DANNY LENNON: Ciaran, welcome back to the podcast.

CIARAN O'REGAN: Cheers for having me mate.

DANNY LENNON: I'm looking forward to getting into some of these topics that we've already discussed quite a lot and you've put a lot of thought into and will continue to do as part of some of your doctoral work which we might discuss a bit later on. Probably a good place to start is just this term "ignorance navigation" that you have brought to me, as far as I know, this term that you've been using to conceptualize a lot of the ideas of the framework you've been thinking through – how do you define what ignorant navigation is and why is that concept important to you, specifically?

CIARAN O'REGAN: It's in relation to a concept that I would have come across from Nassim Taleb – we had this concept of epistemic humility, which is basically, if I was the paraphrase it or describe it, it's basically the idea of putting the information or the knowledge that you don't have on a higher pedestal than the information you do have, whereas epistemic arrogance would be the inverse which is putting the information you do have on a higher pedestal than the information you don't. So I suppose what I'm fascinated with is epistemology,

which is the study of what is knowledge, where does knowledge come from, what knowledge has more weight over other knowledge in certain circumstances maybe. Because in order to function in the world, we need to make decisions about what to do next, and all a decision is an opinion about how to navigate reality. But an opinion, if we were to go another layer, is just essentially a kind of... an opinion as a form of creativity, it's creativity because if you define creativity, I suppose, the definition of creativity that brings to mind is by a guy called Jacque Fresco who is a futurist, but I heard an interview before and it just hit me like a ton of bricks when he said it – he defined creativity as the combination of known parts in an unknown way. And then to extend that out, there's a physicist David Deutsch who refers to creativity as a means of, it's like problem-solving basically. So if you combine the two doors, then creativity is the combination of known pattern, unknown way to solve a problem. So when it comes to human opinion formulation about what to do in any aspect of life which is basically a decision about how to act in the world, then the bottleneck is knowledge acquisition and interpretation, and then how that knowledge is used to formulate the opinion.

So the bottleneck in the limitation is what knowledge have you been exposed to and been able to interpret and assimilate, and then being able to put together in a way about how to, in a creative fashion, in order to be able to navigate in the world. So it's impossible to have all knowledge that has ever existed in the past or will ever exist in the future. So in the face of all possible knowledge, apparently there's a really asymmetric relationship between a single human and all possible knowledge that has ever existed and will ever exist; and there may even be knowledge that, if a human had access to, they might not be able to understand it, much as beyond, there's nothing written into the laws of physics that we know about that says a human is capable of understanding

everything that does exist or has existed. So that relationship, that paradoxical, because a human needs to make a decision about how to function – in order to function in the world, you need to make decisions, and then a decision is based on creativity as it relates to opinion formulation, and opinion formulation can only be done based on the knowledge you've had access to. And because we can't have access to all knowledge that has ever existed or will ever exist, then all we're ever doing is navigating our ignorance, that's where the term ignorance navigation came from, or that paradoxical epistemic relationship between a single human and all possible knowledge is what I refer to as the axiom of the infinite unknown – because it's like a ground floor concept, as soon as you realize that, then the only certainty that exists is uncertainty itself.

DANNY LENNON: Right. Like you said, the uncertainty is the only certainty we have, as in like, we don't even know what objective reality is.

CIARAN O'REGAN: Yeah.

DANNY LENNON: And that's a really well understood thing that pretty much everyone with insights would probably agree on, we don't know what objective reality is, are we in a simulation, whatever, like these are legitimate claims to make, because we can't say yes or no, yeah.

CIARAN O'REGAN: Yeah, and the thing is like, just because we can't be absolutely certain about something as this is the 100% infallible unalterable bedrock truth about anything that we can know other than uncertainty itself, that doesn't mean that it doesn't serve a practical utility to try and reach an objective truth if it can be found at all which it likely can't. But as something as pure as physics, it's so obvious, because it's based – as you said, it's the harder science we have, it's the closest thing to objective reality that we have, whereas the further you get away from physics, the more wiggle room there is for

people thinking that they have certainty or thinking that they're closer to certainty than they actually are, because the experimental means of finding out how close they are, are less robust.

DANNY LENNON: So I think that kind of gets into one of the central concepts of all your pieces together, and it's off the back of awareness that we should have of how ignorant we are, the amount of uncertainty around everything. And then at the very start you talked about how the pragmatic value in this is in decision-making that we can use within our life, and a decision-making basis at the center that we have to put this awareness of ignorance. Now, once we have that, let's presume we got that first part down, we are willing to say, okay, we're going to be totally aware of all this ignorance and uncertainty that we have to navigate through. Then, if it comes to decision making, that is going to get based on how someone thinks through those kind of problems which is kind of what you talked about and it's almost like these different branches can come from there, one is going to be dictated by someone who fully embraces that idea of ignorance navigation and they can go that route of, well, how should I make decisions, and that's going to be based on the scientific thinking – to you, what is scientific thinking and how does that tie in to day-to-day decision-making?

CIARAN O'REGAN: In the first part of the series, the uncertainty one, I presented this in a hypothetical scenario where there was, let's say, you're a person, is in a conversation, ends up in a conversation with three people who don't just have a different opinion to them but as different an opinion as possible to them about a particular thing. Before people jump into the conversation and just start flinging information at each other, they kind of posited the idea that maybe the first thing that might be worth doing is laying the rules of engagement. So we do that by asking them what would it take to change your mind on this topic. So then we're laying the

rules of engagement in terms of we're figuring out, well, not just where are you – when you get the answer, and you don't just find out where they are in terms of the utility of the conversation you are about to have, but you're also finding out how it is they got to their opinion in the first place. And so, let's say, person one says, I'd be willing to change my mind in light of evidence, and I'd be willing to entertain that your viewpoint is a more accurate reflection of reality than my own, I'd be willing to entertain the idea of changing my mind basically...

DANNY LENNON: If provided with...

CIARAN O'REGAN: With evidence.

DANNY LENNON: This time of evidence, yeah.

