Karl Boehm: Today's guest, Eric Schulze, PhD, is using science to make the world more creatively nerdy. Eric is the cofounder and creative director for Thirst and the Periodic Table, as well as the host for the Smithsonian Magazine's first ever digital studio's produced show, Ask Smithsonian. Eric Schulze, PhD is a molecular biologist for a molecular biologist, speech writer, online television show host, entrepreneur and educator. Eric consults on how science is representative and is represented and communicated on the small and large screen. Currently Dr. Schulze is on detail with the National Science Foundation as the Stem Coordinator for the United States government, cross-agency priority, goal of producing one million stem graduates and 100,000 stem educators within ten years.

Dr. Schulze also speaks and writes often about the scientific nature of creativity as well as how science is branded and communicated. Eric will teach anyone who will listen, Eric will teach anyone who will listen about why you should never stop learning about this cosmos. Catch Eric nerding out in print, online, TV and live performances. His work, ideas, nerdery and gingerness have been featured by the Smithsonian, the Washingtonian, Worn, PBS, national academies of science, NASA, the American Association for the Advancement of Science, Reboot America, 1776DC, The National Science Foundation and others.

Welcome, Eric.

Eric Schulze: Well thank you for having me. It's a tongue twister to say, especially the name of my show. I always have to end everything with, 'Ask Smithsonian,' 'Oh, go to Smithsonian.com.' Smithsonian is a terrible word to use for anything you need to say repeatedly and often, it's like a giant tongue twister in itself.

Karl Boehm: Now technically it's Smithsonian Enterprise's Ask Smithsonian, right?

Eric Schulze: Correct, Smithsonian Enterprise is the for profit arm for the Smithsonian. So there's the SI.edu, the museums and all the artifacts; and then you have the Enterprises which is what actually makes money.

Karl Boehm: Something's got to make money over there.

Eric Schulze: Yeah, they won't tell you about it, but yeah it's true.

Karl Boehm: Well. Welcome. So today's topic, the Science of Creativity. Something like that, huh? Let's talk about it. What do you think is the backdrop for the Science of Creativity to help prime the Audience?

Eric Schulze: I guess the most important thing that at least gets me, is that it's called the Science of Creativity. Those two words don't go together, at least when you think about it, right? Science and creativity are sort of thought of different realms that don't necessarily overlap. But, what's really interesting is if you dive into the scientific literature you find out that it's a very studied and very predictable. So creativity is a very predictable enterprise. And that science and the arts and humanities, actually share a lot in common in that they're very predictable and it's hypothesis-driven; you can test it, you can study it. You don't think about that, you think of creativity as a muse. It's some sort of divine intervention that sort of touches these people in their daily lives and then they produce like- Picasso produces work, or Einstein produces Theory of Relativity; but not something you can study. That's what fascinates me. So it is, the answer is you can study creativity.

Karl Boehm: Interesting. When did you start studying creativity?

Eric Schulze: I started studying it because of one of the organizations that I run called ThirstDC and basically-

Karl Boehm: How we met.

Eric Schulze: That's how we met. It's an organization that's entire purpose is to make sure that gingers meet each other on a regular basis.

Karl Boehm: And they do incredible things together.

Eric Schulze: A minimum height is 6'3".

Karl Boehm: Yes, just got in there!

Eric Schulze: So what we really did is we started Thirst as basically a giant social experiment. There's Ted Talks, which I'm sure many people have heard of, there are scientific conferences, there are lectures, there's art galleries; what we wanted to do was we wanted to see if we could make small to medium sized groups of people do creative stuff. We wanted to see if we could do it using evidence, like things that you could study and reproduce. I basically wanted to see if I could quantify people doing cool stuff, so I created an organization to try to test those ideas. And I tell people- like I'm testing on you. Like you're my experiment, you're my lab rats. So that's where it started. And I realized that I wasn't getting information I wanted from my own metrics, my own studies, within Thirst itself. So I was like, "You know what? I wonder if anyone's ever like asked a Nobel Laureate how they won a Nobel Prize." That was my question.

Karl Boehm: Interesting.

Eric Schulze: How do we know Nobel Laureates are Nobel Laureates? Like did they know that growing up that they were going to win a Nobel Prize?

Karl Boehm: What did you find?

