level of fear. There's some level of distrust of their fellow human beings screwing things up that's probably a common thread for nukes, for GMOs, for vaccine. I got to admit, I'm not quite there yet with the nukes. I'm going to have to maybe study up on this. Maybe you can tell me something to read on this because I'm still--

[01:52:20.45] - Well, you have behind your right shoulder there, you have Steve Pinker's book, Enlightenment Now. Read his chapter on nuclear power, OK?

[01:52:28.40] - All right. Very good.

[01:52:30.82] - Yeah, actually, one last point on that fear thing-- my colleagues at Chapman University, where I teach, they do this annual survey on fears. And anyway, last year, it was on conspiracy theories. Part of the problem is, if you list a bunch of things, the survey takers are just ticking boxes. So amongst the most-- a bunch of famous conspiracy theories, 9/11, JFK, and so on, they threw in the Dakota crash. Well, like, 40% of people that took it said, oh, I think the government's hiding what we know about the Dakota crash. What the crap? There is no Dakota crash. They just made it up. So that's part of the problem when you're doing surveys like that.

[01:53:04.58] - No, it is. I'm coming out to your neck of the woods in the fall. I'm coming out to Pomona College--

[01:53:10.53] - Oh, good.

[01:53:10.84] - --to give a talk on October 2, 3, something like that. And then I'm also going to give a lecture at the Aquarium of the Pacific that following week.

[01:53:21.64] - Oh, perfect. So my class is--

[01:53:23.84] - So I'm going to be--

[01:53:25.42] - My class is on Monday's is from 4:00 to 7:00 at Chapman. Maybe if you're-- at any Monday if you're around, come in, give a guest lecture in my class. We'll have this conversation for the students. It'll be great.

[01:53:36.85] - I'll be around because my talk at Pomona is on the Friday, and then my talk at the Aquarium of the Pacific is on a Tuesday. So I've got that Monday. If you go to leemcintyrebooks.com, it's got my whole fall schedule there. And there's a date in between there. Yeah, I've always wanted to meet you in person.

[01:53:55.27] - That'll be great. We'll do it.

[01:53:56.50] - It's been my honor to [INAUDIBLE] show. Thank you so much.

[01:53:59.08] - All right. Thanks, Lee, again. The Scientific Attitude, let's all take that. Thanks for being on the show.

[01:54:04.52] - Thank you very much. Take care.

[01:54:05.74] - Bye bye.