CIARAN O'REGAN: Yeah. And then the second person says basically something along the lines of I'm right, you're wrong, I'm going to show you what. And the third person doesn't even engage in discourse in relation to the topic, and instead they either literally leave the conversation by leaving the room, leaving the place, putting headphones on, just ignoring you or whatever, or figuratively leaves the conversation by slapping a label on you in order to discredit your opinion. So let's say, it's an opinion about something, I don't know, let's pick a hot topic like, it could be gender pay gap or whatever, pick a spicy topic. And then the person says, look, they won't even engage because they go, you're just a show-off and you are just a sexist, we can't have this conversation, because the idea of even having the conversation to them means that they're not even willing to engage in the topic, so they slap a label on you to discredit your opinion so that they don't have to engage, so they figuratively run from the conversation by taking away the idea of a logical exchange of information in the first place.

The first person who is willing to change their mind in light of evidence, that's what I call it that, a scientific thinker; second person who thinks that they've found truth and what truth is and they're just going to defend it, that person I'd refer to as a believer thinker because they have this faith claim or this belief and they're going to defend and they're not there to learn, they're not there to exchange information, they're just there to show you why you are wrong. And then the third person won't even engage, I call them, because they literally or figuratively lead the conversation, I refer to them as a victim thinker, because they just see themselves as victim or they see themselves as protecting a victim or whatever.

DANNY LENNON: We can see examples of those even in online conversations, particularly with nutrition, like I can think of one where you'll have some people that will say, like get into what you could think of as a debate but in kind of a cordial fashion of saying, okay, you've made this certain claim, what evidence do you have to support that, here's some counter evidence you might have seen, can you show me what you've come across because maybe that is something I haven't seen, right, so that's one way to engage that person, that scientific thinker. The second one is akin to just blocking someone on social media – someone says, hey, you made this claim, do you have any evidence for that, or did you see this counter evidence, I'll just block you from Twitter or Instagram or whatever. And then the final one is the same that you see a lot of time. If someone questions something they've put out or puts a counterpoint to them, it's again an attempt to try to discredit them by saying, oh this person is a shill or...

CIARAN O'REGAN: Yeah, for big sugar companies...

DANNY LENNON: Yeah, bought off by that conventional, like, you can't be trusted because you're within conventional science or conventional medicine and using these labels as if it's some way that you don't have to provide evidence for what

you're saying. So all those three things are readily accessible to people's probably experience...

CIARAN O'REGAN: What I like to do in general and it's maybe just a thing that I find useful is that I like putting labels and stuff and trying to give names to things because then it becomes a thing. So like then that's why I came up with those terms of believe thinking, scientific thinking was already a concept. But then I was like, well, there's other ways of navigating as well as ways of navigating conversation, so that idea, that set of behaviors of, let's say, the person to use blocking or another thing might be they'll only – another example of believer thinking is that they'll only apply skepticism to research or arguments that don't agree with their bias, instead of applying skepticism to all knowledge. So we should employ skepticism all the time, especially to our own opinions, because a human is, like, I've written many times, is a flawed, fallible, limited irrational ape, and we should be especially applying skepticism to our own opinions because we're so subject to things like tribalism at the expense of tribalism, at the expense of questioning our own viewpoints, things like confirmation bias, things like negativity bias, things like poor ability to think in terms of probabilities. We have these limitations, tendencies that are evolutionary inherited, that are cross-cultural, that are within the vast majority if not all people. But while giving it a shape, calling it a believer thinker, boom, it's looks like a set of characteristics and you can just see it then, you see it, you know what it is – okay, this is what's going on here – victim thinking. So okay, we see it, now this is a set of behaviors, I get it. I know it's this person. And it allows you then to identify what's going on, same way with ignorance navigation, because that's what language does, language gives us a way of putting in borders between where one thing stops, the next thing starts or putting a constraint on stuff.

DANNY LENNON: I think one of the important parts about that is that it's not that there are these inherently different types of people, and that were in this group of where science thinkers and then everyone else are these terrible people. It's fact that no one begins as a scientific thinker. The whole idea of a scientific thinker is that it is inherently non-human. So the default for human is to think emotionally and to have certain beliefs and usually we're going to default to something that explains what we observe going on, and that whatever the best narrative or story to explain that, we're going to go with, and that's usually built on emotion or culture or what were explained by. And so the idea of science and scientific thinking as you kind of get into, it's this tool to remove as much of the human element from our decision-making as possible. So it's a learned skill that anyone can learn, and that anyone that has learned and even mastered at this point didn't start out with it initially, the best scientists in the world. So it's not a thing of us versus them, it's like here's the direction we can all aim to move in...

CIARAN O'REGAN: Yeah, you're constantly working on it. It's like a technology. It's scientific thinking. It's a technology to help us combat tendencies that affect our ability to objectively navigate reality. So an example would be, say, like tribal conformity, like it's like this idea of ascribing to a particular set of beliefs just because your tribe or a group of people that you want to affiliate with or that are important to you, and you ascribe to their beliefs because you want to be part of that tribe. That would have served an enormous evolutionary advantage because it would have kept you alive. Because a human, in a hunter-gatherer, pre-agricultural time, even now, you can't survive solely by yourself without other people.

DANNY LENNON: Yeah, it's not an inherently bad thing. We're saying like, it's actually a good thing because in many areas of our life we want that, we want to be belonging to certain groups, we get a lot of

benefit from it, so it's understanding that that's going to happen, that's going to be your default to go to because it feels good...

CIARAN O'REGAN: To the evolutionary program thing, yeah.

DANNY LENNON: So for some decision-making, it might not be the best, or at least can bias our opinion. So we have to try and mitigate that, although doing so a hundred percent is almost impossible.