Eric Schulze: That they did, most likely. Here's the weird thing. People started studying Nobel Laureates and they wanted to know what made these exceptional people so incredibly good at what they do. I mean think about it. Like Nobel Prizes shape the world we live in. They engender new economic theories, businesses, political theories and economies; all these things are created under Nobel Laureate ideas. They're the best ideas we have. So maybe the person that created them was exceptional in some way, or maybe not. And it turns out people studied that. They asked that question, 'could you measure it?' And the answer is a lot of these people did know they were going to win a Nobel Prize. And you could predict that they were going to win it before they even knew they were going to win it.

Karl Boehm: Wow.

Eric Schulze: How do we know that?

Karl Boehm: How indeed?

Eric Schulze: Turns out how much work you put out. So this is a lesson and sort of like a thing that sort of comes out in this research, and we can get into this later if you'd like. But creativity is not quality-based, it's quantity-based. Quality is a totally different thing that we can talk about separately, but the one thing that predicts your success in any creative field that we know across any of the science, art, marketing, public relations, anything; is not necessarily the quality of the work that you've put out because that's actually really hard to measure. It's the quantity, we can go into that. Quantity, not quality.

Karl Boehm: That's amazing. So the Nobel Laureates might have said something like, "Well I wrote enough freaking papers that it was going to happen eventually."

Eric Schulze: Actually that's not really far off. You've just summarized fifty years of creative research.

Karl Boehm: Man, they could have called me.

Eric Schulze: They could have. You could do their marketing.

Karl Boehm: Nice, nice. Yeah the science of marketing. That's actually closer to how we met, the evolution of marketing. That's a whole other topic we really are going to have to explore at some point.

Eric Schulze: Yeah, evolution. Well just evolution in concept to begin with. Like- so evolution has no purpose that we know of. It's junk, it doesn't have an end goal, there's no reason for it to that we know of. But what's really neat is how the environment shapes anything and we were talking about this off the air, is the evolution of marketing. What affects marketing, or what affects evolution? And that really comes down to selection, selection pressures. So how does the environment change the organism to either fit or die? So I guess the question in marketing which I'm curious as a scientist is like how- like what are the selection pressures? What parts of the environment place the biggest like constraint on marketing as a field and force these ideas to live or die?

Karl Boehm: Right. Well you know it's funny because I think of the evolution of marketing a little bit like a forest. You know? In that they're all vying for sunlight. The sunlight could be dollars profit, audience, customer value that they're trying to provide and transmute to their audience. Well, they're literally adapting to try and communicate to other communities. So kind of speaking off the

cuff here, but that really is accurate. They're adapting and in order to get market share, they need to adapt their methods so that they can stand out amongst the crowd of their competitors.

Eric Schulze: Interesting. So how would you say- like for example, the most recent human mutation that we know of is the ability to digest milk. Lactose.

Karl Boehm: Interesting.

Eric Schulze: Happened about 10,000 years ago in a population in Scandinavia. And it's the most recent gene that's spread itself through the human population as something novel. Like we're not supposed to drink milk past infancy, that's a terrible idea. Most of the world is lactose intolerant, but we can if you have any sort of European ancestry. And that's hugely shaped the course of human progress in recent human evolution. So I'm curious, like what maybe in marketing was that most recent evolutionary trait, that most recent selection pressure, the most recent gene mutation that has pushed marketing to where it is now I guess.

Karl Boehm: Sure well I know that this is totally off topic but obviously the Internet changed marketing quite a bit.

Eric Schulze: Well the Internet changed creativity, too. I mean it's totally- one of the questions that's asked is do online communities have the same theory or mind or collective intelligence like we're doing, real life interaction? You're reading my body language, my emotional state to try to guess and know what I'm thinking, who I am. You're empathizing, you're using emotional intelligence.

Karl Boehm: And ginger telepathy.

Eric Schulze: Well what people don't realize right now is we have connected using a Vulcan Mind Meld, and we are actually the same person separated by several cosmic distances that's at the same place- we're quantumly entangled. Our particles know no distance.

Karl Boehm: Really a bonus for me, it's kind of a bummer for you, I'm sorry. My apologies.

Eric Schulze: Yeah, but you're right. The Internet's changed research into human creativity. Arguably we're the most productive we've ever been in terms of producing stuff, and lots of people like to say that maybe we're not producing as much quality stuff but if you remember what we were talking about earlier, quality doesn't matter; it really doesn't. Being able to judge work, that matters, but as a producer of creative work, all research points to it doesn't matter, you just produce. In fact we know that your most cited work correlates exceptionally strongly with your most ignored work. So whenever- and that all correlates to your maximum output level. So you can measure how much stuff you're creating. For example Picasso produced 20,000 pieces in his lifetime as a professional.

Karl Boehm: Wow.

Eric Schulze: 20,000 as an artist in photography, paintings, drawings, live action pieces and you can plot what he produced each year because his life was really well studied and at his maximal output level is when he gained his most well-known notoriety as an artist. And then it presupposes some other conditions like he was already an expert when he first started, he was an amazing, accomplished, traditional painter before he got into what he decided to do and become cubism.

Karl Boehm: Interesting. Wow, you have a treasure trove of knowledge of all kinds of subjects in there. How about- why don't we talk a little bit about how your current work relates to the topic? Because I know

you're having to kick out a lot of creative work regularly. How does the science of creativity relate back to that?

Eric Schulze: The number one thing that helps me, and I think helps anyone if you try, is exposure to what's called distant information. Everyone has an expertise field, everybody. Yours is marketing, mine science. But what's really important is constantly bombarding yourself, actively exposing yourself to information that is not in your realm of expertise. Nothing breeds success like not knowing something.

Karl Boehm: Challenge yourself to learn something new and in that pursuit you grow.

Eric Schulze: Right. The greatest thinkers that we know, these what are called System Builders like Einstein, they were- what they did is they didn't just simplify a system with their elegant equations or what have you. They made the world more simple through making it more complex. If that makes any sense. He used a set of equations to simplify a bunch of different fields, he relegated, he eliminated all kinds of useless information. And then that opened the door to understanding our universe even deeper than we ever had before. It's made it infinitely more complex to us, to a simple little equation, E=MC2.

Karl Boehm: Do you think through formulas and some of these concepts as you're creating for let's say, Ask Smithsonian?

Eric Schulze: Sure.

Karl Boehm: What does that process look like? What would a story look like?

Eric Schulze: So for Ask Smithsonian, it's exceptionally collaborative and although I'm sort of touted as the host, it's a very collaborative and

it's the way it should be in any create endeavor. You should have a creative community and you should ideally run in several. So my team- my production team is my creative community. They all come from different backgrounds. And they themselves field questions from the public, we solicit them. We then take the questions we think would provide the most interesting answer to a large range of students primarily, and then we bounce around ideas on how to answer them. Usually a writer or head writer writes an actual answer and then that goes to the group basically and we sort of provide input. My job is to make sure the science is verifiable and defensible. But what's cool is we have a non-scientist write the scientific answers- or I should say this, we have someone whose domain of expertise has nothing to do with what I know as a molecular biologist, write the science answers. And actually- it goes counter intuitive to most things.

Karl Boehm: Well I mean I guess it makes sense. What's the famous, 'tell me like I'm five.'

Eric Schulze: Yes!

Karl Boehm: You have to really write down. Because people aren't really paying attention and if you want them to understand then you have to just simplify so that they can understand quickly.

Eric Schulze: Sure, yeah you're right. Explain Like I'm Five is my favorite subreddit on Reddit; I'm addicted to Explain Like I'm Five. It is my- if you want to see great communication, you go to Explain Like I'm Five on Reddit; if anyone here is into that sort of thing. What is it- have you ever heard of the web comic XKCD?

Karl Boehm: No

Eric Schulze: By Randall Monroe. He's a computer geek who writes one of the most popular web comics and it's technologically focused. He's

published a book called, 'What If,' and he asks like, "What if you were able to throw a baseball at the speed of light, what would happen? Could you hit it?" And what he describes is basically a nuclear bomb would go off and it would destroy half the earth. But he uses math in an explainable way and he wrote this website called Up Goer 5. How would you explain the Saturn 5 rocket to a five-year-old? Using only words a five-year-old could understand, and it's called the Up Goer 5.

Karl Boehm: Wow. Cool.. Okay, so how about- we talked a little bit about this offline but in terms of your professional background how did you get started in the science of creativity?

Eric Schulze: So like most people, completely on accident. How does anyone get in their career? I thought I was going to be a professional basketball player, I played college basketball and realized I hated basketball. Because when basketball became a business I didn't want to do it anymore, I felt like cattle. So I decided I needed to have a real job, and I actually went to school to become an artist and then I realized, 'Oh, I don't know if I can make a career of that.' I was the first person in my family to go to college. And my parents, as supportive as they were of my academics, really pushed athletics because it was my ticket out of the country bumpkin lifestyle that I was living in.