CIARAN O'REGAN: Exactly, yeah, and that's we're doing is we are – and we talked about this number of times – something like Decartes' Error; that concept that reason and emotion are separate. And a really good example from that book by Antonio Damasio by the same name, is that there was this guy who had brain damage, and it basically meant that he didn't experience emotion. And as a result, he could function in the world in terms of doing things that were kind of mechanical and repetitive or math and stuff, stuff that didn't – even certain parts of kind of it, not even all math, because imagine there's a lot of a feeling to that as well, but he could do stuff in the world, he could function. But he couldn't decide what to have to eat because you literally, like even the way that we speak to each other, we go what do you feel like having for lunch, like what do you feel like eating tonight, like after this we'd go out for dinner, what do you feel like eating. And then, you literally – even the language we use is based on feeling, and that's emotion, that's not logic. You cannot logically determine which pizza to eat unless we are getting in the way of emotion, like you're not eating – unless you're him, and you're just... saying what happened for this fellow. I think, if I remember correctly from the book, lunchtime would come about and then he'd just decide – trying to decide what to have for lunch, and then it's time to go home at the end.

DANNY LENNON: Yeah, there's no objectively accurate answer.

CIARAN O'REGAN: Yeah.

DANNY LENNON: So even if you were just completely robotic about your food and, let's say, you're a machine and just only care about doing...

CIARAN O'REGAN: There's so many different ways...

DANNY LENNON: Stereotypical robotic, yeah. So like would the exact same amount of calories and protein from chicken versus turkey make a difference, what should you pick? Objectively, no right answer. So it comes down to feeling or just saying, oh I'm picking this. But if you have to come up with a rational answer to it, there isn't one, so you can't make the decision. That's wild.

CIARAN O'REGAN: Yeah, I kind of see scientific thinking as it's a learned, as you said, technology, it's an error correcting machinery. Because as much as we need emotion to make decisions like to be able to decide what pizza to have thereon, it can get in the way of clouding objective understandings of reality itself of the reality that is. So that's what is scientific, that's what science does. Scientific thinking is an error correcting machinery that helps to navigate our ignorance.

DANNY LENNON: That is the perfect kind of segue for one of the topics I want to ask about, and it's that use of that term science, because you just laid out now scientific thinking is this way that we can navigate around the flaws of human thinking and try and remove the human element for it to try and make objective decisions. And if we follow the kind of set process of scientific thinking or science, that should get us closer to these objective facts. But then we have this counterpoint that some may make that – of certain problems with science, that science is biased or science has this, that, any other problem that we can maybe discuss. And, in fact, I actually sent you the other day after we had a discussion about this, a clip from...

CIARAN O'REGAN: Yeah, that was perfect...

DANNY LENNON: Russell Brand's recent podcast with Neil deGrasse Tyson, and they bring up a bit about science and Neil deGrasse Tyson is trying to make a point about it and Russell Brand essentially puts across this idea of science being biased, but you can see there's this mismatch between how he's viewing the term science versus what Neil deGrasse Tyson was using originally for the term science. And in fact, if I can work this with copyright and so on, I might insert a clip of that into the podcast at this moment...

RUSSELL BRAND: So my concern would be as a great man of science, do you have concerns that the field of science, whilst its findings are transcendent and – verifiable and transcendent of politics that their funding, for example, and many of their objectives, say in the pharmaceutical industry, weapon industry, are contained and ultimately controlled by primal motives that do belong in that 2% deficit chimpanzee land that we thought we'd left behind, ways of enforcing power, ways of demonstrating control.

NEIL DEGRASSE TYSON: There's no question that what science gets funded is driven by geopolitical forces. There's no question about that, and geopolitical could mean economic, it could be militaristic, it could be hegemonistic, any and all of the above, no question about it. But it does not affect what science finds to be objectively true – that answers to a higher power, that's the funding source. That is nature serving as the ultimate judge, jury, and executioner of an idea. And it is possible, by the way, scientists are human, just like anybody else, and we have bias like anybody else. We might be a little more aware of our own bias, but we have bias. So fortunately, the methods and tools of science have systems in place to ferret out that bias. Why is it, how does that work? You came out with the result and I think you're biased, I'm going to do your experiment to see if I get the same result. Well, I got a different result. That throws your result into question and it throws

in your integrity as a scientist into question. I get credit for showing that you're wrong.

RUSSELL BRAND: Yeah, in the more esoteric circles of academic science perhaps, but not like if you're churning out some opioids across [inaudible 00:25:33] and I would say, no, you shouldn't be selling Percocet and Fentanyl, it's a new study because that's not in the interests of the pharmaceutical industry. So I would say that the ultimate ideology is a capitalist consumer ideology and scientific pursuit, even though it's based on objectivity has to exist within that framework. And as a result, there's an incremental but continual bias towards the results that do not challenge the interest of the powerful, and that challenges the fundamental objectivity of the entire discipline.

NEIL DEGRASSE TYSON: No, not the objectivity. It challenges the – there could be entire branches of science that go unresearched, because they are not of interest to the state.

RUSSELL BRAND: Yeah [inaudible 00:26:13].

NEIL DEGRASSE TYSON: And that's sad. So occasionally you get people who are wealthy and will fund their own research project. Or if you win a Nobel Prize, you get a $1.3 million, a $1.5 million and then you start your own project and you're not beholden to the wishes of the state.

RUSSELL BRAND: Or big business.

NEIL DEGRASSE TYSON: Or the economic or political wishes. My book before this one was titled Accessory to... Yeah, exactly, the unspoken alliance between astrophysics and the military, and there's a very real fact that in spite of the general liberal anti-war posture that I and my colleagues take with overwhelmingly liberal progressive anti-war, there are common needs that overlap with the military, there are innovations in the military that we have exploited, there are innovations that we have invented that they have exploited. And this overlap is a two-way

street, and it's been going for centuries, even millennia. So it doesn't change the objectivity, it changes just the categories of things that get researched, that's all.

RUSSELL BRAND: And in a sense, how can we make any claim to objectivity when there is such evident bias in the direction of study – it's not ultimate objectivity, it's...

NEIL DEGRASSE TYSON: That's a different bias from bias in your actual research.

RUSSELL BRAND: Yes.

NEIL DEGRASSE TYSON: So I want to separate those two.

RUSSELL BRAND: I would agree.

NEIL DEGRASSE TYSON: Definitely, the state will fund what they want to see. If you now do the experiment, you can do it in an unbiased way; and if you don't get the results the state wants, that's too bad for the state.