Karl Boehm: Did you say New Orleans?

Eric Schulze: Rural Texas.

Karl Boehm: Rural Texas, okay.

Eric Schulze: And then I went to school in New Orleans and played two years of basketball, hated it. And then decided science! I can be a teacher! I could like do research. I had a teacher that taught a class- she was

trying a new class, and she was like, "It's called Molecular Genetics." And the syllabus was this, she handed me a piece of paper, she said, "On this paper, in the fibers, is DNA from a bacteria that I've isolated. You need to get the DNA out, cut out a specific gene that I've placed in it, put that gene in a different piece of DNA, and then put that DNA in a different bacterium. Your final project will be handing me that functional bacterium that produces that gene's product- that protein." And I was like, "You can do this?" And my alcohol addled, undergraduate mind was blown that you could actually cut DNA with like molecular scissors and the world opened up for me, I basically had my Carl Sagan moment at that point. The cosmos opened up and the scientific gods spoke to me. I don't know, and then after that I went to school and I ran a lab and got my PhD and I've just loved science ever since. Because of that I've always wanted to know how people make cool stuff, including science, so that led me to creativity as you mentioned earlier.

Karl Boehm: Was there a point where you specifically thought, "You know what, I'm really actually going to study the science of creativity" and how you integrated it into your work?

Eric Schulze: Yeah. So how I integrated it into my work was as I mentioned earlier with my organization Thirst, I really just wanted to know what makes truly eminently creative people, creative. Is there a science to it? And I just took it on a hunch that maybe there was, and diving through literature I discovered some very famous in their own rite fields and authors and researchers, but no one knew about them. Through some of my work at Smithsonian I worked with a woman who had worked with the Nobel Laureate Commission. And she had interviewed a lot of the Nobel Laureates and told me, "Listen these people- like they're fascinating. You should study- there's a lot of work out there," and I started looking them up and looking into the research to see what it said it didn't match with my data from Thirst...

Karl Boehm: Yeah I'm not sure that we paid proper homage to that.

Eric Schulze: Well let me get it from your- I'd love to hear your interpretation of it.

Karl Boehm: Oh man. Yeah, well I was- first of all I've referred a number of people there, particularly single people even though I know it's not exclusively single. But I think it's especially cool for single people because it's like- it's nerdy, drunken Ted Talks.

Eric Schulze: Yeah, you're not far off actually.

Karl Boehm: Right? But it's really cool and I think they're all in DC, or at least they all have been so far, right? And you go to a bar and there's three or four, or however many scientists who are also creatives and at least have the willingness to do the public speaking to be potentially heckled in a bar, giving an interesting talk like 'The Science of Online Dating.' And they talk for what, five, ten minutes, something like that. And it's a very interesting, typically smart and unique crowd that comes through.

Eric Schulze: Yeah, you pretty much nailed it. We wanted to challenge the idea of what communicating was. Just like Nobel Laureates, there's this notion- have you ever seen the Big Bang Theory?

Karl Boehm: Sure.

Eric Schulze: Okay, then the main character Sheldon, who sort of built as this- in sort of a pejorative way, this sort of on the autistic spectrum of disorders he's never outright said that the character's based on that, but he's taken influences he said for the actor that plays him.

Karl Boehm: Sure.

Eric Schulze: I have to be careful, one of my friends is a writer on the show. It's okay Chad, don't be afraid. I'm going to talk a little bit about your show. But the point is they build the most brilliant people on the show are the least communicative, the least socially apt to have a good social experience, like Penny the sort of normal person who lives next door is sort of seen as an outsider for being not smart, and having social skills. This could not be farther from reality in terms of studying science and like where Thirst came from. Nobel Laureates, the master idea creators on this planet are master communicators. They understand the power of their ideas and the breadth of their ideas. Einstein knew that his idea had more than an effect in physics. It would have an impact in mathematics, it would have an impact in daily lives. And I'm sure in marketing too, that the point is they understood how to brand and market an idea. So truly creative people understand marketing; whether they're a scientist or artist.

Karl Boehm: Love it.

Eric Schulze: That's one of the most like revelatory parts I've heard recently is some of the research that came up that like if you want to be the best you have to be the best at communicating it.