RUSSELL BRAND: Yeah, but you ain't...

DANNY LENNON: But before we get into those problems people can run into, you've kind of set the stage for that in one of your pieces, by you saying, look, we have this term science, but depending on the context do you use that in a conversation or in a sentence, it can have different meanings, and we need to, number one, know what those different meanings are; and then, two, be aware of cases in which different people are using those different meanings whilst having the same conversation. So to start, can you maybe mention – I think it was like four primary classes of meaning for the term science depending on the context – can you outline some of them and then we can maybe get into some of the problems it can cause?

CIARAN O'REGAN: Yeah, so what kicked off all of this was that even an enormous interest in all sorts of stuff as it relates to politics, economics, the structure

of our political system, democracy, and it was actually through scientific thinking that I ended up getting so obsessed with epistemology and science from a philosophical sense. And then I started looking at, well, what are the bottlenecks or the boundaries, the things that are stopping people from being able to understand science and what science is? One of them is what I refer to as brain gardening, which is, brain gardening is a term I use to describe the addressing of a complex narrative or a complex situation with an overly simplistic narrative, or an overly – or addressing a complex situation with an overly simplistic solution. The reason I call it brain gardening is because that kind of behavior is akin to performing brain surgery with gardening tools. It's drastically inappropriate. It's not enough nuanced, not enough complexity, and enough precision in what you're doing, not enough acknowledging, it's literally too low a resolution.

DANNY LENNON: It's kind of where we see any reductionist analysis that doesn't take account of a very complex area. So one that's been discussed a lot on the podcast before, and I mentioned quite a bit where people take a reductionist simplified view of something is when we look at carbohydrate-insulin hypothesis of, if you were to have some of the narratives, not everyone, but some people that will say – well, if you eat carbohydrates, blood glucose goes up, insulin goes up, what we know about the function of insulin is when insulin is high then you get this suppression of lipolysis, you get the increases in the process related to fat storage within a fat cell, therefore eating more carbohydrates surely relates to someone putting on more adipose tissue. So that's this one very narrow field that doesn't take into account all the other stuff that may influence body composition but also any of the other things that insulin does or the time course or really any other variable, so it's a very simplified issue. So yeah, it's trying to take a complex detailed issue and trying to

explain it with a solution that is maybe reductionist in some way.

CIARAN O'REGAN: Yeah, the prime example as well is – to get back to your initial question again, from my unsurprising tangent – so in science basically, the world science is, from my understanding, so far in the way that I've kind of thought about it and kind of tried to make sense of it in our language, the vernacular, the word science is used to describe four different things that are related but separate. One of them is the field of study of the study of nature. The second one is the human endeavor of studying nature – I'll get back to in a second why I separated them out. The third one is the method of investigation, the scientific method used by the humans to investigate nature. The fourth one then is the body of knowledge generated by the methodology, but used by the humans to investigate nature. If we bring it back, the first one, the reason I separated that out from the human endeavor of doing it is because of innate human limitations. So for example, there is a theoretically perfect way of investigating nature but a human can't do it, but yet, or maybe might not ever be able to do it. You look at something like the observer effect in the perspective of light as a particle or a wave, and what appears as interfering in what's going on, we're altering the result; by trying to observe what's going on, we are altering the result; because of our innate limitations we're limited in how well we can interpret reality; but there is a theoretically perfect interpretation of reality that we just can't do, that's why I separated them out.

DANNY LENNON: Right, and I think, I mean, every researcher in the world is aware of this when they look at, okay, I'm setting up a study, what threats are there to internal validity, what threats are there to external validity; in other words, if I were to follow the scientific method, this is like ideally how we test something; what are all the things that we as researchers could do that would interfere or could the participants do that

would interfere or things external to that that we can't account for or the scope that we have based on the apparatus we're getting, like all these million different factors, funding, everything can impact the ability to have a perfectly done piece of research. But at the same time, that doesn't say anything about the method itself, that stepwise process of trying to objectively work things out, it's some other chink in the chain.

CIARAN O'REGAN: Yeah, and second is the fact that there is the potential for people to be working in the field of science, that themselves have biases, that could be research publication bias where certain companies decide not to publish studies that don't support their product. So there's loads of studies done but they the only published, so then there's a bias in the pool of research based on, so that, let's say, a drug company might do whatever and then that bias is done because it's not in their interest of said profit. But that doesn't mean that the scientific method itself is broken, for example. Similarly, someone could choose not to use a scientific method at all and just produce fraudulent stuff while working in science and not just make update and get studies published that made up data, and not have used the scientific method because the scientific method is largely based around trying to find out where you're wrong, trying to, like, you come up with a conjecture and you try and refuse it, and you do that with ideally something like an experimental sense. The harder you try to come up with an experiment that is going to show you that your idea is incorrect, then the more robust the information that comes out the other end of it, and the more likely it is to be an accurate reflection of reality.

The best scientific knowledge is the stuff that's had the most sledgehammers taken to it, and it's still around. It's not about trying to support your idea, it's about trying to find out where your idea is wrong as aggressively as possible, because then what you're left behind with it is

more likely to be an accurate reflection of reality, whereas there are people who may be operating in the field of science who are working in science, who are not trying to reach an objective truth if it can be found at all, they think that they have found an objective truth and then only perform researcher, perform – go down rabbit holes that they're trying to accumulate evidence to support their existing voice, they're trying to set up studies that are more likely to show that their bias is the case.

DANNY LENNON: Yeah, I think that was the main confusion in that kind of Russell Brand piece that we mentioned because his kind of argument was how can science be objective when we know, let's say, big corporations are funding certain things are not going to publish certain things. And yeah, a certain piece of research may be biased, but the science as a field or how science works is still an objective way of arriving at decisions, right, could have [inaudible 00:35:48] that we replicate studies independently, we build up this body of knowledge over time, we have this process for trying to minimize these biases, that's different from these certain pieces of research were done in a biased way by a biased human being.

CIARAN O'REGAN: It's that, I think that's the limitation, like I was saying earlier about language – language gives shape to stuff, but language is also inherently limited because language is based on, when I say a word, what you might – or let's say a sentence or anything, you're not interpreting that exactly as I'm meaning it to be interpreted because you're interpreting that based on previous understandings of context of certain words layered upon understandings and layered upon understandings. And there's an inherent limitation to language as well because of that where something like mathematics isn't open to interpretation from the perspective of like, if I put, I'm an engineer here in Ireland, and I put together a set of – or a physicists, and I put together a set of plans for a certain machine, and those plans are done out and are

presented in using various forms of SI units with specific measurements from just that perspective, that is far less open to interpretation than if I write a letter to you. I could send that set of instructions done it out in SI units with drawings, I could send that to a Japanese guy who, even if they don't speak English and that will get built; whereas I could send an email to you or native English speaker, I could send an email to you and there's so much room for interpretation from what I am trying to say to what you're reading in it if I were just – no matter what we're talking about, because language is so open to interpretation whereas something like any math or SI units aren't to the same extent.

What's really important for people to understand is that I think as a way of understanding what science is, is the fact that the word is used to describe different things, and people like Brand in that situation seemed to just have his wires crossed about what science meant. So he heard the word and he was saying, well, as you said, how could it be objective when there are biased people working within it, essentially the essence of what he was saying, and that's the case but that doesn't mean that the method itself is broken, the method itself works precisely because it helps us to overcome our inherent bias, and that's why it's so useful. And then the knowledge generated out the back of it, that is the science on a very – like someone might say, the science on this topic shows what they're referring to is that body of knowledge on the particular topic, but that in itself, it just feeds into our ability, it's just knowledge to help us determine viewpoints, and to open doorways for further investigation. So there's a really good definition of science by a guy called Jacob Bronowski, I think it was, who's like this polymath biologist historian dude from – he was around in the 60s, 70s I think. He had this phrase of like, science is the organization of knowledge in such a way that it demands more from the hidden potential of nature. That's the

description he had of it, that kind of covers a lot of bases because every bit of knowledge we get out the back of the scientific method is just opening more problems, it's just opening more doorways, because it's just giving us more knowledge, more accurate knowledge ideally to be able, for us to be able to have creative, to come up with creative conjectures about the workings of nature that then [inaudible 00:39:19] conjectures. So a conjecture is a technical term for an opinion made without complete information, but because of the axiom of the infinite or known that I mentioned earlier on, no human ever has complete information about anything. So that means that all we are ever doing is making conjectures. Another way that physicist David Deutsch puts it as the beginning of infinity that every time we make a leap forward in a scientific understanding or a more accurate viewpoint in the workings of nature, all that's doing is opening a potentially infinite number of other directions to go down off the back of that. So every time we learn more, it's opening another doorway to infinity.

DANNY LENNON: I want to talk about a couple of pragmatic things, so first from your own perspective since going down these various different rabbit holes and thinking through a lot of stuff and writing out thoughts and drawing in information from different areas and kind of arriving at some of the conclusions you have in this different area, number one, has it influenced the way you think about things, in general; number two, how that has influenced how you operate as a practitioner and a coach. And if the answer is yes to those things, is there anything that comes to mind or how would you describe in what ways it's changed how you think?

CIARAN O'REGAN: I think what it's given is, it's actually, it's so freeing, it's paradoxically – once you can come to terms with this concept of uncertainty as the only certainty, and your perpetual inescapable ignorance as a human, and the fact that all we're ever doing is navigating ignorance, and

that certainty except the existence of one certainty doesn't exist from an objective sense, then it's so freeing because it puts you in the situation of like, okay, I don't know that.

DANNY LENNON: Because that's one of things that most people struggle with, they start learning about something and they learn more and more, and then, after a while, people like, man, I just don't seem to understand anything. There's just all this stuff out here, whereas the ironic thing is that that's probably a good sign if that's the way you feel, because if you feel like you know everything or you've got most of the answers, it's probably not that you actually do, it's probably that you're just unaware that you don't know.

CIARAN O'REGAN: Yeah.

DANNY LENNON: Actually, I think, you might have referenced this in your article, a quote from Thinking Fast and Slow by Daniel Kahneman – and I'm going to try and pull it up because it was a great quote that gets to that, I can find it here. So the quote was, and this is the one you referenced, so it's a Daniel Kahneman quote from Thinking Fast and Slow that says "You build the best possible story from the information available to you and if it is a good story, you believe it. Paradoxically, it is easier to construct a coherent story when you know little when there are fewer pieces to fit into the puzzle. Our comforting conviction that the world makes sense rests on a secure foundation – our almost unlimited ability to ignore our ignorance."

CIARAN O'REGAN: Yeah, that's class.

DANNY LENNON: And that kind of speaks to that point, right, being at peace with feeling like you don't know everything.

CIARAN O'REGAN: And that's it, it's like how it's benefited and just changed in a positive way or changed the way I think in a positive way is that it's made it okay to be wrong, it's made it okay to have an

incorrect viewpoint; it's made it okay to go, oh Jesus, that's – cool, no, thanks for, like it kind of helps to – because we love to be certain and we love to be correct and assert, and we have this egotistical stuff to think that we have stuff figured out that we can assert authority...

DANNY LENNON: Or even beyond that to show other people that we have it figured out. I think particularly for a coach, right, one of the traps that we fall into is I need to be seen to have all the answers for these players that I'm working with or these people I'm coaching, and there's that part as well that would seem to be certain about stuff as well as just wanting to be certain.

CIARAN O'REGAN: I've had players say to me, some of my athletes say to me that, not to toot my own horn, but that they enjoy the fact that I'm willing to say I don't know that but I'll try and find out for you. That I get asked the question about a particular, it could be a supplement, it could be a training modality, it could be anything, whatever. And usually, in relation to sport, and I would say, sport science, training condition and physical preparation, nutrition, whatever, and the fact that I'm willing to say – totally willing to say, if I'm not comfortable, and if I don't have the requisite knowledge, I am totally comfortable saying, I don't know, but I'll try my best to do, I'd dig in for you and figure out what's going on here, e. And the fact that I'm instead of just trying to bluff them, instead of just trying to seem like I'm this omnipotent dude that just has all the answers and that I'm just going to just blow up from [inaudible 00:44:34] all the big words that leave them stumped, make them kind of embarrassed because you see people do this, some coaches do this unfortunately, in any field people do this, they don't know what's going on, they're just that plain word soup and flinging word soup around as if they're really smart and they're trying to demonstrate their knowledge, but they're not actually saying anything.