Karl Boehm: Very cool. Well the next question that I have is relates to passion. So what keeps you passionate about your work and parallel to that, how do you keep that passion produced into your work? How does that passion keep the work that you're producing going?

Eric Schulze: I want to know everything. I want to know why, I want to know why I can't know something. I want to know all the things. I can't know enough; I literally think this is the only ride I'm going to get on this celestial orb-making, sub-elliptical orbit through an electron cloud in this particular part of this tiny, little galaxy that's fairly nondescript in this nondescript part of the universe. You know and we're this little ape that learned its way down from the trees and onto the ground, but we still looked up. And I still think that like I want to know- I want to know why. And that honestly

keeps me going. Your mind is something you have to exercise just like anything else, and learning is exercising your mind. I just love learning. I love learning from people. I don't know anything about marketing probably compared to you, but I love the idea that I can. That's what keeps me going, being able to understand something and then like by the time I die I'll be going- I'll say to myself, "I know so much, I know so little. And now someone else can have that burden."

Karl Boehm: Very nice. What do they say; wisdom is when you finally understand that you know very little.

Eric Schulze: Absolutely. Yeah, there's an effect for the opposite of that. It's called the Dunning Kruger Effect. It was recently discovered, it's the exact opposite. It's the less you objectively know about a subject, the more you will claim confidence in how well you know that subject.

Karl Boehm: That's really funny.

Eric Schulze: So- and it's an actual thing we have to account for in expertise and running studies for example, people overcompensate for what they think they know. It's actually an indicator of how little you know, is how much you claim to know about something.

Karl Boehm: Wow. That's funny. Well how about how do you integrate the science of creativity into your work on a regular basis?

Eric Schulze: To me, the most important way to integrate sort of science creativity is to one, ask the opinions of other people. You as an individual are not creative; your community is creative. Creativity doesn't exist for an individual, the research is very clear about this. The idea of the toiling genius that- what's the name of the movie

with Leonardo DiCaprio where he plays the eccentric billionaire that locks himself away?

Karl Boehm: Is it the Great Gatsby?

Eric Schulze: It was older than that. He plays this eccentric billionaire that locks himself away; a real-life-

Well anyway the point is the idea of this like toiling genius sitting in their basement, like creating the next cancer cure, is BS. There is no evidence that supports that. All evidence points to- you know if you want to create the next cancer cure, you're going to have to work with lots of people, and that's because there's no such thing as an individual that's creative- it's a creative community. And it's because it's a give-take relationship, you have to produce work, quantity, that has to be evaluated by others- that's the quality part. So quality is determined by others, that's not your job as a producer of creative stuff. That's a huge issue a lot of people never get over. They never learn to accept constructive criticism, or criticism in general even if it's undue for their work.

Karl Boehm: Interesting. Yeah, you know we talk a lot about the lean startup method on this show somehow, and it just comes up- I guess it's hot in the field at the moment. And something I heard recently was somebody went out and they studied a bunch of billionaires. And they tried to determine what patterns were surfacing amongst the billionaires and what they found was, they were not shooting for perfection. They were shooting for rapid experimentation. And so it's interesting to hear you say that, that the real creative genius is in the group think and getting it out there, getting the quantity, and in the quantity there will be quality; quality ends up rising up. Maybe I'm paraphrasing too much.

Eric Schulze: No you're absolutely, I would add to it. And it's the creativity's not necessarily in the group think itself, it's in the- it's in sharing that with a group, but ultimately doing what you feel creatively- so taking their advice and still doing what you believe is you. Truly

creative people view creating as play, I don't invoke a lot of neuroscience in the work because it's too new of a field still. But like for example there's no left brain, right brain. No one's a right brain person, that's BS too, that's not supported by any evidence whatsoever. In fact if you were just operating in your right hemisphere you'd probably have a medical condition that requires a doctor. That's not a good thing to be happening. And if all of your brain was working all at once, like that whole 10%- did you see Lucy?

Karl Boehm: I did, yeah that was embarrassing even for a non-scientist.

Eric Schulze: This creativity thing, like unlocking your mind's potential and using 100% of your brain. If you used 100% of your brain, you'd have- it's called a grand mal seizure, and you'd be dead. You use most of your brain, most of the time. It's just where you decide to like focus your energy if that makes any sense. But yeah, getting back to your point about lean startups- that's totally true. Like doing cool stuff requires you to iterate quickly, and I'm not familiar with lean startups.