DANNY LENNON: No, and I think they might think that they're fooling people, but probably not, right. If you have a really complex answer to every question, a team of players is asking you, I think probably, surely, some of them at some point are going to say, I wonder is this guy actually full of shit or not.

CIARAN O'REGAN: Yeah.

DANNY LENNON: Or even at least question that whereas I think the answer you gave there, you said to me, look man, I don't actually know 100% answer to that, but I'll do my best to find out and I'll get back to you, like there's nothing that can't be any more genuine than that, right?

CIARAN O'REGAN: Yeah.

DANNY LENNON: There would be no reason to know the answer and say, I don't know, I'll find out. So they know that you're telling the truth, and if you're doing that regularly, then when you do have an answer, they are like, oh yeah, this guy is telling the truth because otherwise he would just tell me he didn't. And so, that's a really good example because I think it's a thing that as practitioners, whether that's coaches, nutritionists, and so on, that everyone kind of struggles with, even in how we interact on the internet as well, because it's kind of seen as a positioning thing. Yeah, there's something just really freeing to do that.

CIARAN O'REGAN: Especially as it relates to human interaction, it's really interesting to have these concepts to catch yourself when you feel the defense is going on. So you end up in a discussion with someone and they happen to have a particularly different viewpoint, and then you automatically, as they're speaking, I'm hardly alone in this experience, but you might automatically or I would have, I would in loads of circumstances continued to have his defense mechanisms go up as they're speaking. Instead of me entertaining their information as if it could be more accurate than my own, I'm

automatically coming up with counter-arguments instead of genuinely listening and playing, and like bringing their ideas in and having a look at them and flipping them upside down and go, hmm, this is interesting. Instead it's my counter to this, my counter to this, and then you catch yourself. Having this awareness of epistemic humility to entertain opposing arguments as if they could be more accurate than your own, you can literally catch from my own experience, catch yourself doing it, catch yourself doing the opposite which is just defending immediately, catch yourself and then go, okay, wait, let the information in and play around with it. And let their opposing viewpoint come in, play around with it, analyze it, have a look at it, and then it's a win-win then because either you are wrong or your viewpoint is less accurate than theirs is, that's what I mean by wrong in terms of how it reflects reality from an objective sense to be more specific – either you're wrong and you learn, and now you can course correct, and stop going down a less accurate pathway, or you just end up coming across more or it ends up being almost in an experimental scientific sense, it's taking sledgehammers to your own ideas; and if your ideas are still left behind after you try to take a sledgehammer to your own ideas, we're using this new information or knowledge that this other person is presenting you with face to face interaction or written article or podcast or book or whatever, then you're just left behind, then if you've tried your best and you've honestly tried to take a part and deconstruct and bash your own viewpoint with a hammer and still it's left behind, then it's more likely to be robust if you've genuinely tried to find out where you're wrong. So it's a win-win.

DANNY LENNON: Yeah, I've found that as well, because I think if you dismiss people that have points that from the surface seem to be kind of quite flawed, or they are bought into a certain ideology, and let's even say we're fairly sure that it’s not a sound claim that they're making, nonetheless they came to this conversation or this

discussion or online forum with this idea. And so if you're going to engage with that person, number one, we should probably try and understand how did they come to that viewpoint; but two, if you can understand the points they're making and then you can get to a point where you can make yours not in a dismissive way that just loses them, but what would I need to talk through with this person that's actually going to get them to see where I'm coming from and we can actually engage here, then you might slightly change how you communicate that same idea in the future, so that people like that person are now also going to be brought on board if that makes sense. I've seen that in some ways of trying to tweak certain messaging so it kind of allows people from certain perspectives to initially engage with them, and also addresses may be the key criticisms or talking points they would have heard from some sort of flawed ideology that you can include that within your own explanation without outright being dismissive of it.

CIARAN O'REGAN: Popper actually used to do the same thing, Karl Popper, who's one of my intellectual mentors. Even though he's long dead, his books are class. He had this thing, he used to do it as well where he'd be in a debate and he'd present the opposition argument to them, in as robust means as possible, and the best he'd present their argument back to them with as much clarity as possible and then he'd proceeded to deconstruct certain parts to take certain elements apart to show where there was holes in the understanding. I know we've discussed this before steel mining in our position where you try and take the opposite of straw man – straw man is you just take an overly simplistic description of their argument and then you just beat that up, it's easy to beat up because it's literally a straw man; deal man is like what's their argument, what is the most powerful version of their argument that I can possibly come up with and in order to do that forces you to understand the opposition argument. We

talked of Dan Dennett, you mentioned Dennett...

DANNY LENNON: Yeah, in Dan Dennett's book, Intuition Pumps and Other Tools for Thinking, it's one of the ones I recommend people quite a lot, and it's the same idea, there's a part in that where he has this four-step process for engaging in debate with people, and essentially the four-step process to go through before you go for a kill shot in terms of your argument because – and then to start off, so the same as you just described, take that person's viewpoint, repeat it back to them in the most charitable terms possible and get them to agree that is that your actual position, just so that you both agree, because oftentimes the same concept is what you talked about with wires crossed, of people arguing back and forth, but not really about the same thing. So if we can say, okay, is your position this and then you lay it out in the most charitable steel man terms, and then if they say, yeah, that's a pretty fair assessment of what mine is, then you can move on there and present counter arguments to that. But if you haven't done that step, then you might be talking about something that's not relevant to their point.

CIARAN O'REGAN: Even with Dan Dennett example, it's like another benefit to that, like I was saying is that if you go down the rabbit hole in the idea, to the point where you want to be able to understand it enough to be able to steel man it, it would be as powerful a representation of the idea as possible. There is always the chance that you realize, oh I didn't realize this, this is you just – and all of a sudden you course correct. So it's win-win because either you – it's win-win-win-win because either you end up realizing that you were incorrect or you end up coming up with the best possible understanding of the argument so you find out where the bedrock foundation stone is, so you know what to hit with a sledgehammer. It's a win-win, so either you learn or you now realize

how to dismantle opposition arguments. So it's win – it's class, but it comes down to humility.

DANNY LENNON: You've got to a stronger conclusion regardless, you've already got to a more accurate one, or you've got – you are on and that's more robust now to other criticisms, so you would mention there how this trying to overtime refine this journey to becoming more and more scientific thinker, realizing there's no ever perfection but trying to do that more and more, trying to use that type of thinking for decisions in various different areas, how that's impacted your coaching for example, how you might interact with people that you're working with in that context So for many people listening that are like, look, I'm totally signed up, I'm into the whole scientific thinking idea, I fully accept all these ideas around ignorance navigation and uncertainty, what are some practical things I can start doing – or maybe a better way to ask that is, if I were to ask you what questions people could ask themselves, that might help them in this area, are there any that come to mind, to jot down on a piece of paper, like here are some things that I want to ask myself, or here's some exercises I'm going to do, or here's some set things that you'd advise people to start doing if they came to you and said, Ciaran, what's the best way for me to improve my scientific thinking, is there anything that that you would recommend?

CIARAN O'REGAN: The first thing that springs to mind is the very question that I had in the first science article, would you ask yourself, especially the topics that you hold that are very – there's a lot of emotional weight to it, and it's entangled in your identity is to ask yourself – or it feels like the defense mechanisms go up when someone starts questioning it. It happens to me all the time, I'm still human. As I said, I'm a flawed, fallible ape as well, it's asking yourself what would it take for me to change my mind on this viewpoint. So what do I need to come across, need to change my mind. And if the answer is nothing then unless it's about uncertainty itself

from an objective sense – I know we're talking about subjective truth earlier on, a subjective understanding if there's such a thing – but from an objective sense, as it relates to an opinion about the world, if there's anything that you're not willing to let go in light of evidence, then you don't have that idea anymore, you maybe never had it, that idea has you, it's as versus has is the way I describe it.

DANNY LENNON: So maybe a better way than saying do I do that would be to say about what topics do I do that because there's almost certainly something that all of us have where we have committed that kind of flaw of I have this certain opinion or act in a certain way or have this certain viewpoint that's based on just an inherent belief or bias towards it that I really have tried to dismantle and I don't really want to change if someone did find new evidence, and what areas are they, and then you can start investigating those.

CIARAN O'REGAN: Yeah, that's the first one that's brings to mind because I think of it in terms of ideological possession, it's like people don't have ideas, ideas have people. I think that's a Carl Jung quote that Peterson referenced. But I don't know if that's always the case – I don't think that's the case, I think it's either a person has an idea or an idea has them. So for example, if you identify your sense of self with a particular idea, then it's not you that has the idea anymore, it's the idea that has you. You're under ideological possession because that idea is intertwined in your identity, you and it are wrapped up in the same thing.

DANNY LENNON: There's no room for you to be able to change it. I think you used the term Belief Guardian in one of your pieces, right?

CIARAN O'REGAN: Yeah, Belief Guardian. That's if there's an opinion that you have, that you're not willing to let go in light of evidence. Then that means that the opinion has you rather than you have it, whereas if there's an opinion that you have that you are genuinely willing to let go in light of

evidence and you're willing to update your views in light of evidence around this area, then you have it, because you and it are separate, and you can let that go in light of new evidence. That's the difference, it's like what – so that's the first question I think is asking, it's like what would it take for me to change my mind on this. Another one could be, let's say, you end up in a heated exchange, there's an idea and even if you can identify those, even if you can identify it, [inaudible 00:57:24] if I got presented with sufficient evidence then you can still ask yourself where could all you be wrong. So like not only what would it take for me to change my mind but another question which is separate but related is where could I be wrong, where could the holes be in my game here. If I was to critically analyze an objective, that means it's possible, my own viewpoint or opinion – where could the holes be in my game – those kind of questions, because we already have a drive towards certainty, we already have a drive towards brain gardening, we already have a drive towards tribalism, we already have a drive towards confirmation bias, we have drives towards all sorts of cognitive biases, we have drives towards things like negativity bias, we have all these tendencies that our innate programming as a result of nature and then that get groomed by just things that happen as a result of social interactions that are cross-cultural that are already driving us towards latching onto overly simplistic narratives, latching onto tribal tendencies, latching onto seeking information that supports our bias rather than information that negates our bias or questions it. So we have all these tendencies already, so what we need to work on is error correcting machinery which is the technology of critical reflection, scientific thinking, Bayesian updating of viewpoints in light of evidence, on an iterative basis in a perpetual sense because uncertainty is the only certainty because of the axiom of the infinite unknown. So we already have all these drives towards certain information, so we need error correcting machinery to keep us on a path

towards a better objective understanding of reality.

DANNY LENNON: I love it and I think it's probably evident to people listening here is some of the people you've referenced during this discussion that you also mentioned in some of those articles is quite a diverse group of people and you have definitely drawn on the perspectives and viewpoints and work of a wide mix of seemingly unrelated individuals. And just as a matter of interest, when I was thinking about this, I said I'm going to look up and see exactly who you went through in those pieces just because I remember as I was reading it, this is kind of cool, so in the end there is – I think there was like 17 or 18 diverse different groups of people. So the fact that this is a piece, just to remind people that three articles that appeared on the Sigma Nutrition website generally on the topic of science – so there are many that are fairly standard that you'd expect to see in a piece about science, you had physicists like Richard Feynman, Carl Sagan, you had Karl Popper, Einstein, Newton, Daniel Kahneman as we've mentioned people, people like Philip Tetlock and a couple of others, we've had some authors that have talked about some of these ideas, Dan Gardner and Nassim Taleb, you mentioned Arthur Eddington earlier; and then it starts to get into a more kind of eclectic mix of including those pieces with references to Ralph Waldo Emerson, the writer Anais Nin, mathematician and historian Jacob Bronowski, French philosopher Peter Abelard, the futurist and polymath Jacque Fresco – so they were kind of like, oh this is kind of outside of the usual realm of science, and then you have this other just random ones thrown in discussing science included references to the poet William Butler Yeats, Donald Rumsfeld and Spock.