Karl Boehm: Well that really is the crux of it, is you try to get a product out as quickly as possible, as lean as possible, then you test, and then you iterate. And the process keeps going. And it's right in line with what I was describing about the Spiral Marketing, it's iterative growth.

Eric Schulze: Right. Interesting. Today I learned I need the NBC The More You Know star to fly over my head.

Karl Boehm: We can get the sound guy to find that somewhere. So how about influencers and inspiration for this field specifically? Is there any king of scientists for creativity?

Eric Schulze: Oh, there's an undisputed king in this field.

Karl Boehm: Yeah?

Eric Schulze: His name is Dean Keith Simonton, he's a researcher at University of California and Davis; and this guy works in relative obscurity. He wrote the only textbook on creativity. To give you an idea of how new of a field this is, even though it's been happening for hundreds of years, this textbook didn't come out until this year.

Karl Boehm: Wow.

Eric Schulze: This has been something that's- think of it this way. So fifty years ago if I told you, you could study scientifically creativity, you would have been laughed out of the building as a scientist. Now that question- now it's accepted that we can study it through FMRIs, neuroscience; although I take a little bit of an issue with the neuroscience , although I take a little bit of the scientific aspect. Now the question is, how do we measure curation? Can you scientifically predict someone who's going to be good at picking, choosing the next idea? That's the new frontier of creativity research.

Karl Boehm: Interesting.

Eric Schulze: How do you foster- what are the Nobel Laureate characteristics of a curator? And that's going to be- because ideas are a dime a dozen, it's the person who knows which idea is going to hit is the person that's valuable in a community.

Karl Boehm: Then you might look at the investors. It's the investors who have the highest success rate arguably, are the best at curation.

Eric Schulze: Right, and I would be- if you were to run a study then I would actually like try to figure out what characteristics give them their edge, what expertise do they have that other people don't? I mean I don't know frankly. Another influence is Arthur I. Miller who writes about the intersection of science, art, and how he believes art and science are melding into one field that he calls SciArt. But that is more art than science; he believes that- and here's the thing. It sounds crazy now, but there's a premise for this. Science cannot exist, literally cannot exist, it was not discovered until art became accepted as a part of cultures around the world. Art has to exist first for science to exist, no matter what we look at. Every culture that invented art, or treated artists as citizen, or as a part of their communities, science prospered eventually. But science never came first, ever. We've never invented science before art.

Karl Boehm: Why do you think that is?

Eric Schulze: There's a couple of reasons but no one really knows for sure. The number one is that if you can afford as a society to have and harbor great artists, you have a somewhat- you have a prosperous society. Art, even in early humanity was sort of a leisurely activity that wasn't necessary. The moment it becomes something that's part of the culture, it means society is stable enough to harbor the scientific endeavor. Also, you have to invent public sanitation. So remember that whole quantity argument I was saying, you need to have people that need to be born that possibly could invent stuff. And if you're struggling to crack two billion people, which we didn't as a world or globe until the mid-19th century, you didn't have enough people to create stuff. Like just playing the probability game. So you have to like understand that people are going to- public sanitation, germ theory of disease, all this stuff. You had to have enough people.

Karl Boehm: I see. I see. I've got this saying, I don't know where I picked it up from but it's art from ink spills.

Eric Schulze: True.

Karl Boehm: Because a lot of times art almost comes off as like an accident, you know? So two people riffing, they come up with an idea, ends up being art.

Eric Schulze: Sure, absolutely.

Karl Boehm: Whether it's a song, or it could be any number of things and arguably when somebody comes up with something brand new, they're just experimenting in their minds.

Eric Schulze: Oh, yes. That whole process is called ideation and there's several steps to creating an idea and that's one of them; and there's five of them, at least in literature. The first is ideation, you have to bumble around these ideas in your head, toss them around, and then five to six to seven of them whatever, end up getting like to the front of your brain, the pre-frontal cortex, the super computer if you will, gets time on the super computer so it can do some processing. But all this presupposes that you are exposed to enough stuff to create the ideas.

Karl Boehm: Do you know the other five steps?

Eric Schulze: Off the top of my head, oh my goodness.

Karl Boehm: Put you on the spot here.

Eric Schulze: Right, I don't have my other notebook with me. But the general flow of the ideas is you have to collect information, and that's exposure. Then you have to ideate, you have to create the ideas. Then you have to allow them to go through what's called Darwinian Selection; there's an evolutionary process in your brain that has to happen with the ideas itself, right? And this happens

sort of semi- you're semi-aware of it. Fourth step is walking away, is allowing those ideas to just sort of ferment in your head. That actually- we now know what part of your brain is taking care of them at that point. Walking away is called the Default Mode Network. It's the part of your brain that becomes active when you're not thinking about anything. And we thought- it's like when you're in the shower, when you're driving, on your way to work-

Karl Boehm: Similar to a subconsciousness of sorts?

Eric Schulze: Exactly, but it's autopilot for your brain and we thought, 'Oh, it's just doing autopilot. It's just taking over.' Turns out that's not true. It's your brain's housekeeper. It takes- during the day you're receiving information and your brain is just shoving it places. So you then, your Default Mode Network, takes up that piece of information and places it in its proper brain space on the shelf; and that's when an idea clicks.

Karl Boehm: Very cool, very cool.

Eric Schulze: And then the fifth, the last step is actually producing the idea, like doing it.

Karl Boehm: Okay. Well it's perfect segway I think because I was going to ask you, how do you think the science of creativity can help somebody who's trying to come up with a creative idea like a marketing campaign, a new brand, something like that?

Eric Schulze: This is going to sound really weird, because it goes against what a lot of people think but the evidence points towards the contrary. You have to tell as many people as possible. You have to bounce- I know and it's weird because you're like, 'It's my idea and I want to protect it.' No, you have to tell as many people as you possibly can the idea; forcing yourself to flesh it out. Forcing yourself to get

feedback. Not because you want them to tell you yes or no, but one- it has two effects. It builds a creative community around the idea already. And two, it allows your brain to work out any kinks as you're explaining it. So that's like the big way that like people don't realize. So I- and that way it has a huge effect on future ideas that you might develop because then people remember. We know that if you pitch an idea, it's what I call the sort of Paris Hilton-Kim Kardashian hypothesis. They have no discernible value in society, those two people; none. But they're super famous, worth billions of dollars, or millions of dollars, whatever. For nothing discernibly good, right? Why? Because people at some point thought they were worth pitching an idea to, and then those people heard that they pitched an idea so the circle grew wider and more people pitched ideas. And so these Kim Kardashian, Paris Hilton types, they are now exposed to tons of creative ideas every day, and just by virtue of being around all of those wonderful ideas, because they initially were told it was okay. They now get to be super creative because they're around a ton of creative ideas, and we know this works unfortunately.

Karl Boehm: Wow, that's so interesting. So it's almost like the popular girl syndrome times a thousand.

Eric Schulze: It goes to the quantity argument, again. If you pitch your idea to everyone, they start thinking you're the person that has the ideas; they'll pitch you theirs. As more people find that out, you'll be pitched to over and over and over again. This is why Steve Jobs impartially, I know he's invoked a lot, part of what is attributed to his success other than being crazy, was that a lot of different people pitched him ideas and he was aware of them. We know no matter- whatever you take the size of creative community, say you have 100 people that are close to that you would pitch this idea to. We know that the square root of the size of that community is the number of people that will produce over half of the ideas in that community. So in a community of 100, ten people will produce half of the ideas that get developed. So if you have- you can imagine in a group of four people, two people are producing half of the ideas. And as it gets bigger and bigger, less and less people are producing all of the ideas.

Karl Boehm: Interesting, it's not far from the 80/20 rule.

Eric Schulze: Sure. Well, so what's really interesting too, is for example like I could fire right now the fifty- like the lower 50% of the least productive scientists in the world if we organize them by productivity. And the world's productivity would fall by only a seventh in scientific output. Like you just got rid of half of the workforce and still almost everyone else- and this is true for any field. We know this is true, it's called Power Law, it's been known for a long time and you can model it. There's a little wonderful thing called a lotka Curve, and this is true for any field across all fields. Even like Aristotle compared to Einstein; like you can compare them in terms of output. And Aristotle puts Einstein to shame in terms of how much more work he produced, but he ran a school, like everyone talked to him. So my point is-

Karl Boehm: That Aristotle. I feel like we wouldn't be speaking- like there wouldn't be microphones or anything, he's at the root of so much of modern civilization.