So with that the kind of point, was there's such an eclectic mix of different perspectives here, and this is of course no surprise to me because I know about the breadth of your interests and reading, but it's not about having these

different interests and you read in different areas because I think a lot of people do, it's the, I suppose, the connection of those unrelated fields or unrelated perspectives and opinions that you've been able to put into this one concept – can you maybe talk a bit about how you've gone about that, the value you might see in it, and is that a purposely done thing where the reading is done outside of what seemed to be related fields?

CIARAN O'REGAN: There's another Eric Weinstein quote where he said, jack of all trades, master of none, but a master of one trade is a connector of none. If you think about it from a perspective what excites me about connecting stuff together is because – and this is actually another, I think this is a Ralph Waldo Emerson line where he said basically that you can't create Shakespeare from the study of Shakespeare, because what magic really happens in the field is cross-pollination between fields. The alternative would be atomization within a field where the really cool line about atomization within a field which is that you end up learning more and more about less and less until eventually you learn everything about nothing.

DANNY LENNON: So for you as a practitioner and let's say we'll take the example of your strength conditioning work with some of the rugby teams, the learning that and reading you've done in areas like philosophy, epistemology, science in general, all these different things that you kind of mentioned and have played some role in influencing your thought process on this, they've obviously tied in to make you as an S&C coach have a unique skill set. I'm sure you can probably think of examples in your own mind of things that you've done, things that you've said to players, how you've gone about structuring or training conversations you've had with them that have been influenced by things that you learned not in your formal S&C education, they were influenced from elsewhere, but nevertheless in an unrelated field or what people would think was unrelated

have had an influence of how you carry out your role as an S&C coach – is that a fair statement?

CIARAN O'REGAN: Massively, yeah, hugely. But then there's a kind of a part with me that I've realized that in order to get better and better at my job, I can't just keep going back to the same, well, I have to move on, I have to innovate by studying outside of my field by looking for novel stimulus to cross-pollinate and bring back into the field, the new ways of viewing things, to develop new methodologies based on the principles. And then even you learn more principles, you learn better ways of describing the principles. So like look at the parallels between complex systems for example, complex system is just a system, a human is a complex system as it relates to training for example because a complex system is from a technical sense, it's not just complicated, a complex system is a technical term to describe a system in which there was a thing called an emergent property, that is a thing that emerges, basically it's a thing that emerges from the system that isn't determinable by studying any of the individual components because it's the interaction between the components that resulted in this unpredictable emergent property. So let's say, for example, there's an exact, there's a parallel between the complex system of a human in regards to the input that we use a particular training stimulus or nutrition and intervention or whatever to ideally manipulate reality and as favorable a means as possible, because that's all a training program is or a nutritional program is, it's like a best guess attempt to manipulate reality in a favorable manner towards a particular direction. That's all the training program is or nutritional intervention that I can – that's my understanding of it. But we can't predict what the outcome is going to be precisely, because there's too many moving parts. So let's say, from a human perspective, you manipulate a certain – let's say, we manipulate certain calorie intake or we bring in a certain training

intervention, that's one aspect of, that's one strand of information or one strand of input going into a system that also has in that particular person that interacts with their genetics their epigenetic expression, their – let's say if it's training, it could be the nutritional status,, it could be what way they're sleeping, it could be their college stress, work stress, relationship stress, – whole load of these different factors that are all interacting, and then there's an emergent property out the back of this system that will be our response to the training effect, but we won't know if it will be favorable or not or how favorable it will be or what the rate of change will be, there's no way we can predict any of that stuff in advance because it's an emergent property, and what we're doing is manipulating just one aspect.

DANNY LENNON: Before we finish, where can people find you on the internet?

CIARAN O'REGAN: Social media is probably a good place to get me. My Instagram account is @ctquarrelsome. I also have a website quarrelsomelife.com, and I have the actual articles on Sigma it might be worth a read for people which are there, the uncertainty one, or basically, Are You Really Science Based Part 1, 2, and 3 on Sigma, so they're on Danny's site (sigmanutrition.com) I suppose was one thing that I'd like to say, and I suppose it's in line with what we discussed is this is just all the stuff, that I talked about today is like it's my current best understanding. But if I've made bollocks of certain philosophies or I've got these holes in my game that someone's noticed listening to this, then please let me know. I genuinely appreciate showing me where I fucked up, where I may be wrong here, and it would be remiss of me to say that considering it's exactly what we're talking about. I genuinely want to seek a better understanding, so if you notice something if I've made mistakes that stand out...

DANNY LENNON: So if you were to advise people to do one thing each day that would have a positive impact on

any area of their life, what would that one thing be?

CIARAN O'REGAN: Deeply thinking about your own death, your own mortality, and the inevitability of it, and deeply thinking about your time as a temporarily assembled cluster of atoms that has happened to reach a sufficient level of organic complexity for you to realize you are such. Think about that and then realize what way, what is like, as a means of for loads and loads of benefits to it, one of them is perspective, and what is difficult, what is hardship, what is suffering, what is, you know, it's like – and also the fact that it allows you to I think connect with other people more because you realize that they're the same, they're also a person who's aware of their own debt and that anxiety or discomfort and they've also lost loved ones and we're going to lose loved ones. And the appreciation that you can get for your own time, for your experiences with other people, for other people to be able to help you have compassion and empathy for other people's situation, and to use that as a means to seek connection with others, I think is – I can't think of a more potent means of doing so than acknowledging the thing that connects us all which is death.

DANNY LENNON: Thank you man for the conversation and thanks for doing it.

CIARAN O'REGAN: Cheers man.