Eric Schulze: That's true, we also wouldn't have zero- well he didn't invent it, but my point is for all the things the Greeks are given credit for - Pythagorean Theorem, wine or whatever - they didn't invent two things: soap and zero. Seriously. Not all technological innovations are practical, and it goes to show you that. They could figure this out, they figured out how to run water from the mountains to the city center, but they couldn't invent soap and the concept zero; which literally did revolutionize the modern world.

Karl Boehm: Seems like we touched a nerve there on soap and zero.

Eric Schulze: See, it's the little things that get scientists all up in arms.

Karl Boehm: Okay. Well is there any resource for insight and inspiration that you'd recommend for folks who want to learn more here? You mentioned the godfather, but I mean if you wanted to say, "Alright team, we need to get creative here," what would be a potential resource to look at?

Eric Schulze: So anything written by Scott Barry Kaufman at Huffington Post, believe it or not he's a researcher who is probably the best at like keeping up with communicating how this research is progressing. But in terms of like looking online, or just like what could people do?

Karl Boehm: Either one actually- yeah they're both, tips and tricks, resources, those are both really helpful.

Eric Schulze: Easiest tips- it's going to sound silly but practicing your analogies. The more we know that- it's a high predictor of creativity is your ability to form analogies, that's why it's tested on the SAT. I know it seems silly but it's actually really true. Building analogies allows you to open up your mind to different ideas, especially distant analogies. Running in five to six different creative communities that are all less than 100 people in size, that actually takes some time to think about. You should run between multiple different crowds; that almost will guarantee that you're producing ideas. Tell your ideas to people regularly, often and get feedback but you don't have to listen to it. That's another thing, produce, produce, produce, produce, produce. You have to actually produce ideas and we know the more you produce, the more likely one's going to hit. And that's according to what the evidence says. And probably the one thing most people don't think about is you have to live in a city that has a certain population density. This has a huge impact on your creativity, with online is sort of helping make this disappear. DC just makes it, actually.

Karl Boehm: Just makes it?

Eric Schulze: Just makes it. Most of Nova doesn't, that's about 4,000 people per kilometer squared. Above that, and your chances of producing an idea that hit for some reason go up exponentially. So, I don't know it's really interesting.

Karl Boehm: Fascinating.

Eric Schulze: Yeah, it's weird. It's the weird things that are sort of tethered together.

Karl Boehm: Farmers are screwed, huh?

Eric Schulze: Yeah but their chickens and pigs are great.

Karl Boehm: Those pigs are so creative! How about a question to challenge yourself to perform better?

Eric Schulze: Who could I talk to or ask, that will completely destroy my ideas, fundamental premise?

Karl Boehm: Awesome. What's the next big project for you?

Eric Schulze: I'll be launching another television show here soon hopefully. But more importantly as a personal project, I'm going to be launching a scientific talent agency that evaluates scientists, not on their scientific credentials exclusively, but their communication ability in different venues. So evaluating them that way so that we can get at the next generation of science communicators out there and promote it properly.

Karl Boehm: On top of the other four projects that you've got going?

Eric Schulze: Yeah, I don't sleep. Bill Nye the Science Guy and Neil Degrasse Tyson can't have all the fun.

Karl Boehm: Okay, what do you think the future of this topic will look like? It's one of my favorite questions.

Eric Schulze: That is a great question. I hope- I hope we're sitting here five years from now or whatever, discussing how people now are able to predict taste. Taste is a scientific measure. Like it's not just like Karl you can produce ideas; it's your taste that's predictable and scientifically testable. That's incredible.

Karl Boehm: Taste as in style.

Eric Schulze: Right, not only that but I can predict what your taste will be, that you have- and your taste is not only quantifiable but it's what is needed like for a field. Like we know that whatever comes out of your mouth is what the field will become, but from a scientific perspective.

Karl Boehm: Wow.

Eric Schulze: That- I hope that happens. That's like Minority Report sort of stuff. But in a good way. I want the Tom Cruise gloves.

Karl Boehm: Perfect, thank you. Okay what's the best place for people to learn more and to reach you?

Eric Schulze: The easiest is Twitter, it's @SciencEric or you can send me an email, I might give that to you or on my About Me page. But Twitter is easiest; @SciencEric.

Karl Boehm: Okay.

Eric Schulze: If you have a question out there in the land of electrons, I'd love to try and answer it.

Karl Boehm: Awesome, thanks so much.

Eric Schulze: Thank you, sir.

Karl Boehm: Awesome, thanks so much.